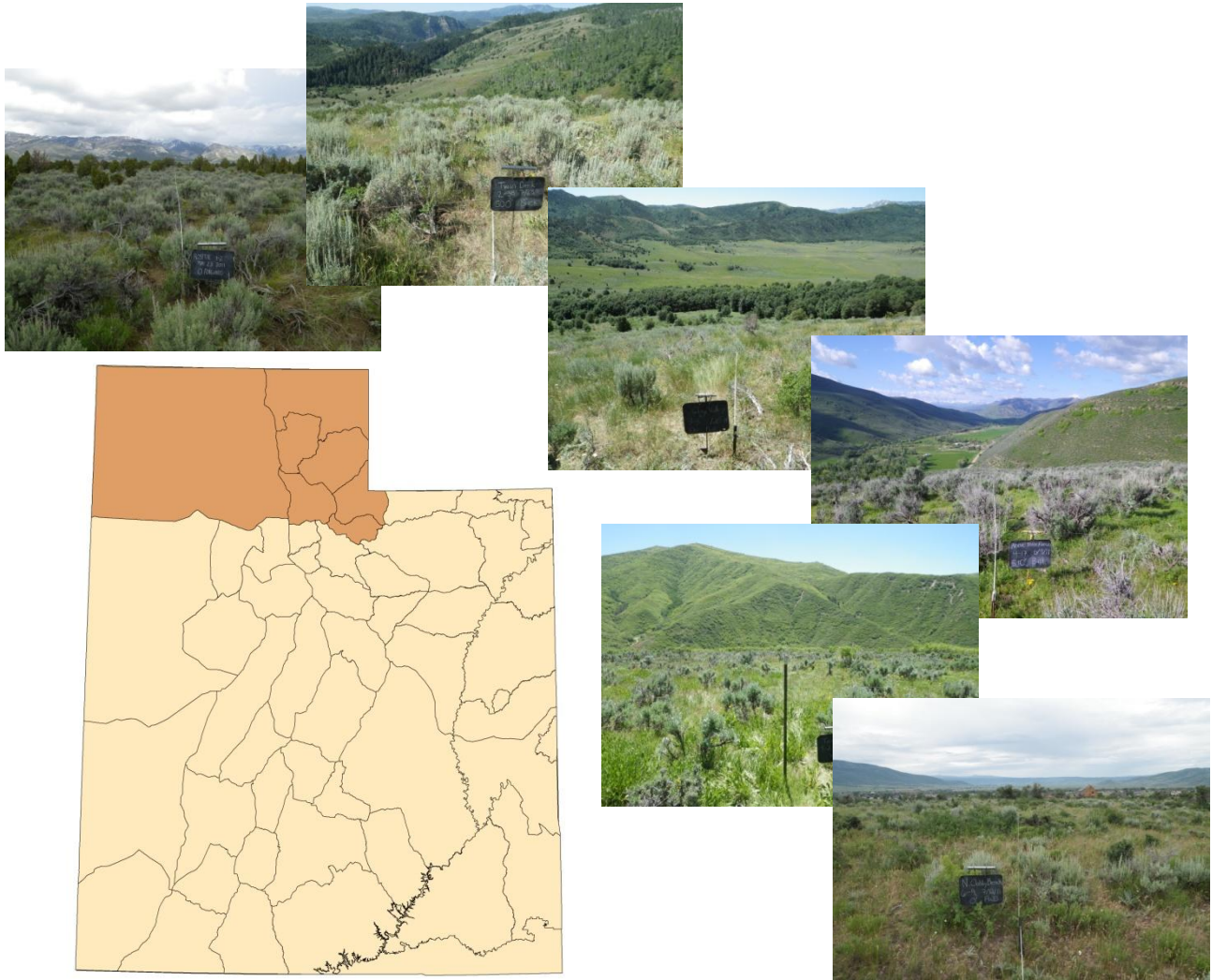


UTAH BIG GAME RANGE TREND STUDIES 2011 Northern Region



**PUBLICATION NUMBER 12-15
REPORT FOR FEDERAL AID PROJECT W-82-R-56**

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

**UTAH BIG GAME
RANGE TREND STUDIES
2011**

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Performance Report for Federal Aid Project W-82-R-56

Publication No. 12-15

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Reports for all regions, with accompanying photographs, are available online at <http://wildlife.utah.gov/range/>.

PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-56

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 Utah Division of Wildlife Resources (DWR) 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 Bureau of Land Management (BLM) and United States Forest Service (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 DWR 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 2011 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northern Region. Most trend studies surveyed in these management units were established in the 1980's and reread at 5 year intervals.

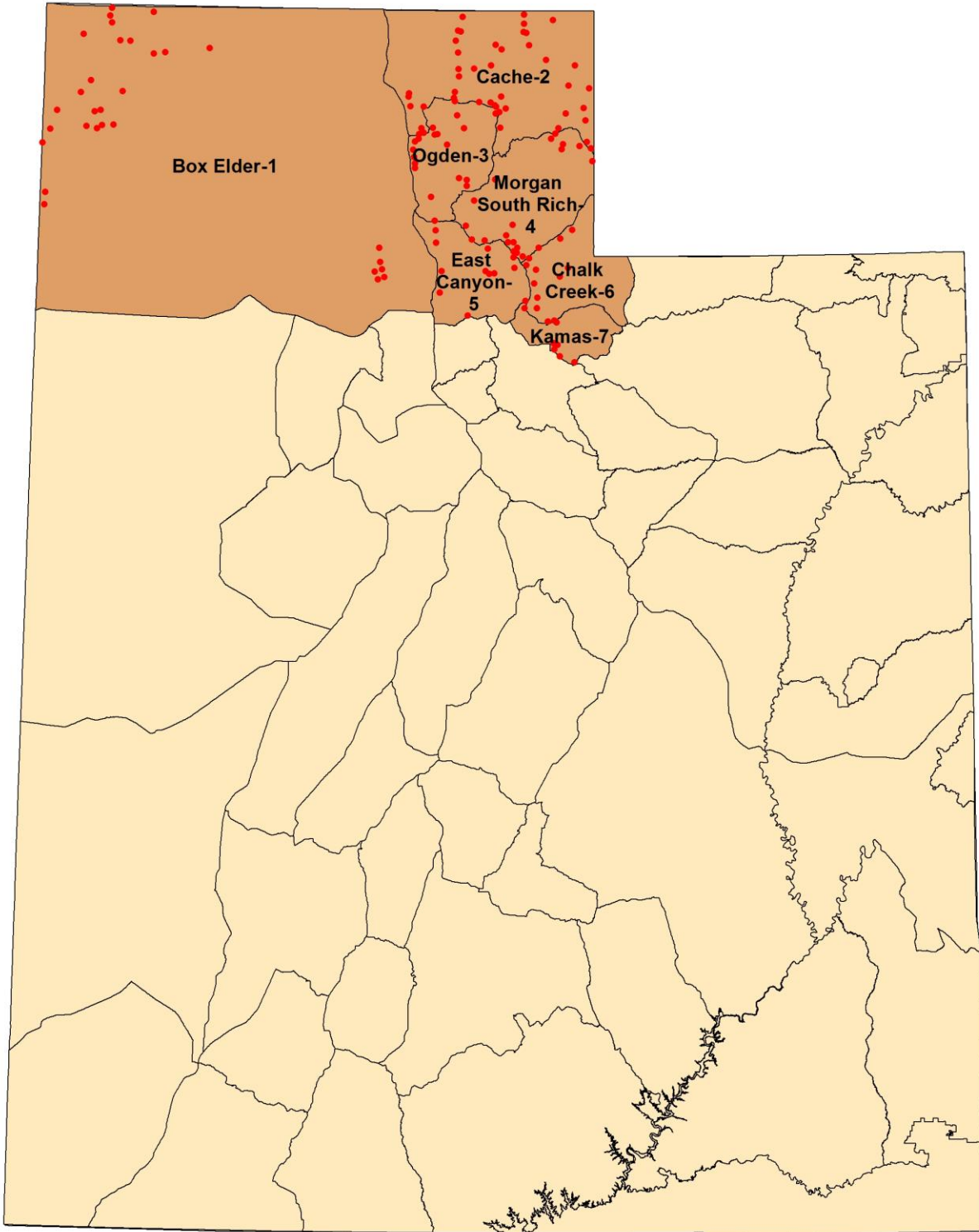
The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies which add to the value of this interagency report:

Bureau of Land Management
Salt Lake Field Office

Sawtooth National Forest
Wasatch-Cache National Forest

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

Utah Management Units Surveyed in 2011



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 vegetation 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 has demonstrated a definite pattern of use during normal climatic conditions over a long period of time. Trend studies are located within these areas of high use and/or crucial habitat as agreed upon by DWR, BLM, and USFS personnel. Often, range trend studies are established in conjunction with permanently marked pellet group transects. Once a “key” area has been selected, specific placement for sampling is determined. The sampling grid is carefully placed in order to adequately represent the surrounding area. All sampling baselines are permanently marked by half-high steel fence posts. The first, or “0 foot baseline stake”, is marked with a metal tag for proper identification of the transect.

Vegetation Composition

Determining vegetation characteristics for each “key” area is determined by setting up five 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 m² 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. However, prior to 1992 no data was collected for annual species.

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

Total canopy cover of shrubs or trees is also estimated using the line- intercept method (¹U.S. Department of Interior Bureau of Land Management 1999). 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. After 2002 all canopy cover both above and below eye level was estimated.

Nested Frequency: 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 (Figure 2).

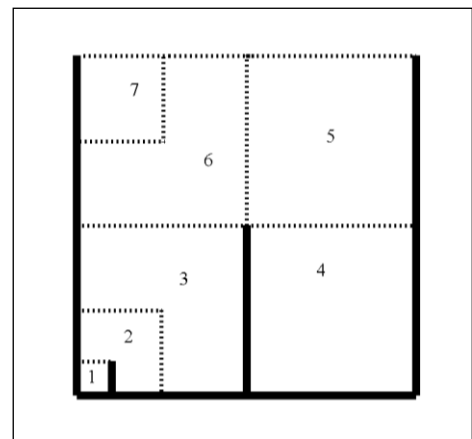


Figure 1. Cover classes of the 1/4 m² sampling quadrat.

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 independently and do not necessarily indicate changes in composition and/or distribution of key plant species.

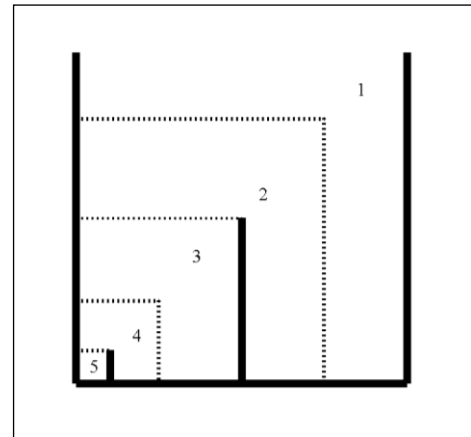


Figure 2. Nested frequency sub-quadrats of the 1/4 m² sampling quadrat.

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

Shrub Density & Characterization: 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 categorized using a modified Cole Browse Method (²U.S. Department of Interior Bureau of Land Management 1999):

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 nine 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.

Unavailable: 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 four 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 (Mitchell 2007, Dahdouh-Guebas and Koedam 2006, Pollard 1971, Cottam and Curtis 1956) at 100 foot intervals along the baseline measuring to a maximum of 15 meters. If trees are rare due to a treatment or wildfire, the sampling area is extended to 200 foot intervals measuring to a maximum of 30 meters, and 300 feet is 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 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.

Browse: Particular attention is given to woody plants and their important role as indicators on crucial big game 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 cover contributed by key species
- 3) recruitment or proportion of young plants in population
- 4) proportion of decadent plants
- 5) proportion of plants in poor vigor
- 6) changes in height and crown diameter measurements for mature age class
- 7) changes in browse species composition
- 8) strip frequency values

Herbaceous Understory: Trends in herbaceous plants as a group or as a single “key” species are 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, the Friedman test (analogous to analysis of variance) (Conover 1980), is conducted on nested frequencies of each species to determine significant changes at $\alpha = 0.10$.

Soil: Ground cover parameters are analyzed and compared in the discussions of the reread studies, but no actual trend is determined. Beginning in 2002, an erosion condition class assessment adapted from the Bureau of Land Management was also completed on each study site to provide additional qualitative information on soil condition (Clark 1980).

Data Interpretation

The following tables and partial tables are taken from study number 13A-1 to help illustrate how to read the data and some basic comparisons that can be made with the data.

Herbaceous Understory: The “Herbaceous Trends” table summarizes the 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 13A-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, trend is determined using the change in the sum of nested frequency and cover of perennial grasses, and the change in composition of grasses determined by each species nested frequency and cover.

As shown in the “Herbaceous Trends” table, the undesirable species bulbous bluegrass (*Poa bulbosa*) was the most common species in nested frequency on the site in all sample years. The subscript letters indicate that the nested frequency value for *P. bulbosa* declined significantly between 1999 and 2004. Cover of *P. bulbosa* was estimated at a high of 8.01% in 1999 to a low of 2.43% in 2004. Trend for this grass species is down over the life of the study due to a significant decline in sum of nested frequency and a decrease in cover, though the decrease in this species is desirable for the grass trend of the site. The more desirable species crested wheatgrass (*A. cristatum*) has also decreased in nested frequency over the life of the study, but the decrease was only significant between the 1987 and 2009 sample years. Grasses had a combined total cover value of 11.52% in 1994, 13.89% in 1999, 11.35% in 2004 and 7.32% in 2009. These changes would indicate a slightly downward perennial grass trend over the life of the study. The forb trend can be determined in a similar manner.

HERBACEOUS TRENDS--
Management unit 13A, Study no: 1

Type	Species	Nested Frequency					Average Cover %			
		'87	'94	'99	'04	'09	'94	'99	'04	'09
G	Agropyron cristatum	b135	ab106	ab100	ab112	a81	2.46	2.50	4.81	2.00
G	Agropyron intermedium	-	-	3	2	3	-	.03	.00	.03
G	Bouteloua gracilis	15	19	17	13	17	1.07	.14	.53	.30
G	Bromus inermis	75	67	63	68	92	.63	2.40	1.00	1.35
G	Bromus tectorum (a)	-	-	3	-	-	-	.00	-	-
G	Hilaria jamesii	-	-	-	2	-	-	-	.03	-
G	Koeleria cristata	b61	a3	a19	a3	a-	.03	.18	.01	-
G	Oryzopsis hymenoides	-	3	3	3	8	.00	.00	.03	.07
G	Poa bulbosa	b220	b256	b250	a129	a136	7.14	8.01	2.43	2.86
G	Poa fendleriana	a-	b16	d53	cd55	bc24	.06	.38	1.24	.33
G	Sitanion hystrix	6	1	-	-	-	.00	-	-	-
G	Stipa comata	b48	a14	bc24	bc30	a21	.11	.23	1.24	.36
Total for Annual Grasses		0	0	3	0	0	0	0.00	0	0
Total for Perennial Grasses		560	485	532	417	382	11.52	13.89	11.35	7.32
Total for Grasses		560	485	535	417	382	11.52	13.90	11.35	7.32
F	Astragalus convallarius	b40	bc17	ab25	b37	a9	.10	.42	.99	.10
F	Calochortus nuttallii	8	-	-	1	-	-	-	.00	-
F	Castilleja chromosa	b38	a4	a-	a-	a-	.01	-	-	-
F	Castilleja linariaefolia	-	2	1	-	-	.01	.03	-	-
F	Comandra pallida	-	-	-	3	-	-	-	.01	-
F	Cordylanthus sp. (a)	-	-	-	5	5	-	-	.16	.01
F	Crepis acuminata	b14	a6	a-	a-	a-	.03	-	-	-
F	Erigeron flagellaris	-	-	3	-	1	-	.15	-	.00
F	Erigeron pumilus	b111	a21	a43	a20	a12	.07	.51	.53	.08
F	Eriogonum racemosum	b63	a30	a34	a25	a28	.14	.30	.35	.21
F	Hymenoxys acaulis	3	-	3	1	-	-	.00	.03	-
F	Lomatium triternatum	b31	a-	a-	a-	a-	-	-	-	-
F	Lupinus argenteus	d162	c57	b20	a-	a-	3.64	.14	-	-
F	Machaeranthera canescens	1	-	2	-	-	-	.01	-	-
F	Penstemon caespitosus	85	2	6	6	5	.01	.03	.07	.02
F	Petradoria pumila	-	-	5	-	-	-	.06	-	-
F	Phlox longifolia	c67	bc53	ab31	a7	a17	.14	.06	.05	.10
F	Polygonum douglasii (a)	-	-	-	-	6	-	-	-	.01
F	Senecio multilobatus	-	1	1	-	-	.00	.00	-	-
F	Sphaeralcea coccinea	58	55	52	49	48	1.24	.38	.60	.59
F	Tragopogon dubius	6	-	-	-	-	-	-	-	-
F	Trifolium gymnocarpon	-	3	3	2	-	.00	.00	.00	-
F	Zigadenus paniculatus	-	-	3	-	1	-	.00	.00	.03
Total for Annual Forbs		0	0	0	5	11	0	0	0.15	0.01
Total for Perennial Forbs		693	251	232	151	121	5.43	2.15	2.66	1.15
Total for Forbs		693	251	232	156	132	5.43	2.15	2.82	1.17

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

Browse: 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 13A-1 are listed. For example, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) had a strip frequency of 86 out of a possible 100 in 1994, 82 in 1999 and 85 in 2004 and 2009. Average cover is determined using cover classes in conjunction with the 1/4m² quadrat and estimating the percent of the quadrat covered. In this case, mountain big sagebrush cover was estimated to be 16.28% in 1994, 9.40% in 1999, 10.65% in 2004 and 9.94% in 2009.

BROWSE TRENDS--

Management unit 13A, Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'94	'99	'04	'09	'94	'99	'04	'09
B	<i>Amelanchier utahensis</i>	18	18	16	20	2.25	3.74	6.50	5.30
B	<i>Artemisia tridentata vaseyana</i>	86	82	85	85	16.28	9.40	10.65	9.94
B	<i>Chrysothamnus depressus</i>	12	26	23	23	.66	.72	1.46	.87
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	86	81	72	72	3.62	4.96	5.00	6.14
B	<i>Coryphantha vivipara arizonica</i>	0	2	5	5	-	.00	.00	.00
B	<i>Eriogonum microthecum</i>	10	16	10	9	.01	.53	.12	.12
B	<i>Gutierrezia sarothrae</i>	0	4	8	4	.01	.04	.15	.03
B	<i>Juniperus osteosperma</i>	0	0	0	0	-	-	-	.15
B	<i>Opuntia</i> sp.	36	35	41	45	.32	.56	1.12	1.33
B	<i>Pinus edulis</i>	0	16	14	10	2.92	3.53	7.21	8.53
B	<i>Purshia tridentata</i>	0	1	1	1	-	.00	.00	.00
B	<i>Quercus gambelii</i>	0	3	3	2	.76	.63	1.48	.76
B	<i>Symphoricarpos oreophilus</i>	3	2	4	2	.00	.00	.00	.00
Total for Browse		251	286	282	278	26.86	24.13	33.72	33.20

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, mountain big sagebrush had a cover of 13.21% in 2004 and 13.93% in 2009. Compare this to the cover determined using the 1/4m² quadrat cover class method. Prior to 2002, only trees species were sampled in the line-intercept transect above eye level. Beginning in 2002, all woody species were included in the line-intercept transect and a total canopy cover (above and below eye level) value for each was determined.

CANOPY COVER, LINE INTERCEPT--

Management unit 13A, Study no: 1

Species	Percent Cover		
	'99	'04	'09
<i>Amelanchier utahensis</i>	.80	7.25	9.48
<i>Artemisia tridentata vaseyana</i>	-	13.21	13.93
<i>Chrysothamnus depressus</i>	-	1.04	.58
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	4.73	7.25
<i>Eriogonum microthecum</i>	-	.11	.06
<i>Opuntia</i> sp.	-	.65	.71
<i>Pinus edulis</i>	3.59	11.86	13.43
<i>Quercus gambelii</i>	-	1.23	1.43
<i>Symphoricarpos oreophilus</i>	-	-	.08

Beginning in 2002, annual leader growth of the key browse species was 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 serviceberry (*Amelanchier utahensis*) averaged 1.8 inches and 1.7 inches in length in 2004 and 2009, respectively, while mountain big sagebrush leaders averaged 1.3 inches in both sample years.

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 13A, Study no: 1

Species	Average leader growth (in)	
	'04	'09
<i>Amelanchier utahensis</i>	1.8	1.7
<i>Artemisia tridentata vaseyana</i>	1.3	1.3

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. Point-quarter tree data for pinyon estimated 201 trees/acre in 1999, 175 tree/acre in 2004 and 213 trees/acre in 2009, with average basal diameters of 2.1 inches, 2.8 inches and 3.2 inches, respectively.

POINT-QUARTER TREE DATA--
Management unit 13A, Study no: 1

Species	Trees per Acre			Average diameter (in)		
	'99	'04	'09	'99	'04	'09
<i>Pinus edulis</i>	201	175	213	2.1	2.8	3.2

The “Browse Characteristics” table summarizes characteristics of the shrub community. 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 3,198 plants/acre in 1987, 4,800 plants/acre in 1994, 4,080 plants/acre in 1999, 3,800 plants/acre in 2004 and 3,820 plants/acre in 2009. 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 area (more than three times larger) was used to better characterize the shrub populations. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that characteristically are clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate shrub populations. Other characteristics like percent decadence, percent of the population displaying poor vigor, percent heavy hedging, young recruitment, etc., are given more weight in determining shrub trend when comparing survey years where sample sizes are different.

BROWSE CHARACTERISTICS--
Management unit 13A, Study no: 1

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
87	3198	8	79	12	-	42	8	2	13/17	
94	4800	4	54	42	940	13	2	10	18/32	
99	4080	13	63	24	360	41	3	3	21/31	
04	3800	5	73	22	-	33	10	9	15/24	
09	3820	6	68	26	60	34	17	22	17/25	

The data for mountain big sagebrush from study 13A-1 shows the proportion of decadent shrubs in the population was highest in 1994 at 42%, but has been more moderate at an average of 24% since 1999. More seedlings were also encountered in 1994, but recruitment of young plants has been low (< 10%) in all sample years except for 1999. The percentage of plants displaying poor vigor was low in most sample years, but increased to 22% in 2009. Considering all these factors, trend for sagebrush over the life of the study is stable.

Soil: 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 vegetation cover (15.25% in 1987), while the new method estimates the vertical projection of the crown, or aerial cover (33.38% in 1994, 39.61% in 1999, 42.08% in 2004 and 42.20% in 2009). Therefore, comparisons can be made for all cover measurements except for general vegetation cover.

BASIC COVER--

Management unit 13A, Study no: 1

Cover Type	Average Cover %				
	'87	'94	'99	'04	'09
Vegetation	15.25	33.38	39.61	42.08	42.20
Rock	0	.02	.00	.00	.00
Pavement	0	.03	.04	.05	.03
Litter	61.00	46.05	40.37	45.25	50.69
Cryptogams	3.50	1.50	8.07	2.74	2.00
Bare Ground	20.25	32.20	29.56	34.09	22.93

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. 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 (Allison and Moode 1965, Day 1965, Kenney and Nelson 1982, Normandin et. al. 1998, Olsen et. al. 1954, Rhodes 1982, Schoenau and Karamonos 1993, Sims and Jackson 1934, Walkley and Black 1971).

SOIL ANALYSIS DATA --

Management unit 13A, Study no: 1, Study Name: Two Mile Chaining

Effective rooting depth (in)	pH	loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11	6.5	48.2	30.6	21.3	2	8	105.6	0.4

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

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

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

Utilization: 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 1994, rabbit pellets were found in 44% of the quadrats placed on study 13A-1, decreasing to just 6% in 1999 and 2004, then increasing again to 34% in 2009. Quadrat frequency of rabbit or big game pellets indicates a relative amount of use by that particular animal. This data can help characterize changes in wildlife use patterns on the site.

It was determined that additional information on pellet groups was necessary. Therefore, a pellet group transect is now sampled in conjunction with the vegetation transects. The pellet group transect utilizes 50, 100ft² circular plots which are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetation transect which runs 400 feet to 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 (hectare) (Neff 1968). Rabbit pellet groups are not included in this sample. In the example, elk days use/acre was estimated at 70 in 1999 and decreased steadily to 4 elk days use/acre in 2009.

PELLET GROUP DATA--

Management unit 13A, Study no: 1

Type	Quadrat Frequency				Days use per acre (ha)		
	'94	'99	'04	'09	'99	'04	'09
Rabbit	44	6	6	34	-	-	-
Elk	28	26	11	3	70 (173)	27 (68)	4 (10)
Deer	14	28	15	9	32 (79)	16 (40)	25 (63)
Cattle	-	2	-	1	6 (14)	4 (11)	4 (9)

Other Information: 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 spp.* and *Purshia spp.*, the species names used by the Range Trend Study Plant Species List (Giunta 1983), Intermountain Flora (Cronquist et al. 1977) and the Intermountain Range Plant Names and Symbols (Plummer et al. 1977) are retained to maintain continuity and alleviate confusion with earlier published reports.

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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.

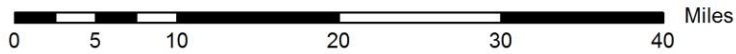
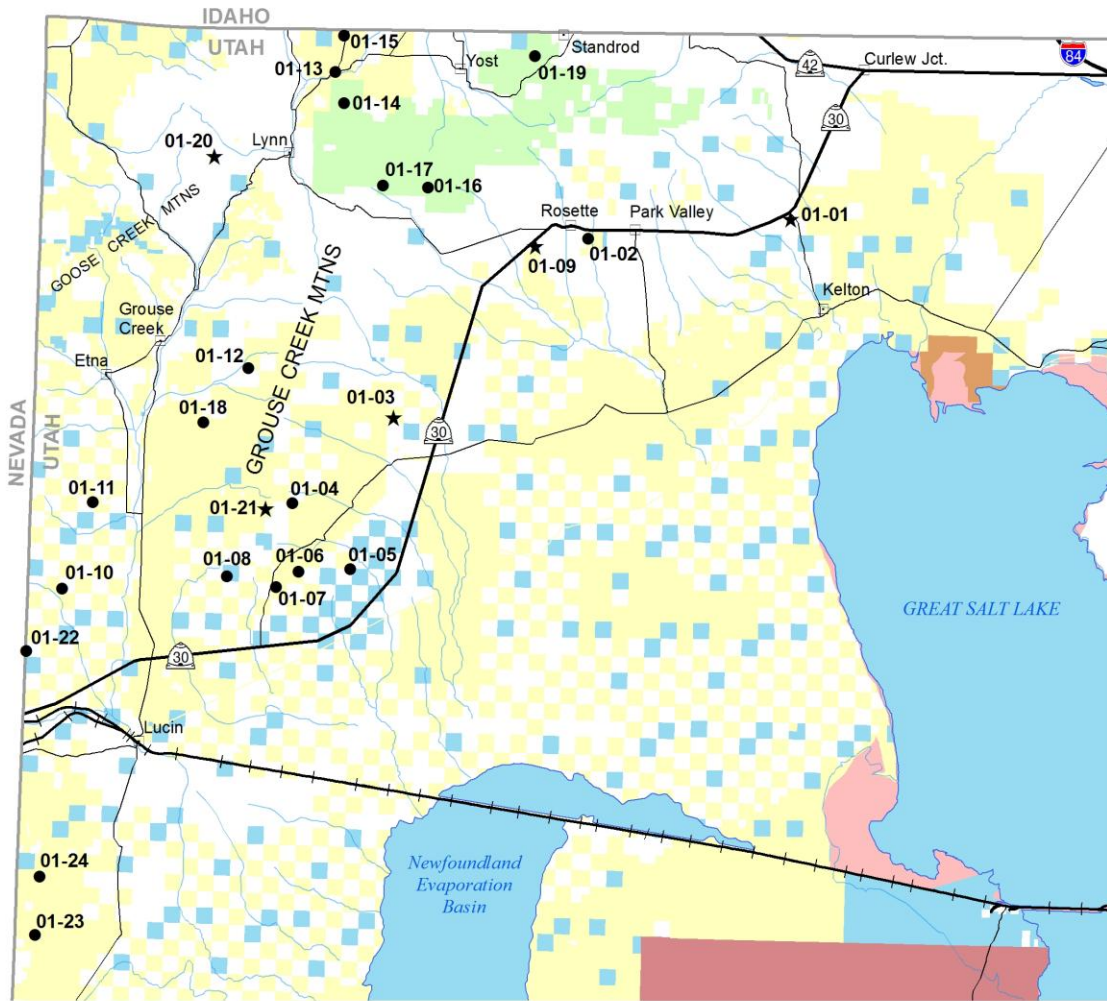
The name and directions for locating the site are given on the location page. Also included on this page are the vegetation type, range type, NRCS ecological site description, land ownership, elevation, aspect, slope, arrangement and diagrammatic sketch of the baseline, and the location on a topographical 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 historic characteristics, soil, ground cover, vegetation 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.

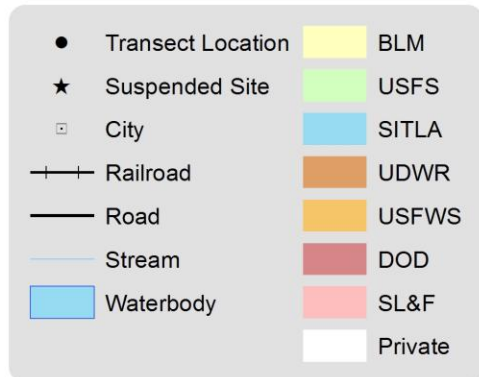
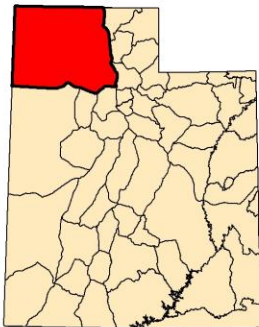
Tables with the compiled data follow the study discussions. A computer-generated data summary presents the pooled data for nested frequency, quadrat frequency, basic ground cover, soil characterization, shrub density, and shrub characterization. A nonparametric statistical analysis, the Friedman test, 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 1



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.

Management Unit Description

The Box Elder Management Unit 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 that 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), is where all of the permanent range studies have been established. The land area of this subunit is comprised mostly of 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 east-west, parallel to the Utah-Idaho border. Slopes on this mountain range are moderately steep on the south and east, and gentler on the north and west. The highest point is 9,925 feet on Dunn Benchmark 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 rougher, but the terrain becomes gentler near the Three Corners area.

Seasonal migration consists mainly of elevational and north to south migrations from summer range to winter range. A substantial 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 crucial to the unit's big-game herds, especially 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.

There is an estimated 931,645 acres of normal deer winter range that mostly follows the foothills of the major mountain ranges within the sub-unit. The upper limit of normal deer winter range varies from 6,000 to 8,000 feet over the sub-unit based on the mountain range on which it occurs. The lower limit of normal deer winter range typically follows the line of Hwy 30 from Curlew Junction to the Nevada border, with further deer winter range occurring in Nevada and Idaho. This sub-unit has a unique situation during severe winters. The limits for the severe deer winter range are not only lowered at the upper limit, but are also raised at the lower limit. This is because the low growing vegetation at the lower limits of normal deer winter range are easily covered by heavy snowfall, making them unavailable for big game use. During severe winter's, deer winter range is estimated to be reduced to 240,989 acres (King and Muir 1971).

King and Muir (1971) also describe seven general vegetation types which appear to dominate the big-game range. Sagebrush makes up 55% of the winter range and 58% of the summer range. 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. In these vegetation types, juniper trees are more important for the thermal cover than for forage. 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 Wildlife Management Unit 1 can be found in the 1970 Range Inventory Report published in 1971 by King and Muir.

Range Trend Studies

Nineteen interagency range trend studies were sampled in Unit 1 during the summer of 2011. A total of twenty-four studies have been established within Unit 1. Fourteen studies were established in 1984, and of these studies, four studies [Rosette (1-2), Mud Springs Basin (1-8), South West Rosette (1-9), and Raft River Narrows (1-13)] sample Wyoming big sagebrush communities, three studies [Chokecherry Springs (1-4), Red Butte Exclosure (1-12), and Broad Hollow (1-14)] sample mountain brush communities, five studies [Rosebud Hills (1-3), Devils Playground (1-5), South Side Emigrant Pass (1-7), Kilgore Basin (1-10), and Kimber Ranch (1-11)] sample black sagebrush communities, and two studies [Kelton (1-1), Bovine Exclosure (1-6)] sample basin big sagebrush sagebrush communities. One range trend study [Cedar Hills (1-15)] was established in 1990 and monitors a burned pinyon and juniper community. Nine range trend studies were established in 1996 to provide data in other areas of concern. These include mixed mountain brush sites [Nut Pine Hills (1-16), Clark's Basin (1-17), and Keg Springs (1-21)], a high elevation black sagebrush site [Bally Mountain (1-19)], and an aspen site [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, and an additional site [Dake Pass (1-22)] was established to monitor a black sagebrush wintering area for elk north of the Pilot Mountains.

In 2006, five studies (Kelton, Rosebud Hills, Southwest Rosette, Cotton Thomas, and Keg Spring) were suspended due to lack of use by wildlife. If the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

ROSETTE - TREND STUDY NO. 1-2-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R028AY220UT](#)

Land Ownership: BLM

Elevation: 5,500 ft. (1,676 m)

Aspect: South

Slope: 1%

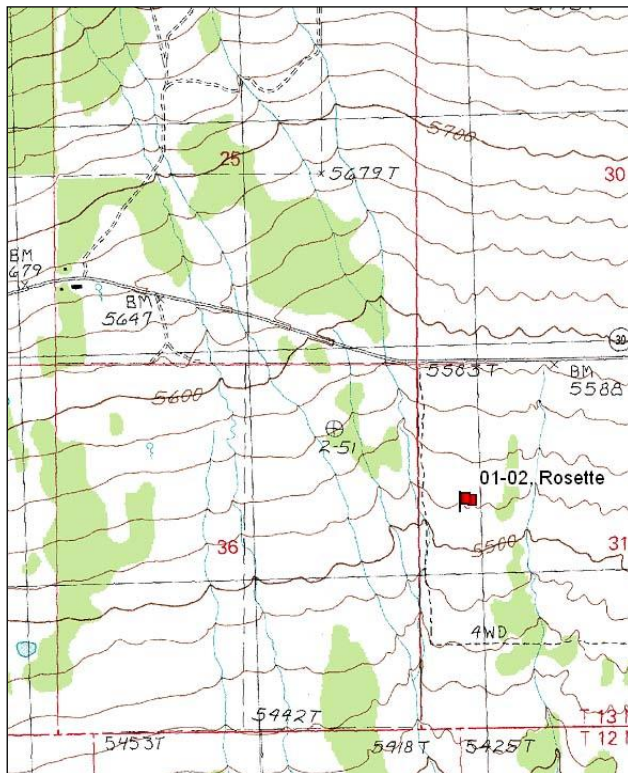
Transect bearing: 0° magnetic

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

Directions:

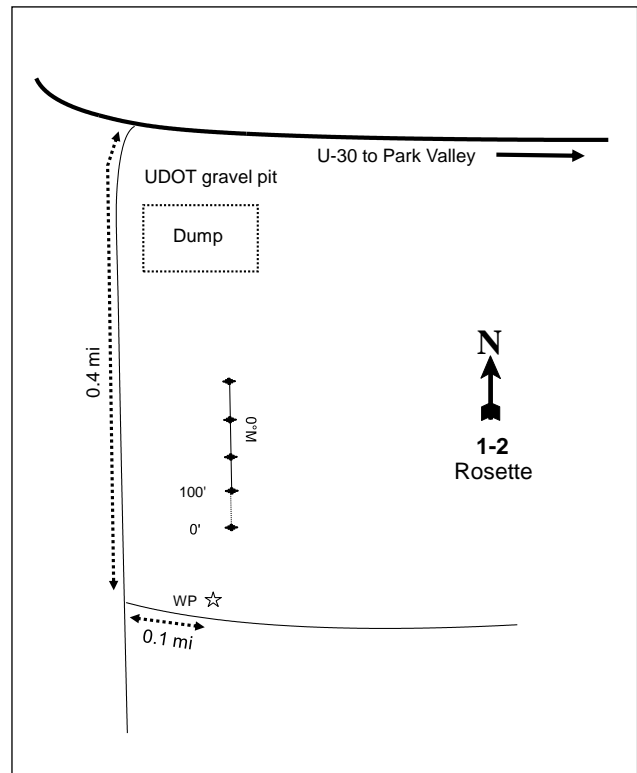
From Rosette, Utah and mile marker 51, proceed northeast on U-30 approximately 1.0 miles and turn right. Proceed through the Utah Department of Transportation gravel dump and find a dirt road on the west side of gravel pile area. Proceed south on this road for 0.4 miles (passing a left fork) to a left 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



Township: 13N Range: 13W Section: 31

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 301847 E 4631470 N

ROSETTE - TREND STUDY NO. 1-2

Site Information

Site Description: The trend study is located approximately two miles east of Rosette, on crucial deer winter range. The area is a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) type, which also contains some scattered Utah juniper (*Juniperus osteosperma*) trees and a few pockets of black sagebrush (*A. nova*). The land is administered by the Bureau of Land Management (BLM) as part of the Hirschi allotment. Deer pellet groups have been sampled in moderate abundance since 2001. Cattle also graze the area, and were on site when the study was established in 1984. However, sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The key browse species on the site is Wyoming big sagebrush, which provides the majority of the browse cover on the site (Table - Browse Trends). The Wyoming big sagebrush population also shows characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), but for the purposes of this study all of the big sagebrush plants were classified as Wyoming big sagebrush. The Wyoming big sagebrush stand is a fairly dense population that has had mostly light to moderate use through the sample years, with the exception of 1984 when the population displayed heavy use. The big sagebrush population has displayed moderately high amounts of decadence throughout the sample years, with very high decadence in 1990. Sagebrush plants in the population displaying poor vigor have also been moderately high over the course of the study. Recruitment of young sagebrush plants was very good in 1996 and 2001, but young plants have comprised less than 10% of the population in all other sample years (Table - Browse Characteristics).

Other shrubs sampled that produce additional forage consists of a small number of black sagebrush and rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *consimilis*). Narrowleaf low rabbitbrush (*C. viscidiflorus* ssp. *stenophyllus*), considered in this study to be a weedy increaser, is common on the site and provides a moderate amount of cover (Table - Browse Trends) and density (Table - Browse Characteristics). Utah juniper is found on the site at moderate density (Table - Point-Quarter Tree Data) and canopy cover (Table - Canopy Cover).

Herbaceous Understory: Sandberg bluegrass (*Poa secunda*) and western wheatgrass (*Agropyron smithii*) are the most abundant perennial grasses, but the annual grass species cheatgrass (*Bromus tectorum*) has been sampled at higher frequency than both perennial species since 1996. Cheatgrass has also provided the majority of the grass cover since 2001. Other grass species are rare on the study. Forbs are diverse, but are sparse. The most common perennial forb species and the only perennial forb species that has had consistent frequency and cover over the sample years is Hoods phlox (*Phlox hoodii*) (Table - Herbaceous Trends).

Soil: The soil is classified as part of the the Lembos-Taylor's flat complex, which is found on fan remnants. The parent material consists of alluvium derived from limestone, sandstone, and quartzite. The soils within this classification are characterized as deep, well drained soils, with a slow infiltration rate (Soil Survey Staff 2011). Soil texture is a clay loam with a neutral soil reaction (pH 7.3) (Table - Soil Analysis Data). Bare ground cover is moderate on the study site, though there is a large amount of vegetation and litter cover providing protective ground cover (Table - Basic Cover). Due to high amounts of pedestalling, flow patterns, and rills, the soil erosion condition was classified as moderate in 2001 and 2006. The soil erosion condition was classified as stable in 2011, but pedestalling was still deemed to be fairly high.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of Wyoming big sagebrush decreased by 40% from 6,331 plants/acre to 3,799 plants/acre. Decadence of sagebrush increased from 23% to 77%, and poor vigor increased from 21% to 28% of the population. Recruitment of young sagebrush plants decreased from 9% to 0% of the population.

- **1990 to 1996 - up (+2):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of Wyoming big sagebrush decreased to 29%, and poor vigor decreased to 9% of the population. Recruitment of young sagebrush plants comprised 49% of the population, therefore, density estimates are likely inflated for the 1996 sample year.
- **1996 to 2001 - stable (0):** There was a 13% decrease in the density of Wyoming big sagebrush from 6,160 plants/acre to 5,380 plants/acre, though most of the decrease was due to a decrease in the recruitment of young sagebrush plants. Recruitment of young sagebrush plants remained good, however, at 23% of the population. Cover of sagebrush increased from 14% to 19%. Decadence within the sagebrush population decreased to 18%, and plants displaying poor vigor decreased to 7%.
- **2001 to 2006 - down (-2):** The density of Wyoming big sagebrush decreased by 22% to 4,180 plants/acre, with a slight decrease in cover to 16%. Decadence of sagebrush increased to 35%, and poor vigor increased to 16%. Recruitment of young sagebrush plants decreased to 7% of the population.
- **2006 to 2011 - slightly down (-1):** Wyoming big sagebrush density decreased by 14% to 3,600 plants/acre, though cover remained similar at 15%. Decadence, poor vigor, and recruitment of young plants remained similar at 23%, 18%, and 6%, respectively.

Grass:

- **1984 to 1990 - up (+2):** There was a 31% increase in the sum of nested frequency of perennial grasses. Bottlebrush squirreltail (*Sitanion hystrix*) increased significantly in nested frequency, and Sandberg bluegrass also increased substantially.
- **1990 to 1996 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased from 6% to 9%. There was a significant decrease in the nested frequency of bottlebrush squirreltail, but this species was never prevalent on the site.
- **2001 to 2006 - slightly down (-1):** Perennial grass sum of nested frequency decreased by 7%, but has decreased by 16% since 1990. Cover of perennial grasses decreased to 6%. The nested frequency of the weedy annual species cheatgrass increased significantly, and cheatgrass became the dominant grass species in cover on the site at 5%.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased to 11%. Cheatgrass decreased significantly in nested frequency, but increased in cover to 11% and remained the dominant grass species on the site.

Forb:

- **1984 to 1990 - slightly up (+1):** There was a 10% increase in the nested frequency of perennial forbs, though perennial forbs remain sparse.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 41%, though cover remained similar. Annual forbs increased substantially in nested frequency, but cover remained similar.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial forbs decreased by 35%, and cover decreased from 2% to 1%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 51%, and cover increased to 2%. However, annual forb sum of nested frequency also increased substantially, and cover increased from less than 1% to 3%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

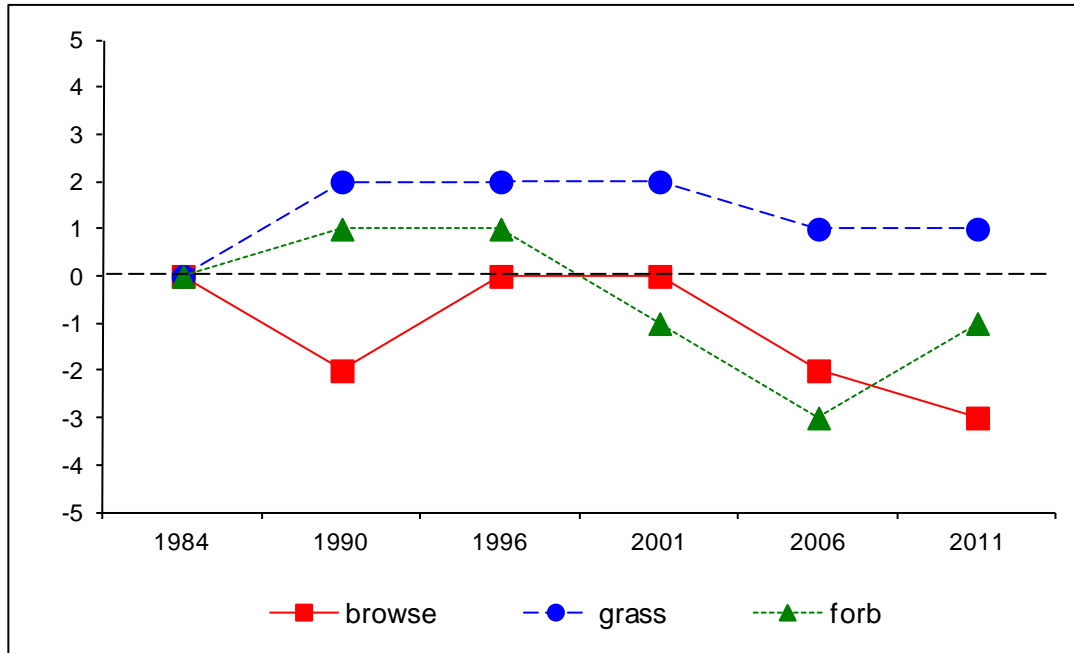
Management unit 1, study no: 2

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	17.6	6.3	15.0	12.8	-2.4	3.4	0.0	52.6	Good
01	23.2	9.6	11.5	18.4	-2.7	3.7	0.0	63.6	Good-Excellent
06	19.9	4.5	3.5	11.4	-4.0	1.9	0.0	37.2	Fair
11	18.7	8.1	3.0	21.1	-8.3	3.8	0.0	46.3	Fair-Good

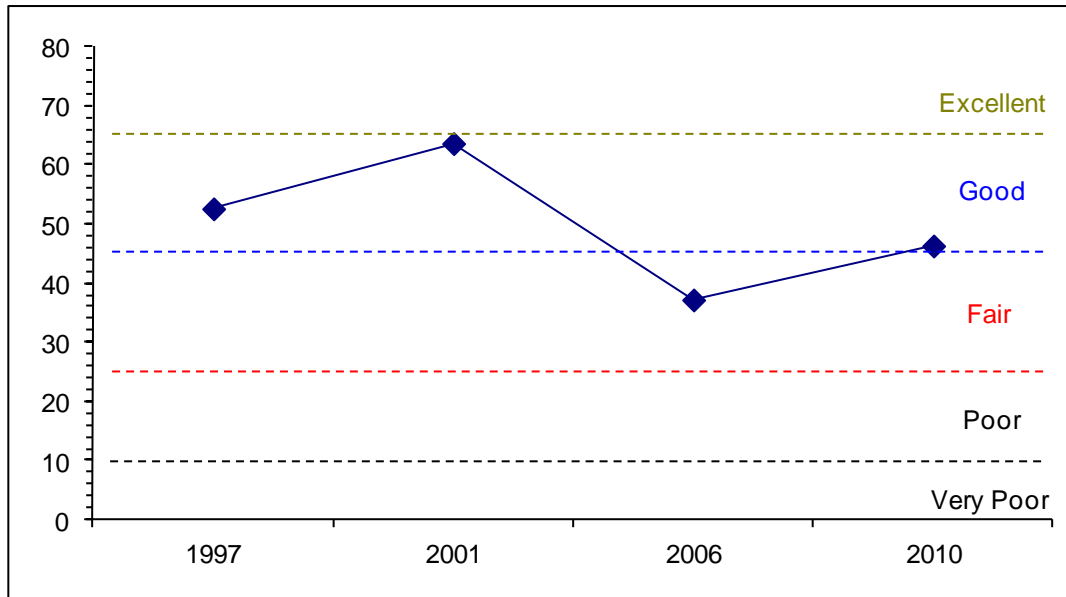
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 1 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 2



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron smithii</i>	abc73	a51	ab67	abc83	bc102	c113	.57	1.12	1.36	2.16
G	<i>Agropyron spicatum</i>	a-	a1	b14	a-	a-	a-	.05	-	-	-
G	<i>Bromus tectorum</i> (a)	-	-	a259	a227	b296	a204	3.20	3.66	5.34	11.09
G	<i>Oryzopsis hymenoides</i>	1	2	-	1	6	3	-	.00	.19	.03
G	<i>Poa pratensis</i>	-	-	-	-	-	4	-	-	-	.15
G	<i>Poa secunda</i>	abc180	c231	abc189	bc212	ab171	a156	5.15	7.40	3.74	7.80
G	<i>Sitanion hystrix</i>	a21	b74	b70	a29	a22	a29	.61	.68	.42	.39
G	<i>Vulpia octoflora</i> (a)	-	-	3	-	6	-	.00	-	.01	-
Total for Annual Grasses		0	0	262	227	302	204	3.21	3.66	5.36	11.09
Total for Perennial Grasses		275	359	340	325	301	305	6.38	9.22	5.71	10.53
Total for Grasses		275	359	602	552	603	509	9.59	12.88	11.07	21.62
F	<i>Agoseris glauca</i>	-	-	3	-	-	-	.01	-	-	-
F	<i>Allium acuminatum</i>	b23	a-	a-	ab9	a3	b28	-	.04	.00	.21
F	<i>Alyssum alyssoides</i> (a)	-	-	a4	a-	b18	b17	.03	-	.06	.06
F	<i>Antennaria rosea</i>	-	-	3	7	3	4	.03	.07	.03	.03
F	<i>Arabis</i> sp.	-	-	6	3	2	-	.01	.03	.00	-
F	<i>Astragalus beckwithii</i>	-	-	2	-	1	-	.00	-	.03	-
F	<i>Astragalus</i> sp.	-	-	3	-	-	1	.00	-	-	.03
F	<i>Astragalus utahensis</i>	-	2	6	7	4	4	.07	.04	.04	.03
F	<i>Balsamorhiza hookeri</i>	-	-	2	7	-	-	.18	.33	-	-
F	<i>Calochortus nuttallii</i>	-	3	-	-	-	4	-	-	-	.01
F	<i>Chaenactis douglasii</i>	a10	a4	b32	a5	a3	a3	.08	.01	.00	.03
F	<i>Collinsia parviflora</i> (a)	-	-	a-	a-	a2	b42	-	-	.00	.12

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cryptantha sp.	a-	ab ⁵	c ⁴⁴	a-	ab ⁹	b ¹²	.19	-	.01	.02
F	Cymopterus longipes	b ⁵³	b ⁵⁵	ab ²³	ab ²⁸	a ⁹	ab ²⁸	.06	.22	.03	.33
F	Delphinium nuttallianum	b ¹⁷	a-	a-	a-	a-	a ⁵	-	-	-	.06
F	Descurainia pinnata (a)	-	-	a ³	b ⁴¹	a ⁵	c ¹⁵⁵	.00	.15	.01	.95
F	Erigeron pumilus	-	-	-	1	-	-	-	.00	-	-
F	Eriogonum caespitosum	a ²	b ¹⁶	a ³	a-	a ²	a ²	.00	-	.03	.06
F	Eriogonum cernuum (a)	-	-	b ²¹	a ⁶	a ⁶	a ²	.06	.03	.01	.00
F	Gayophytum ramosissimum(a)	-	-	a-	a-	ab ⁴	b ⁹	-	-	.01	.08
F	Gilia sp. (a)	-	-	b ¹³	ab ⁵	a-	b ¹⁰	.05	.01	-	.02
F	Lactuca serriola (a)	-	-	-	-	2	-	-	-	.00	-
F	Lappula occidentalis (a)	-	-	17	11	12	21	.09	.03	.02	.10
F	Machaeranthera canescens	-	-	4	-	-	-	.07	-	.00	-
F	Navarretia intertexta (a)	-	-	a ⁴	a-	a-	b ¹⁷	.01	-	-	.22
F	Pedicularis sp.	-	-	-	-	-	3	-	-	-	.41
F	Penstemon sp.	-	1	-	-	-	-	-	-	-	-
F	Phlox hoodii	a ²⁷	b ⁵¹	ab ³⁶	ab ³⁰	ab ⁴⁸	ab ³⁴	.77	.97	.74	.62
F	Phlox longifolia	bc ⁴⁸	c ⁶⁶	bc ⁵⁷	b ³³	a ¹	a ²	.18	.09	.00	.01
F	Polygonum douglasii (a)	-	-	4	-	-	-	.01	-	-	-
F	Ranunculus testiculatus (a)	-	-	a ⁹	b ⁶⁹	c ⁹⁰	c ¹²⁵	.01	.23	.24	1.39
F	Salsola iberica (a)	-	-	-	-	-	3	-	-	-	.03
F	Sisymbrium altissimum (a)	-	-	3	-	-	-	.03	-	-	-
F	Streptanthus cordatus	8	4	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	-	-	-	2	1	3	-	.01	.00	.03
Total for Annual Forbs		0	0	78	132	139	401	0.31	0.45	0.37	3.00
Total for Perennial Forbs		188	207	224	132	86	133	1.68	1.84	0.94	1.90
Total for Forbs		188	207	302	264	225	534	2.00	2.30	1.32	4.91

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	'11	'96	'01	'06	'11
B	Artemisia nova	0	0	2	1	-	-	.00	-
B	Artemisia tridentata wyomingensis	90	88	84	73	14.07	18.53	15.91	14.94
B	Chrysothamnus nauseosus consimilis	2	1	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	81	64	66	66	5.62	3.02	1.58	3.62
B	Juniperus osteosperma	8	7	7	7	2.50	1.51	3.14	1.41
B	Leptodactylon pungens	31	32	40	37	2.04	2.83	1.22	1.27
B	Opuntia sp.	8	3	4	4	.21	.06	.06	.00
Total for Browse		220	195	203	188	24.47	25.96	21.91	21.26

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 2

Species	Percent Cover		
	'01	'06	'11
Artemisia tridentata wyomingensis	-	18.00	19.29
Chrysothamnus viscidiflorus stenophyllus	-	3.25	4.09
Juniperus osteosperma	7.00	6.33	6.11
Leptodactylon pungens	-	1.86	1.23

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.3	1.8	1.1

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 2

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	55	56	56	47	3.9	7.8	5.5	4.9

BASIC COVER--

Management unit 01, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	4.25	8.25	35.01	42.59	35.93	40.11
Rock	0	.50	1.20	.37	.32	.19
Pavement	9.25	4.00	4.63	3.88	5.82	3.58
Litter	37.25	26.25	39.15	38.11	47.36	22.93
Cryptogams	7.25	11.50	4.57	2.85	5.06	3.57
Bare Ground	42.00	49.50	22.06	28.75	19.75	30.19

SOIL ANALYSIS DATA --

Management unit 1, Study no: 2, Study Name: Rosette

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.3	7.3	46.6	25.4	28.0	1.5	7.2	236.8	0.7

PELLET GROUP DATA--

Management unit 01, Study no: 2

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	19	6	55	9	-	-	-
Moose	1	-	-	-	-	-	-
Deer	21	11	22	15	26 (65)	25 (61)	24 (60)
Cattle	-	-	-	-	-	-	2 (4)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 2

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia nova</i>										
84	66	0	100	-	-	100	0	0	10/10	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	40	50	50	-	-	50	0	0	6/10	
11	20	0	100	-	-	0	0	0	6/17	
<i>Artemisia tridentata wyomingensis</i>										
84	6331	9	67	23	66	41	52	21	19/20	
90	3799	0	23	77	66	14	11	28	27/28	
96	6160	49	21	29	2620	22	0	9	25/37	
01	5380	23	59	18	20	1	0	7	22/27	
06	4180	7	58	35	2940	21	2	16	23/30	
11	3600	6	71	23	20	39	2	18	19/30	
<i>Atriplex canescens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	13/11	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Chrysothamnus nauseosus consimilis</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	40	0	100	0	-	0	0	0	17/19	
01	20	0	0	100	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
<i>Chrysothamnus viscidiflorus stenophyllus</i>										
84	3465	15	63	21	399	65	4	15	7/13	
90	4198	30	35	35	466	8	17	8	9/8	
96	5900	20	78	2	1660	2	0	.33	11/18	
01	3160	11	63	26	80	0	0	.63	10/14	
06	3560	9	76	15	800	11	12	2	10/13	
11	4160	19	80	1	-	0	0	.48	10/14	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Juniperus osteosperma										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	66	0	0	0	-/-	
96	160	38	63	-	-	0	0	0	-/-	
01	140	43	57	-	20	0	0	0	-/-	
06	140	29	71	-	20	0	0	0	-/-	
11	140	14	86	-	20	0	0	0	-/-	
Leptodactylon pungens										
84	0	0	0	0	-	0	0	0	-/-	
90	465	72	14	14	133	0	0	0	5/5	
96	2520	10	89	1	40	0	0	.79	12/15	
01	2660	9	86	5	60	0	0	.75	7/8	
06	2700	19	77	4	360	0	0	0	6/9	
11	2360	7	92	2	-	0	0	.84	6/10	
Opuntia sp.										
84	66	0	100	0	-	0	0	0	6/4	
90	66	0	100	0	-	0	0	0	6/10	
96	160	13	75	13	-	0	0	0	4/12	
01	140	0	100	0	-	0	0	0	-/-	
06	80	0	75	25	-	0	0	25	5/9	
11	80	0	100	0	-	0	0	0	3/8	
Pinus edulis										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	20	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	

CHOKECHERRY SPRINGS - TREND STUDY NO. 1-4-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Upland Loam \(browse\), R025XY312UT](#)

Land Ownership: BLM

Elevation: 6,400 ft. (1,951 m)

Aspect: East

Slope: 15%

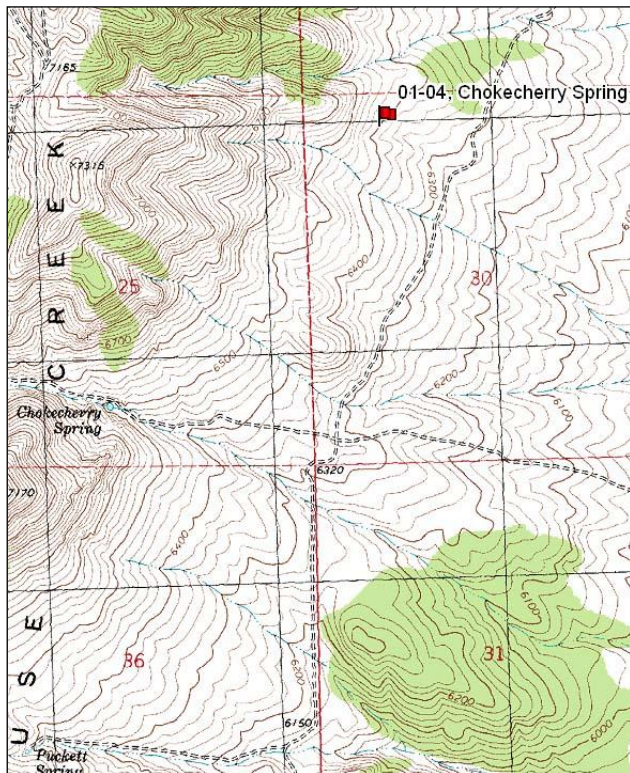
Transect bearing: 345° magnetic

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

Directions:

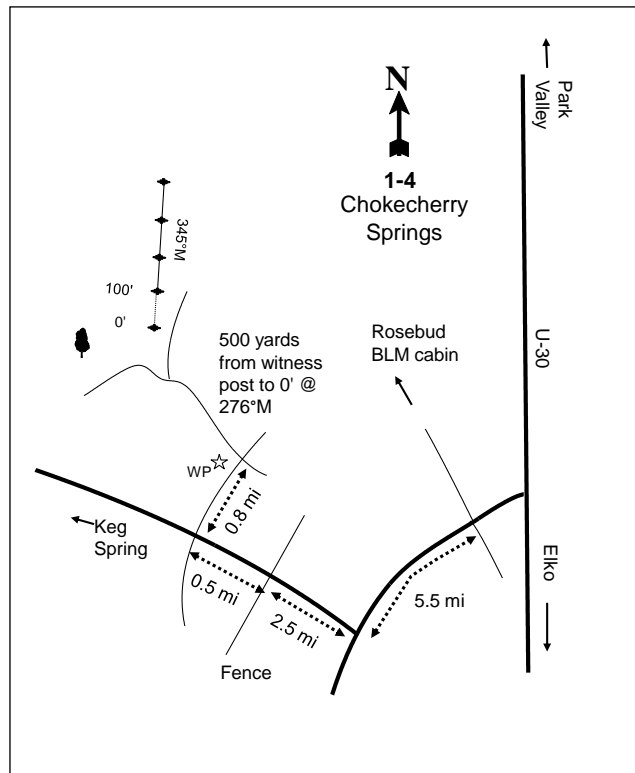
Proceed from U-30 towards the Rosebud BLM field station. Bear left at the fork to the BLM station. Travel 2.1 miles to a canal and intersection with a sign designating Emigrant Pass Road. Proceed southwest on Emigrant Pass Road 5.5 miles to a fork. Turn right and travel 2.5 miles to a gate. Pass through the gate, 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 trees 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 #197. The baseline runs at 345 degrees magnetic.

Map Name: Emigrant Pass



Township: 10N Range: 16W Section: 30

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 272445 E 4605180 N

CHOKECHERRY SPRINGS - TREND STUDY NO. 1-4

Site Information

Site Description: The study is located on the east side of the Grouse Creek Mountains, approximately one mile northeast of Chokecherry Spring. This area is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community, which also contains a scattered population of antelope bitterbrush (*Purshia tridentata*). Immediately below and to the east of the study area, there are broad ridges occupied by black sagebrush (*Artemisia nova*), with intervening swales containing mostly basin big sagebrush (*A. tridentata* ssp. *tridentata*). Deer pellet groups have been sampled in moderate abundance, and cattle sign in light abundance since 2006 (Table - Pellet Group Data).

Browse: Mountain big sagebrush is the key browse species on the site, and has provided 40% to 50% of the browse cover since 1996 (Table - Browse Cover). The sagebrush stand is a moderately dense population that has displayed mostly light use over the sample years, but with more moderate use in 1984, 2006, and 2011. Decadence within the sagebrush population was moderate throughout the early sample years, but increased to higher rates in 2006 and 2011. In addition, sagebrush plants in the population displaying poor vigor were low throughout most of the early sample years, but increased markedly in 2011. Recruitment of young sagebrush plants has comprised less than 10% of the population in most sample years except for 1984 and 1996 (Table - Browse Characteristics). Competition with the annual grass cheatgrass (*Bromus tectorum*) may be limiting sagebrush recruitment. The winter feeding activities of voles (*Microtus* spp.) is also a serious threat to all of the browse species in the area. A large number of shrubs in the immediate area showed evidence of complete or near complete girdling damage during the 1984 reading. This appears to have commonly occurred during the severe winters of 1982-84 in many areas. Such damage is especially evident in swales, however, it has 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 browse species. The bitterbrush occurs on the site in moderately low density with a semi-erect, layering growth form. This species showed evidence of moderate to heavy deer use as well as rodent damage in 1984 and 1990, but utilization has been light to moderate since 1996. The bitterbrush population is healthy with low decadence and good vigor in most of the sample years. Stickleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), considered in this study to be a weedy increaser, occurs in moderately high numbers on the site (Table - Browse Characteristics). Utah juniper (*Juniperus osteosperma*) occurs on the site in a small, but increasing, population on the site (Table - Point-Quarter Tree Data).

Herbaceous Understory: The study has an abundant understory of perennial grasses, though the annual grass species cheatgrass is abundant on the site. Cheatgrass has fluctuated in frequency and cover over the sample years, and has at times dominated the grass component on the site. The perennial grass species Sandberg bluegrass (*Poa secunda*) has steadily increased throughout the course of the study years and was the dominant grass species in 2011. Other important perennial grass species include bluebunch wheatgrass (*Agropyron spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and subalpine needlegrass (*Stipa thurberiana*) (Table - Herbaceous Trends).

The forb component is fairly diverse and moderately productive. The most productive perennial forbs include arrowleaf balsamroot (*Balsamorhiza sagittata*), wayside gromwell (*Lithospermum ruderale*), silvery lupine (*Lupinus argenteus*), tapertip hawkbeard (*Crepis acuminata*), Beckwith milkvetch (*Astragalus beckwithii*), and longleaf phlox (*Phlox longifolia*). Annual species increased markedly in 2011 due to a large increase in cover of blue-eyed Mary (*Collinsia parviflora*) (Table - Herbaceous Trends).

Soil: The soil is part of the Bullump-Sonlet-Rodrof association, likely as part of the Bullump component which is a deep soil. This component is on drainageways, with parent materials comprised of colluviums and

alluvium derived from quartzite and mica schist (Soil Survey Staff 2011). The soil texture is a clay loam, but is quite rocky and has a slightly alkaline soil reaction (7.7 pH). Phosphorus may have limited availability for plant growth and development at 5.9 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is low, with vegetation, litter, rock, and pavement all providing a good amount of protective ground cover (Table - Basic Cover). Low to moderate soil movement is occurring by trailing livestock and wildlife. The soil erosion condition was classified as slight in 2001 and 2011, but was stable in 2006.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** Mountain big sagebrush density decreased by 15% from 3,998 plants/acre to 3,398 plants/acre. Most of the decrease in density was due to a decrease in recruitment of young plants. Recruitment of young sagebrush plants decreased from 45% of the population to 8%. The density of bitterbrush decreased 60% from 333 plants/acre to 132 plants/acre. Again, this was primarily due to a large decrease in the recruitment of young bitterbrush plants. All of the plants sampled in 1984 were young plants with no young plants sampled in 1990.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. There was little change in the decadence or vigor of the sagebrush population. Recruitment of young sagebrush plants increased slightly to 11% of the population. Decadence within the bitterbrush population decreased from 50% to 0%. Recruitment of young bitterbrush plants increased to 11% of the population.
- **1996 to 2001 - slightly down (-1):** Density of mountain big sagebrush decreased by 15% from 2,960 plants/acre to 2,520 plants/acre, though average cover increased from 13% to 17%. Recruitment of young sagebrush plants decreased to 4% of the population. Bitterbrush density remained similar, but cover also increased slightly from 4% to 6%. Recruitment of young bitterbrush plants decreased to 3% of the population.
- **2001 to 2006 - down (-2):** The mountain big sagebrush density decreased by 30% to 1,760 plants/acre, and cover decreased to 10%. Decadence increased from 21% to 36%, and poor vigor increased from 4% to 10% of the population. Recruitment of young plants remained poor at 2% of the population. The density of bitterbrush decreased by 25% from 800 plants/acre to 600 plants/acre, and cover decreased to 5%. Decadence of bitterbrush increased to 20%, though poor vigor remained low at 3% of the population. Recruitment of young bitterbrush plants increased slightly, but remained poor at 7% of the population.
- **2006 to 2011 - stable (0):** Despite a 19% increase in density of mountain big sagebrush to 2,100 plants/acre, cover decreased to 8%. Decadence of sagebrush also increased to 46%, and poor vigor increased to 39% of the population. Recruitment of young sagebrush plants remained poor at 3%. The bitterbrush population remained similar except for a decrease in decadence to 0%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 37%.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial grasses increased by 39%. Cheatgrass is abundant on the site, but no prior data was collected on this species to determine a trend.
- **1996 to 2001 - slightly up (+1):** There was a 43% increase in the sum of nested frequency of perennial grasses, but cheatgrass increased significantly in nested frequency as well. Much of the increase in frequency of perennial grasses was due to a significant increase in the nested frequency of Sandberg bluegrass. Cover of perennial grasses remained similar, but cover of cheatgrass increased from 6% to 23% providing the majority of the herbaceous cover on the site.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial grasses increased by 25%, and cover increased from 9% to 13%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 14%, and cover increased to 15%. Again, most of the increase was due to a significant increase in the nested frequency of Sandberg bluegrass, though bottlebrush squirreltail and subalpine needlegrass have also increased significantly since the outset of the study.

Forb:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased by 25%.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - stable (0):** Perennial forb sum of nested frequency and cover remained similar.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased by 34%, and cover increased from 6% to 11%.
- **2006 to 2011 - slightly up (+1):** There was a 16% increase in the sum of nested frequency of perennial forbs, though cover decreased slightly to 8%. Annual forbs increased substantially due to a significant increase in the nested frequency of blue-eyed Mary. Blue-eyed Mary also provided the majority of the annual forb cover.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

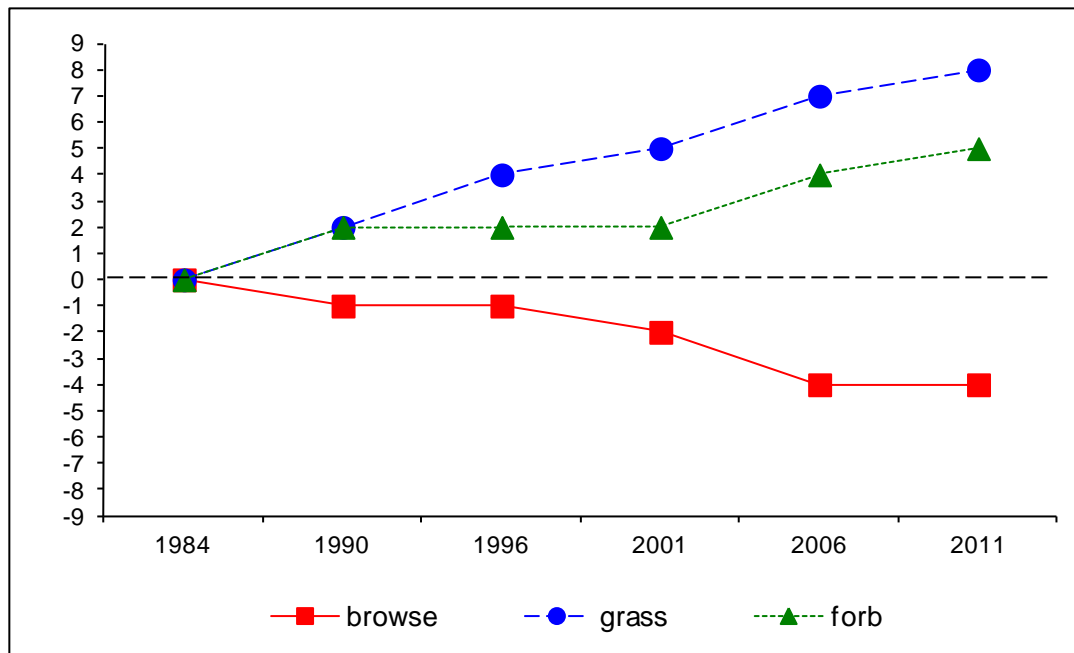
Management unit 1, study no: 4

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	22.3	9.0	5.5	17.4	-4.7	10.0	0.0	59.5	Fair
01	30.0	10.0	1.9	17.0	-17.6	10.0	0.0	51.3	Poor-Fair
06	20.7	5.8	1.8	26.0	-2.3	10.0	0.0	62.1	Fair
11	18.3	6.9	0.9	29.8	-2.1	10.0	0.0	63.8	Fair-Good

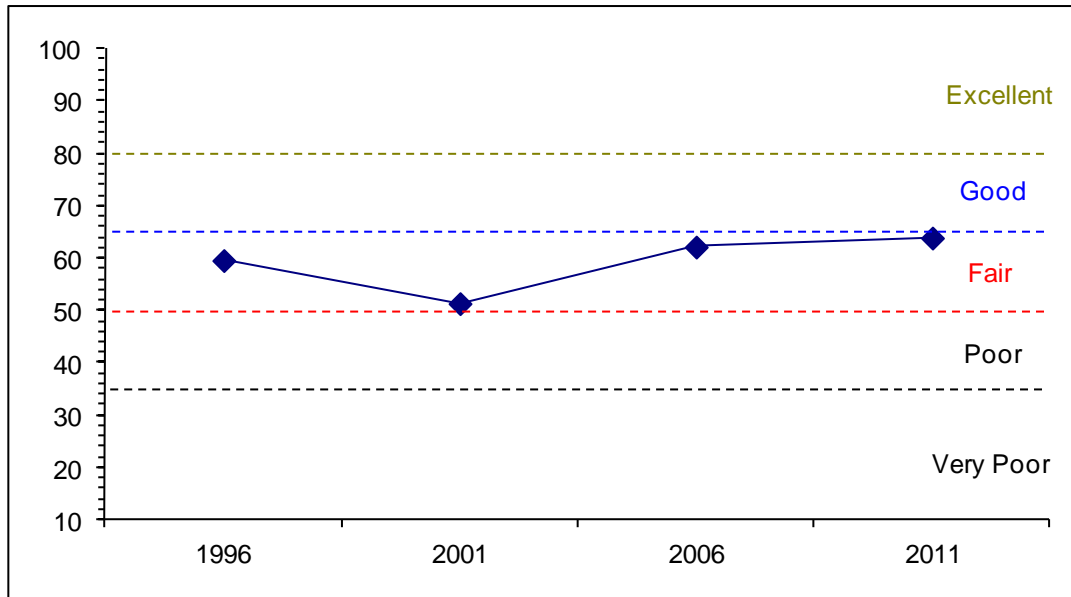
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 1 Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 4



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a-	a-	ab12	ab17	b30	b30	.59	.51	.83	.52
G	Agropyron spicatum	ab58	b72	ab50	ab52	ab58	a45	2.91	2.30	3.46	1.60
G	Bromus tectorum (a)	-	-	c318	d360	b271	a210	6.21	23.46	3.01	2.75
G	Festuca ovina	-	1	5	-	-	-	.19	-	-	-
G	Melica bulbosa	-	-	-	-	-	5	-	-	-	.15
G	Oryzopsis hymenoides	4	14	11	10	17	23	.37	.07	1.00	.39
G	Poa secunda	a22	a35	a58	b140	b170	c209	.99	3.95	5.61	9.60
G	Sitanion hystrix	ab17	a10	abc30	bc41	c50	c52	1.18	.81	1.42	1.39
G	Stipa thurberiana	a-	ab6	b26	b15	b19	b29	2.45	.84	.68	1.24
Total for Annual Grasses		0	0	318	360	271	210	6.21	23.46	3.01	2.75
Total for Perennial Grasses		101	138	192	275	344	393	8.69	8.51	13.02	14.92
Total for Grasses		101	138	510	635	615	603	14.90	31.97	16.04	17.68
F	Agoseris glauca	a28	a32	a5	a2	b66	c117	.01	.01	.42	1.89
F	Allium sp.	b40	a4	ab14	cd92	c71	d112	.04	.67	.30	.46
F	Androsace septentrionalis (a)	-	-	-	-	3	-	-	-	.15	-
F	Astragalus beckwithii	a4	ab15	bc37	bc28	a7	c43	.53	.80	.25	1.50
F	Astragalus cibarius	b34	b24	a-	a-	b38	a3	-	-	1.76	.00
F	Balsamorhiza hookeri	a	a-	a-	a-	a-	b9	-	-	-	.08
F	Balsamorhiza sagittata	4	6	11	6	14	11	1.29	.68	2.49	.79
F	Calochortus nuttallii	-	2	-	5	2	-	-	.01	.00	-
F	Camelina microcarpa (a)	-	-	b76	b74	a23	a19	.19	.81	.07	.06
F	Castilleja linariaefolia	-	-	-	-	3	-	-	-	.00	-
F	Chaenactis douglasii	4	2	7	-	-	-	.01	-	-	.00

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Cirsium arvense</i>	5	4	4	-	-	2	.01	-	-	.03
F	<i>Collinsia parviflora</i> (a)	-	-	a179	a156	a159	b309	.93	1.30	.72	9.38
F	<i>Collomia linearis</i> (a)	-	-	b46	a8	a-	b39	.15	.01	-	.10
F	<i>Comandra pallida</i>	a7	a6	ab29	b36	b34	b31	.55	.50	.24	.29
F	<i>Crepis acuminata</i>	a2	b33	ab17	ab11	ab18	b26	.35	.31	.62	.60
F	<i>Cryptantha</i> sp.	a-	a-	b13	a-	ab15	a1	.04	-	.05	.00
F	<i>Descurainia pinnata</i> (a)	-	-	-	-	4	-	-	-	.01	-
F	<i>Draba</i> sp. (a)	-	-	-	2	-	1	-	.00	-	.00
F	<i>Epilobium brachycarpum</i> (a)	-	-	-	-	11	8	-	-	.04	.01
F	<i>Galium aparine</i> (a)	-	-	8	-	-	2	.04	-	-	.03
F	<i>Gayophytum ramosissimum</i> (a)	-	-	a1	b51	a2	a4	.03	.67	.00	.00
F	<i>Gilia</i> sp. (a)	-	-	-	11	-	-	-	.01	-	-
F	<i>Hackelia patens</i>	ab19	b27	a8	a1	a9	a4	.04	.00	.11	.04
F	<i>Haplopappus acaulis</i>	-	-	-	-	-	2	-	-	-	.15
F	<i>Lactuca serriola</i> (a)	2	-	-	-	3	-	-	-	.01	-
F	<i>Lappula occidentalis</i> (a)	-	-	-	2	5	1	-	.01	.01	.00
F	<i>Lithospermum ruderales</i>	1	15	15	7	15	5	1.20	.29	1.00	.28
F	<i>Lomatium triternatum</i>	9	13	8	4	8	17	.04	.01	.04	.28
F	<i>Lupinus argenteus</i>	ab13	a3	b23	ab17	ab21	ab13	1.33	1.46	1.84	.83
F	<i>Lygodesmia spinosa</i>	bc29	c47	bc37	ab19	ab24	a11	.66	.55	.75	.22
F	<i>Machaeranthera</i> spp	a	a-	b13	a-	a-	ab3	.02	-	-	.03
F	<i>Microsteris gracilis</i> (a)	-	-	a-	c32	b11	c61	-	.47	.02	.28
F	<i>Oenothera caespitosa</i>	2	2	2	-	-	-	.03	-	-	-
F	<i>Penstemon speciosus</i>	-	1	-	-	-	9	-	-	-	.07
F	<i>Phlox hoodii</i>	-	-	-	-	-	10	-	-	-	.01
F	<i>Phlox longifolia</i>	a60	ab89	b100	b103	b97	ab88	.51	.80	.69	.52
F	<i>Ranunculus testiculatus</i> (a)	-	-	a7	a13	a-	b33	.01	.02	-	.35
F	<i>Tragopogon dubius</i> (a)	1	5	5	2	6	4	.04	.01	.07	.01
F	<i>Veronica biloba</i> (a)	-	-	a21	a20	b44	b49	.06	.05	.44	.96
F	<i>Viola</i> sp.	-	-	-	-	3	-	-	-	.00	-
Total for Annual Forbs		3	5	343	371	271	530	1.47	3.40	1.56	11.22
Total for Perennial Forbs		261	325	343	331	445	517	6.71	6.11	10.59	8.13
Total for Forbs		264	330	686	702	716	1047	8.19	9.51	12.16	19.36

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	70	65	47	48	13.18	16.61	10.38	7.96
B	Chrysothamnus nauseosus consimilis	7	7	3	2	.79	.96	.81	.53
B	Chrysothamnus viscidiflorus viscidiflorus	77	72	65	61	10.39	5.98	5.88	4.26
B	Juniperus osteosperma	3	6	8	8	.01	.33	1.06	1.16
B	Opuntia sp.	12	8	8	5	.03	.56	.30	.15
B	Purshia tridentata	28	25	24	23	3.91	6.42	5.16	5.57
B	Symphoricarpos oreophilus	5	10	10	12	.07	1.43	1.70	1.31
Total for Browse		202	193	165	159	28.41	32.32	25.29	20.97

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 4

Species	Percent Cover		
	'01	'06	'11
Artemisia tridentata vaseyana	-	13.11	8.50
Chrysothamnus nauseosus consimilis	-	.03	.28
Chrysothamnus viscidiflorus viscidiflorus	-	7.84	4.15
Juniperus osteosperma	1.00	2.73	3.38
Opuntia sp.	-	.08	.08
Purshia tridentata	-	10.89	12.35
Symphoricarpos oreophilus	-	2.96	2.01

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 4

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.7	2.1	1.5
Purshia tridentata	1.6	1.1	0.4

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 4

Species	Trees per Acre			
	'96	'01	'06	'11
Juniperus osteosperma	30	76	86	104

Average diameter (in)			
'96	'01	'06	'11
3.9	2.6	4.1	3.5

BASIC COVER--

Management unit 01, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.75	11.50	46.40	62.06	50.70	56.79
Rock	8.25	9.75	6.39	4.69	2.79	3.85
Pavement	14.75	16.50	6.14	4.69	6.46	6.26
Litter	58.50	45.25	55.46	44.56	45.93	36.65
Cryptogams	0	0	.05	.06	.21	.10
Bare Ground	16.75	17.00	7.03	7.97	12.13	8.30

SOIL ANALYSIS DATA --

Management unit 1, Study no: 4, Study Name: Chokecherry Springs

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	5	1	18	1	-	-	-
Deer	11	14	7	2	36 (88)	21 (53)	21 (53)
Cattle	3	1	3	1	3 (7)	9 (22)	4 (11)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 4

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia nova									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	7/23
Artemisia tridentata vaseyana									
84	3998	45	33	22	333	30	18	5	34/36
90	3398	8	71	22	-	8	2	14	19/25
96	2960	11	62	26	180	9	1	16	20/32
01	2520	4	75	21	-	2	0	4	22/33
06	1760	2	61	36	280	22	2	10	24/36
11	2100	3	51	46	-	30	0	39	25/36

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus nauseosus consimilis</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	200	50	30	20	-	0	0	0	26/36	
01	160	25	63	13	80	25	0	0	26/26	
06	80	0	100	0	-	0	0	0	25/33	
11	40	0	50	50	-	0	0	50	26/27	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	3931	17	63	20	-	20	0	0	28/32	
90	3331	16	48	36	-	6	0	6	15/16	
96	3660	5	91	3	-	7	.54	2	14/24	
01	3000	3	84	13	-	3	0	3	11/18	
06	2460	7	81	12	100	0	0	2	13/22	
11	2640	21	78	1	20	.75	0	.75	12/19	
<i>Juniperus osteosperma</i>										
84	66	100	0	-	-	0	0	0	-/-	
90	66	100	0	-	66	0	0	0	-/-	
96	60	67	33	-	40	0	0	0	-/-	
01	120	100	0	-	20	0	0	0	-/-	
06	160	100	0	-	20	0	0	0	-/-	
11	180	89	11	-	20	0	0	0	-/-	
<i>Opuntia sp.</i>										
84	199	0	100	0	-	0	0	0	6/5	
90	199	0	100	0	-	0	0	0	8/17	
96	300	7	87	7	-	0	0	0	5/15	
01	180	0	100	0	-	0	0	0	5/10	
06	160	0	100	0	-	0	13	0	5/12	
11	120	0	100	0	-	0	0	0	4/10	
<i>Purshia tridentata</i>										
84	333	100	0	0	-	20	40	20	-/-	
90	132	0	50	50	-	50	50	0	15/35	
96	740	11	89	0	-	35	3	0	27/54	
01	800	3	93	5	-	45	8	0	33/57	
06	600	7	73	20	460	43	13	3	32/58	
11	580	0	100	0	-	52	10	0	31/53	
<i>Symphoricarpos oreophilus</i>										
84	266	50	50	0	-	25	0	0	26/65	
90	331	20	60	20	-	0	0	20	17/52	
96	120	33	67	0	-	33	17	0	21/47	
01	260	0	100	0	-	0	0	0	21/49	
06	360	11	83	6	-	0	0	0	19/45	
11	420	10	90	0	-	0	0	0	20/40	

DEVIL'S PLAYGROUND - TREND STUDY NO. 1-5-11

Vegetation Type: Black Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Semidesert Shallow Hardpan \(Utah Juniper\)](#).

Land Ownership: BLM

Elevation: 5,390 ft. (1,643 m)

Aspect: Northeast

Slope: 8%

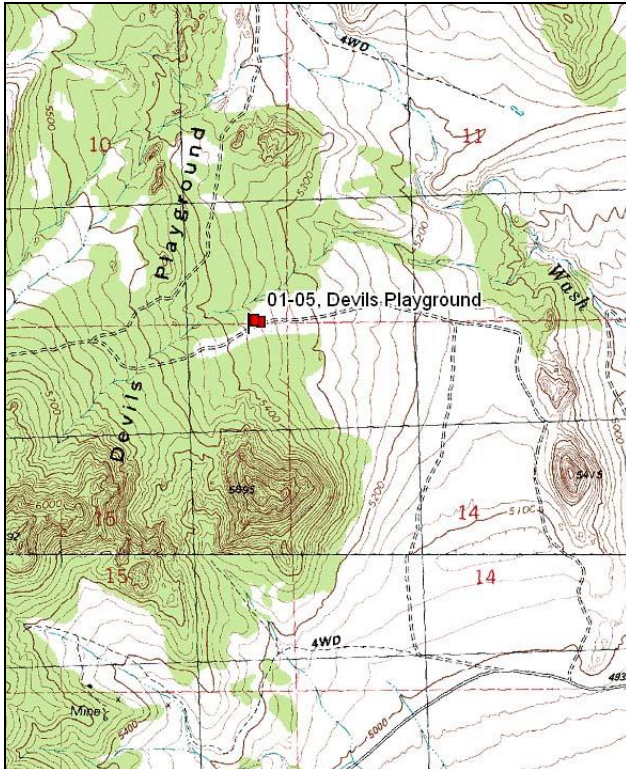
Transect bearing: 173° magnetic

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

Directions:

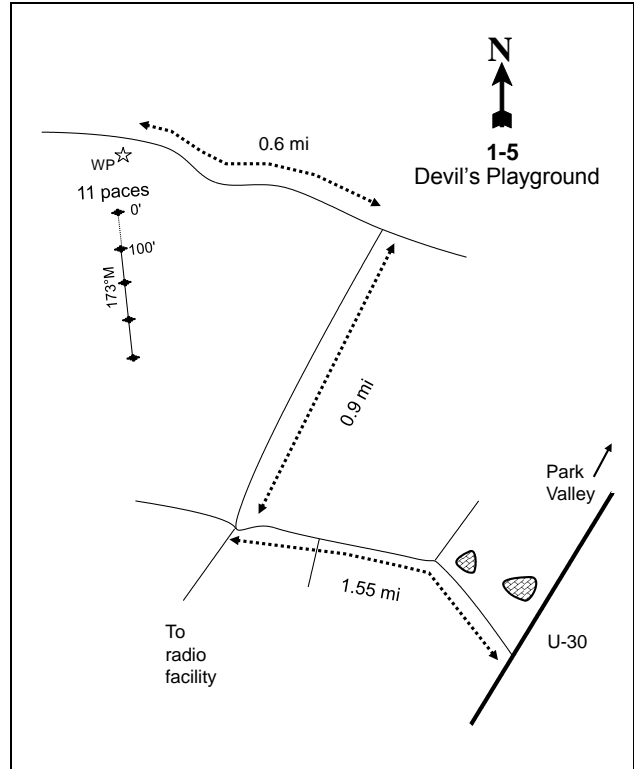
Proceed toward Elko, Nevada on U-30 to mile marker 24 and turn right (west). Travel 1.55 miles to a fork. Bear right and travel 0.9 miles to an intersection. Turn left (west) and travel 0.6 miles to rock pile and witness post on left side of road. Walk 11 paces southwest from the rock pile to the 0-foot 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



Township: 9W Range: 16W Section: 15

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 278206 E 4598628 N

DEVILS PLAYGROUND - TREND STUDY NO. 1-5

Site Information

Site Description: The study samples an area considered to be crucial deer winter range. The vegetation is dominated by a Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon pine (*Pinus monophylla*) woodland, with numerous and various sized openings occupied by black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Farther to the east, the vegetation becomes increasingly dominated by black sagebrush in the more shallow soils. To the west and at a higher elevation, the juniper-pinyon woodland is associated with significant amounts of sagebrush and bitterbrush (*Purshia tridentata*). The area is managed by the Bureau of Land Management (BLM) as part of the White Lake allotment. Pellet groups have been sampled in low abundance for deer, elk, and cattle since 2001 (Table - Pellet Group Data).

Browse: Browse composition consists chiefly of black sagebrush, interspersed by smaller amounts of narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), prickly phlox (*Leptodactylon pungens*), and Wyoming big sagebrush. Also present are scattered individuals of Nevada ephedra (*Ephedra nevadensis*) and spiny hopsage (*Grayia spinosa*). The black sagebrush is a moderately dense population that has displayed mostly light to moderate utilization over the sample years, though with heavy use in 1984. Health of the black sagebrush has been somewhat poor, with moderately high decadence and poor vigor over the sample years. Recruitment of young black sagebrush has been poor over the sample years, though seedlings were very abundant in 2006. Many of the plants classified as Wyoming big sagebrush appear to be hybrids of black sagebrush and Wyoming big sagebrush. The Wyoming big sagebrush is comprised of a small population of light to moderately used plants. Decadence and poor vigor of Wyoming big sagebrush have increased since 2001. Recruitment of young big sagebrush plants has been poor over the course of the study (Table - Browse Characteristics).

A few spiny hopsage occur on the site, but none have been sampled within the shrub density strips. These shrubs have shown heavy hedging in some sample years. Utah juniper and singleleaf pinyon pine trees occur in moderate density (Table - Point-Quarter Tree Data) and cover (Table - Canopy Cover) on the site.

Herbaceous Understory: Perennial grasses are not particularly diverse, and the annual grass species cheatgrass (*Bromus tectorum*) is prevalent and has dominated the grass component in cover during several years. The dominant perennial grass is Sandberg bluegrass (*Poa secunda*), with other prevalent perennial species including bluebunch wheatgrass (*Agropyron spicatum*) and bottlebrush squirreltail (*Sitanion hystrix*). Perennial forbs are diverse, but have not produced over 2% cover in any sample year. Most of these are low growing and of little forage value (Table - Herbaceous Trends).

Soil: The soil is in the Lembos-Jericho-Scalade complex, likely as part of the Jericho component. This component occurs on hillslopes with a shallow duripan, and the parent material is alluvium derived from limestone (Soil Survey Staff 2011). There are also many large granite outcrops in the area. The soil is a coarse textured sandy loam which is light colored on the surface, but much darker below. The soil has a moderately alkaline soil reaction (8.0 pH). Phosphorus may have limited availability for plant growth and development at 3.5 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is moderately low, with good protective ground cover being provided by vegetation, litter, and pavement (Table - Basic Cover). There are extensive areas of pavement and bare ground cover in the interspaces between shrubs and trees. The soil erosion condition has been classified as slight since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly up (+1):** Black sagebrush density increased by 23% from 4,264 plants/acre to 5,266 plants/acre, but decadence also increased from 56% to 82%. Recruitment of young black sagebrush plants decreased from 11% to 0% of the population.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of black sagebrush decreased to 26% and poor vigor decreased from 22% to 6% of the population.
- **1996 to 2001 - stable (0):** Density of black sagebrush increased by 8% from 5,960 plants/acre to 6,440 plants/acre, and cover increased from 12% to 14%. Decadence remained similar, but poor vigor increased slightly within the population. Recruitment of young black sagebrush plants remained poor.
- **2001 to 2006 - slightly down (-1):** The density of black sagebrush decreased by 28% to 4,620 plants/acre, though cover remained similar at 13%. Decadence increased slightly from 29% to 33%, and poor vigor increased to 22%. Recruitment of young black sagebrush plants remained poor. Wyoming big sagebrush density increased more than six-fold, and cover increased from less than 1% to 2%. However, decadence of Wyoming big sagebrush increased from 0% to 21%, and poor vigor increased from 0% to 12%.
- **2006 to 2011 - stable (0):** Densities of both black sagebrush and Wyoming big sagebrush remained similar on the study. Decadence remained similar within the black sagebrush population, but poor vigor increased to 32%. Decadence of Wyoming big sagebrush increased to 59%, and poor vigor increased to 31%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 70%, and is mostly due to a significant increase in the nested frequency of Sandberg bluegrass.
- **1990 to 1996 - down (-2):** There was a 25% decrease in the sum of nested frequency of perennial grasses, with a significant decrease in the nested frequency of bottlebrush squirreltail.
- **1996 to 2001 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, but cheatgrass increased significantly in nested frequency on the study. Despite increases in cover of several perennial species, cheatgrass became the dominant grass species on the site with an increase in cover from less than 1% to 5%.
- **2001 to 2006 - down (-2):** The perennial grass sum of nested frequency decreased by 20%, and cover decreased from 8% to 5%. Cheatgrass again increased significantly in nested frequency, and cover increased to 8%. Cheatgrass remained the dominant grass on the study.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grasses increased by 29%, and cover increased to 11%. Most of the increase in perennial grasses was due to a significant increase in the nested frequency of Sandberg bluegrass, and subsequent increase in cover from 3% to 8%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

Forb:

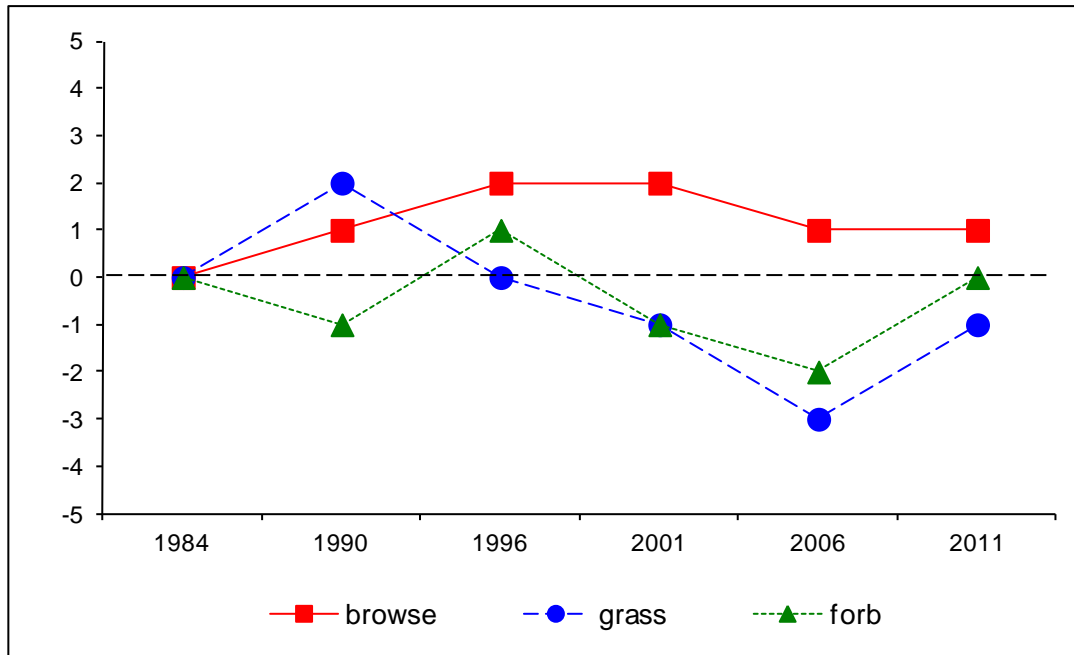
- **1984 to 1990 - slightly down (-1):** Perennial forb sum of nested frequency decreased by 21%, but forbs were already fairly rare on the site.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased five-fold, though annual forbs also increased markedly.
- **1996 to 2001 - down (-2):** The perennial forb sum of nested frequency decreased to 1990 levels.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 32%, and forbs remained rare on the site. Cover of perennial forbs decreased from near 1% to near 0%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased four-fold, and cover increased to 2%. Annual forbs also increased substantially.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
 Management unit 1, study no: 5

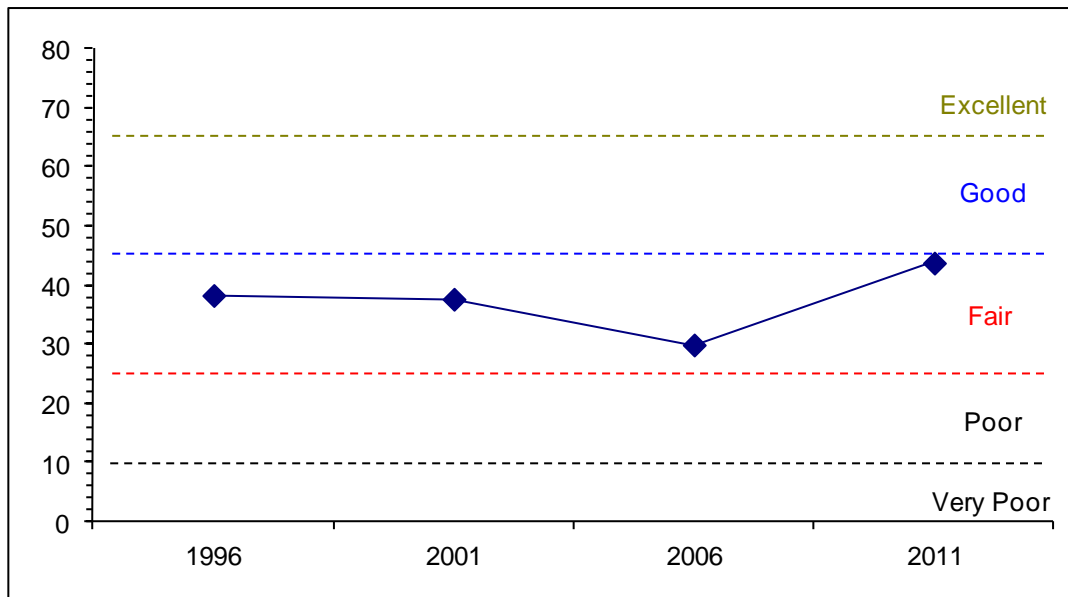
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	15.2	7.4	3.3	10.5	-0.4	2.3	0.0	38.3	Fair
01	17.1	6.4	1.0	15.8	-4.3	1.7	0.0	37.6	Fair
06	18.3	5.5	0.9	10.9	-6.0	0.3	0.0	29.9	Fair
11	14.0	3.6	2.8	21.3	-2.2	4.3	0.0	43.8	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 5



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 5



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron spicatum</i>	ab ²⁸	b ⁵⁶	b ⁴⁶	ab ³⁵	a ¹⁹	ab ³³	1.00	2.26	1.11	1.82
G	<i>Bromus tectorum</i> (a)	-	-	a ⁹⁷	c ²⁸⁴	d ³¹⁸	b ²⁵⁶	.37	5.21	7.93	2.90
G	<i>Oryzopsis hymenoides</i>	a ⁴	b ¹⁷	ab ¹⁸	ab ⁵	ab ¹⁰	a ⁴	.66	.09	.33	.06
G	<i>Poa secunda</i>	a ⁵³	cd ¹⁶²	bcd ¹⁴⁸	bc ¹⁴²	b ¹²⁷	d ¹⁸³	2.90	3.42	2.58	7.56
G	<i>Sitanion hystrix</i>	b ¹¹⁴	b ¹⁰⁰	a ⁵⁶	a ⁴³	a ³⁷	a ⁴⁶	.66	.40	.72	1.18
G	<i>Stipa comata</i>	-	-	-	-	-	-	-	-	.00	-
G	<i>Stipa thurberiana</i>	a ¹¹	ab ²²	a ⁻	b ³⁴	a ¹⁴	a ⁻	-	1.71	.66	-
G	<i>Vulpia octoflora</i> (a)	-	-	b ⁷⁸	c ¹⁴⁵	a ¹⁷	a ⁸	.16	.52	.04	.01
Total for Annual Grasses		0	0	175	429	335	264	0.53	5.74	7.97	2.92
Total for Perennial Grasses		210	357	268	259	207	266	5.23	7.89	5.43	10.64
Total for Grasses		210	357	443	688	542	530	5.76	13.63	13.40	13.56
F	<i>Agoseris glauca</i>	-	-	17	-	9	17	.03	-	.05	.22
F	<i>Arabis</i> sp.	-	-	-	-	3	-	-	-	.00	-
F	<i>Aster</i> sp.	-	-	76	-	-	-	.16	-	-	-
F	<i>Astragalus beckwithii</i>	2	7	3	4	-	5	.04	.15	-	.18
F	<i>Astragalus utahensis</i>	10	14	11	2	4	4	.08	.06	.01	.01
F	<i>Calochortus nuttallii</i>	-	-	-	-	-	4	-	-	-	.01
F	<i>Castilleja chromosa</i>	11	1	7	-	-	-	.06	-	-	-
F	<i>Chaenactis douglasii</i>	b ²²	ab ⁴	b ²⁸	a ³	a ⁶	ab ¹²	.08	.00	.01	.02
F	<i>Collinsia parviflora</i> (a)	-	-	-	3	7	6	-	.00	.01	.01
F	<i>Crepis acuminata</i>	-	-	3	-	1	3	.03	-	.03	.21
F	Cruciferae	-	-	31	-	-	-	.07	-	-	-
F	<i>Cryptantha</i> sp.	a ⁻	a ⁴	b ⁹³	a ⁻	a ⁻	a ¹⁰	.36	-	-	.04

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cryptantha sp.(a)	-	-	b102	a31	a21	b94	.43	.08	.04	.42
F	Delphinium nuttallianum	a-	a-	a3	a2	a-	b20	.00	.03	-	.65
F	Descurainia pinnata (a)	-	-	a4	a11	a-	b73	.01	.03	-	.28
F	Eriastrum sparsiflorum (a)	-	-	c78	a-	b25	a-	.17	-	.05	-
F	Eriogonum cernuum (a)	a1	ab6	b10	a-	a-	a-	.02	-	-	-
F	Eriogonum ovalifolium	-	-	13	-	-	-	.05	-	-	-
F	Galium aparine (a)	-	-	-	3	-	-	-	.00	-	-
F	Gayophytum ramosissimum(a)	-	-	35	18	17	27	.09	.04	.03	.05
F	Gilia sp. (a)	-	-	b21	b30	a-	c101	.04	.08	-	.28
F	Lappula occidentalis (a)	-	-	a-	b8	ab10	ab6	-	.02	.02	.01
F	Layia glandulosa	-	-	-	-	-	66	-	-	-	.46
F	Lomatium sp.	-	-	4	4	-	-	.00	.16	-	-
F	Lygodesmia spinosa	-	-	-	-	-	-	.00	-	-	-
F	Monoptylon belliodies (a)	-	-	-	-	3	-	-	-	.01	-
F	Phlox hoodii	-	8	4	1	-	-	.03	.03	-	-
F	Phlox longifolia	b35	ab23	ab35	b49	a21	ab36	.10	.40	.05	.30
F	Ranunculus testiculatus (a)	-	-	-	-	-	3	-	-	-	.00
F	Townsendia sp.	-	2	-	-	-	-	-	-	-	-
F	Tragopogon dubius (a)	b13	a-	a2	a-	a-	a-	.03	-	-	-
Total for Annual Forbs		14	6	252	104	83	310	0.80	0.27	0.17	1.07
Total for Perennial Forbs		80	63	328	65	44	177	1.14	0.83	0.16	2.13
Total for Forbs		94	69	580	169	127	487	1.94	1.10	0.33	3.21

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	'11	'96	'01	'06	'11
B	Artemisia nova	86	85	79	78	11.55	13.55	12.93	9.78
B	Artemisia tridentata wyomingensis	7	5	16	18	.60	.15	1.71	1.45
B	Chrysothamnus viscidiflorus stenophyllus	50	45	38	43	1.50	2.54	1.97	2.84
B	Juniperus osteosperma	3	7	6	6	4.88	3.77	11.05	10.64
B	Leptodactylon pungens	10	12	12	10	.16	.03	.05	.06
B	Opuntia polyacantha	1	3	3	1	-	.01	.03	.01
B	Pinus monophylla	2	1	3	2	.00	.38	.63	.88
B	Symphoricarpos oreophilus	1	1	0	1	-	-	-	-
Total for Browse		160	159	157	159	18.70	20.45	28.38	25.67

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 5

Species	Percent Cover		
	'01	'06	'11
Artemisia nova	-	13.21	11.71
Artemisia tridentata wyomingensis	-	1.96	2.34
Chrysothamnus viscidiflorus stenophyllus	-	2.61	3.23
Juniperus osteosperma	13.19	11.21	12.35
Leptodactylon pungens	-	.10	.21
Pinus monophylla	-	.20	1.18

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 05

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	1.4	0.6	0.5

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 5

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	39	76	43	48	14.4	7.0	8.6	4.5
Pinus monophylla	9	49	35	43	5.0	2.1	2.4	1.4

BASIC COVER--

Management unit 01, Study no: 5

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.50	8.25	25.64	38.59	38.29	39.20
Rock	.25	.50	1.48	.38	.12	.15
Pavement	20.75	25.00	27.95	32.52	28.31	26.18
Litter	39.75	33.00	27.04	29.48	26.11	26.09
Cryptogams	1.25	1.50	.72	1.59	.53	2.41
Bare Ground	35.50	31.75	19.56	16.53	22.20	17.97

SOIL ANALYSIS DATA --

Management unit 01, Study no: 5, Study Name: Devil's Playground

Effective rooting depth (in)	pH	Sandy-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
26.2	8.0	65.7	17.0	17.3	1.0	3.5	92.8	0.5

PELLET GROUP DATA--

Management unit 01, Study no: 5

Type	Quadrat Frequency			
	'96	'01	'06	'11
Sheep	-	1	-	-
Rabbit	32	7	65	9
Elk	2	-	-	3
Deer	44	24	24	32
Cattle	-	-	-	-

Days use per acre (ha)		
'01	'06	'11
	1 (3)	1 (2)
15 (36)	27 (68)	31 (76)
	5 (13)	7 (16)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 5

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia nova</i>										
84	4264	11	33	56	-	17	80	20	9/16	
90	5266	0	18	82	66	1	0	22	10/15	
96	5960	7	66	26	100	72	14	6	9/23	
01	6440	2	70	29	60	35	17	11	10/21	
06	4620	2	65	33	3040	6	3	22	10/22	
11	4480	6	59	35	160	33	2	32	9/21	
<i>Artemisia tridentata wyomingensis</i>										
84	331	20	20	60	66	80	20	0	20/25	
90	331	20	20	60	-	40	0	0	21/29	
96	260	0	85	15	-	62	0	0	21/39	
01	100	0	100	0	-	0	0	0	35/41	
06	660	0	79	21	340	12	3	12	20/32	
11	580	3	38	59	-	48	0	31	21/38	
<i>Chrysothamnus viscidiflorus stenophyllus</i>										
84	1932	28	55	17	133	31	38	3	10/11	
90	2331	51	46	3	-	3	0	0	15/19	
96	1680	8	92	0	-	6	0	0	9/13	
01	1560	6	73	21	-	4	0	4	9/14	
06	1460	8	89	3	-	4	3	0	10/16	
11	1560	4	64	32	-	0	0	14	11/17	
<i>Ephedra nevadensis</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	16/17	
01	0	0	0	-	-	0	0	0	15/10	
06	0	0	0	-	-	0	0	0	18/23	
11	0	0	0	-	-	0	0	0	17/28	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Grayia spinosa										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	31/35	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	27/31	
11	0	0	0	-	-	0	0	0	31/44	
Juniperus osteosperma										
84	0	0	0	-	66	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	60	0	100	-	-	0	0	0	-/-	
01	160	25	75	-	-	0	0	0	-/-	
06	120	17	83	-	-	0	0	0	-/-	
11	120	33	67	-	-	0	0	0	-/-	
Leptodactylon pungens										
84	532	88	12	0	-	0	0	0	4/4	
90	0	0	0	0	-	0	0	0	-/-	
96	360	22	67	11	-	0	0	0	9/11	
01	520	0	81	19	-	0	0	0	9/12	
06	260	0	92	8	80	0	0	0	6/9	
11	280	7	86	7	-	0	0	7	6/8	
Opuntia polyacantha										
84	0	0	0	-	-	0	0	0	-/-	
90	66	100	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	5/7	
01	120	0	100	-	-	0	0	0	7/9	
06	60	33	67	-	-	0	0	0	4/9	
11	20	0	100	-	-	0	0	0	4/9	
Pinus monophylla										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	50	50	-	20	0	0	0	-/-	
01	20	100	0	-	100	0	0	0	10/10	
06	60	67	33	-	60	0	0	0	-/-	
11	40	100	0	-	60	0	0	0	-/-	
Symphoricarpos oreophilus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	100	0	0	16/23	
01	40	0	100	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	20	0	100	-	-	100	0	0	16/22	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Tetradymia nuttallii										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	22/41	

BOVINE EXCLOSURE - TREND STUDY NO. 1-6-11

Vegetation Type: Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Upland Stony Loam \(Pinyon-Utah Juniper\), R028AY338UT](#)

Land Ownership: BLM

Elevation: 6,400 ft. (1,951 m)

Aspect: Southeast

Slope: 11%

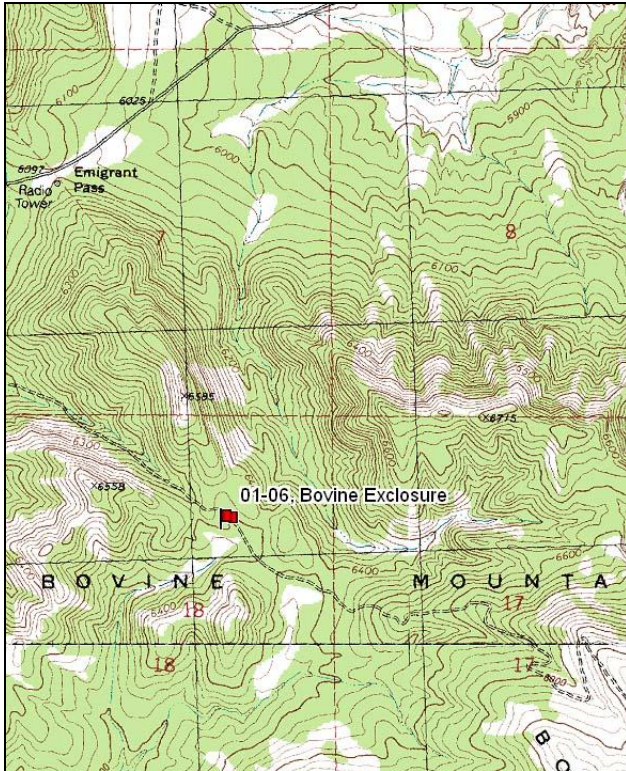
Transect bearing: 165° magnetic

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

Directions:

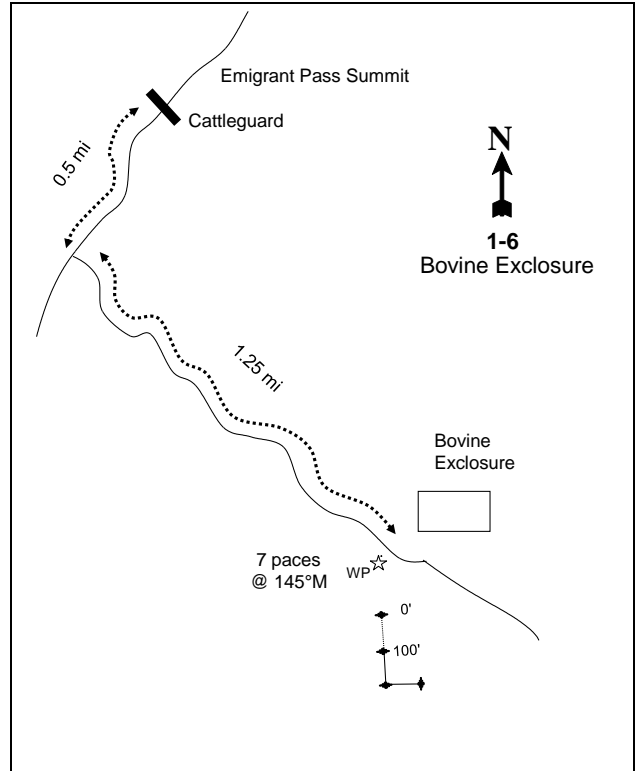
Proceed southwest to the summit of Emigrant Pass on Emigrant Pass Road. From the cattleguard at the summit, continue south 0.5 miles to a fork and turn left. Travel 1.25 miles on this road to the Bovine Exclosure where there is a witness post on the right side of the road. From the witness post, follow 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



Township: 9N Range: 16W Section: 18

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 273065 E 4598397 N

BOVINE EXCLOSURE - TREND STUDY NO. 1-6

Site Information

Site Description: The study is located immediately south of an enclosure on the north side of the Bovine mountains. The study is within a sagebrush (*Artemisia spp.*) and grass community with scattered Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon pine (*Pinus monophylla*) woodland. The nearby enclosure needs repair. The area is managed by the Bureau of Land Management (BLM) as part of the White Lakes allotment. 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 site receives substantial deer use during all but the most severe winters. However, during most years, the area is available and is considered crucial deer winter range. Pellet groups have been sampled in low abundance for deer since 2001, and a low abundance of cattle sign was sampled in 2011 (Table - Pellet Group Data).

Browse: Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), black sagebrush (*A. nova*), and antelope bitterbrush (*Purshia tridentata*) are the key browse species, and combined they provide the majority of the browse cover on the site. Extremely heavy vole damage during the winter of 1983-84 was noted for sagebrush and bitterbrush. Basin big sagebrush has the highest browse cover of the three preferred species (Table - Browse Trends). The density of Basin big sagebrush has steadily decreased since 1996. Decadence was high in 1984 and 2006, but has been more moderate in other sample years. Utilization of the Basin big sagebrush population has been mostly light to moderate through the sample years (Table - Browse Characteristics). Black sagebrush and bitterbrush densities have also decreased from 1996 to 2006, but the density of both species increased in 2011. Despite the decreases in densities, the covers of both black sagebrush and bitterbrush have remained similar or slightly increased since 1996 (Table - Browse Trends). Utilization of black sagebrush has been mostly light with some moderate use in 1996 and 2006. Bitterbrush displayed mostly light to moderate use in 1996 and 2001, but has displayed heavy use since 2006 (Table - Browse Characteristics).

Other browse species of interest include increaser shrubs such as broom snakeweed (*Gutierrezia sarothrae*) and stickleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) which are present, but have remained a minor component of the community (Table - Browse Characteristics). Utah juniper and singleleaf pinyon pine occur on the site in moderate density, but density has remained similar since 2001 (Table - Point-Quarter Tree Data). However, cover of juniper has slightly increased over the course of the study (Table - Browse Trends).

Herbaceous Understory: Six native perennial grasses have been sampled on the site, and perennial grass cover has been good over the course of the study. However, the annual grass species cheatgrass (*Bromus tectorum*) is also prevalent on the site, and at times has dominated the grass component in cover, though cover of cheatgrass has steadily decreased since 2001. Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) are the dominant perennial grasses on the site, with the other perennial species being fairly rare. 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 (*Balsamorhiza sagittata*), tapertip hawksbeard (*Crepis acuminata*), two desert parsley species (*Lomatium triternatum* and *Lomatium. sp.*), and two kinds of milkvetch (*Astragalus beckwithii* and *A. ciberius*) (Table - Herbaceous Trends).

Soil: The soil is part of the Clavicon-Rock outcrop complex, which occurs on hillslopes. Parent material consists of colluvium and residuum derived from limestone, chert, and dolomite (Soil Survey Staff 2011). Soil texture is a loam, with a soil reaction that is slightly alkaline (pH 7.8) (Table - Soil Data Analysis). On steeper areas, erosion has resulted in more shallow soils with a lot of exposed rock. Ground cover is fair for perennial grasses, litter, rock, and pavement. Bare ground cover is moderately low (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2011, but was slight in 2006.

Trend Assessments

Browse:

- **1984 to 1990 - up (+2):** The density of basin big sagebrush increased two-fold from 1,532 plants/acre to 3,199 plants/acre. Decadence of basin big sagebrush decreased from 63% to 23%, and poor vigor decreased from 67% to 3%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. There was little change in the decadence or vigor of basin big sagebrush. Recruitment of young basin big sagebrush plants decreased from 51% to 17% of the population, but is still considered to be good. Decadence was much lower in the black sagebrush population, decreasing from 80% to 7%.
- **1996 to 2001 - stable (0):** The density of basin big sagebrush decreased slightly by 7% from 2,040 plants/acre to 1,900 plants/acre, but cover remained similar. Recruitment of young basin big sagebrush plants decreased to just 5% of the population. Black sagebrush decreased in density 10% from 1,360 plants/acre to 1,220 plants/acre, but cover increased from 1% to 2%. Recruitment of young black sagebrush plants decreased from 10% to 5% of the population.
- **2001 to 2006 - slightly down (-1):** Density of basin big sagebrush decreased by 18% to 1,560 plants/acre, but cover increased to 7%. Decadence of basin big sagebrush increased from 31% to 40%, and poor vigor increased from 8% to 32%. Black sagebrush density decreased 25% to 920 plants/acre, but cover remained similar at 2%.
- **2006 to 2011 - stable (0):** Basin big sagebrush decreased by 8% to 1,440 plants/acre, and cover decreased to 5%. Decadence of basin big sagebrush decreased to 17%, and poor vigor decreased to 4%. Density of black sagebrush increased by 17% to 1,080 plants/acre, and cover increased to 3%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 52%. Bluebunch wheatgrass and Sandberg bluegrass increased significantly in nested frequency.
- **1990 to 1996 - stable (0):** The perennial grass sum of nested frequency remained similar. Cheatgrass was included in the sample for the first time, and is prevalent on the site.
- **1996 to 2001 - slightly down (-1):** There was a slight decrease in the sum of nested frequency of perennial grasses, and cover remained similar at 12%. Cheatgrass increased significantly in nested frequency, and cover increased from 2% to 10%.
- **2001 to 2006 - slightly up (+1):** The perennial grass sum of nested frequency increased slightly, and cover increased to 13%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 4%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 16%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 2%.

Forb:

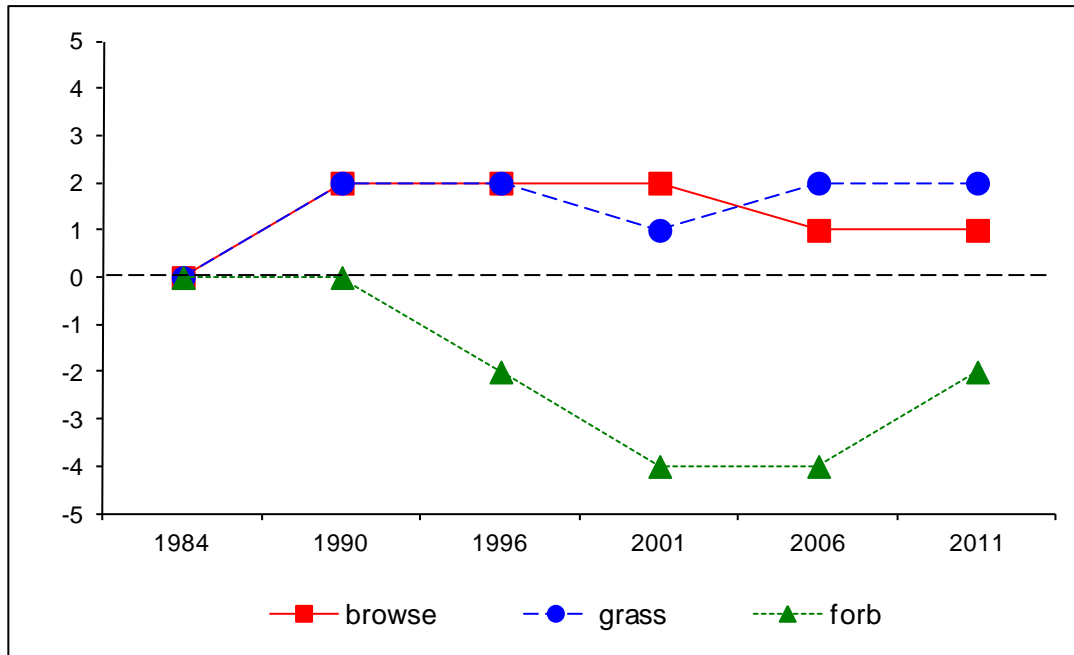
- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial forbs decreased by 31%.
- **1996 to 2001 - down (-2):** The perennial forb sum of nested frequency decreased by 27%, but cover increased from 2% to 3%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial forbs decreased slightly, but cover increased to 5%.
- **2006 to 2011 - up (+2):** There was a 77% increase in the sum of nested frequency of perennial forbs, though cover remained similar at 5%. Annual forb sum of nested frequency increased substantially, and cover increased from less than 1% to 4%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
 Management unit 1, study no: 6

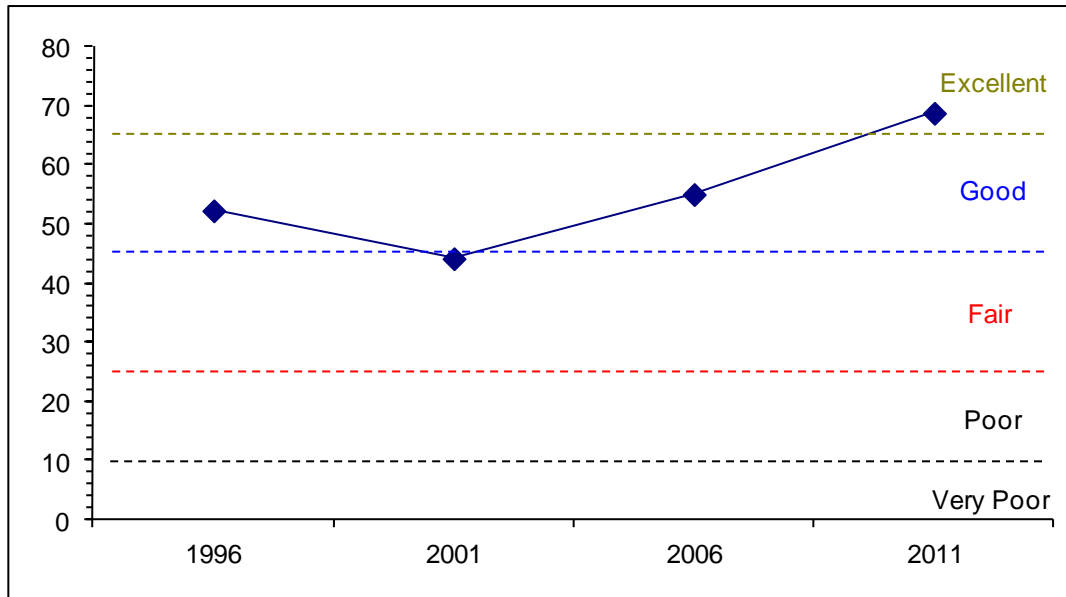
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	9.9	8.5	7.8	23.4	-1.7	4.3	0.0	52.3	Good
01	11.1	7.5	2.8	24.4	-7.1	5.6	0.0	44.2	Fair-Good
06	14.1	6.0	2.6	25.7	-2.8	9.5	0.0	55.0	Good
11	13.3	10.9	5.7	30.0	-1.1	10.0	0.0	68.8	Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 6



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 6



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron dasystachyum</i>	b ₃₅	a ₇	a ₁₀	a ₁₇	a ₁₃	a ₉	.21	.37	.10	.07
G	<i>Agropyron spicatum</i>	ab ₁₃₈	c ₂₀₇	b ₁₅₇	a ₁₁₉	a ₁₀₀	ab ₁₄₁	7.69	6.48	5.00	7.51
G	<i>Bromus tectorum</i> (a)	-	-	b ₂₂₃	c ₂₈₈	b ₂₃₇	a ₁₀₀	2.32	9.53	3.75	1.47
G	<i>Elymus cinereus</i>	b ₁₂	a ₂	a ₄	a ₂	ab ₄	a ₄	.15	.38	.30	.06
G	<i>Oryzopsis hymenoides</i>	-	1	8	10	7	5	.09	.12	.19	.24
G	<i>Poa secunda</i>	a ₅₄	b ₁₄₅	b ₁₄₅	b ₁₆₁	c ₂₀₄	bc ₁₈₀	3.32	4.40	7.21	7.96
G	<i>Sitanion hystrix</i>	a ⁻	a ⁻	b ₁₆	ab ₅	ab ₅	ab ₄	.24	.41	.03	.03
Total for Annual Grasses		0	0	223	288	237	100	2.32	9.53	3.75	1.47
Total for Perennial Grasses		239	362	340	314	333	343	11.71	12.18	12.84	15.88
Total for Grasses		239	362	563	602	570	443	14.04	21.72	16.60	17.36
F	<i>Agoseris glauca</i>	a ⁻	b ₁₇	a ₅	a ⁻	a ₃	ab ₁₅	.01	-	.04	.07
F	<i>Allium</i> sp.	a ₃	a ⁻	a ⁻	a ⁻	a ⁻	b ₂₅	-	-	-	.07
F	<i>Arabis</i> sp.	a ⁻	ab ₁₀	b ₂₄	a ⁻	a ₄	a ₄	.08	.00	.01	.00
F	<i>Aster</i> sp.	-	-	-	-	-	-	-	-	-	.00
F	<i>Astragalus beckwithii</i>	ab ₁₆	bc ₃₂	ab ₇	a ₆	ab ₁₄	a ₄₅	.05	.09	.14	.88
F	<i>Astragalus cibarius</i>	bc ₂₄	a ⁻	a ₂	c ₃₃	ab ₆	a ⁻	.00	.23	.33	-
F	<i>Balsamorhiza sagittata</i>	11	5	8	3	11	9	.87	.72	2.30	.66
F	<i>Calochortus nuttallii</i>	-	3	-	-	-	9	-	-	-	.02
F	<i>Caulanthus crassicaulis</i>	-	4	-	-	-	-	-	-	-	-
F	<i>Chaenactis douglasii</i>	-	-	-	-	6	-	-	-	.01	-
F	<i>Collinsia parviflora</i> (a)	-	-	a ₂₆	a ₂₅	a ₂₅	b ₁₅₁	.06	.11	.06	1.75
F	<i>Collomia linearis</i> (a)	-	-	11	17	-	-	.02	.12	-	-
F	<i>Comandra pallida</i>	-	4	5	9	12	6	.04	.10	.36	.04

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Cordylanthus ramosus</i> (a)	b29	a-	a-	b49	a-	a-	-	.23	-	-
F	<i>Crepis acuminata</i>	c97	b45	a9	ab21	a18	ab34	.02	.56	.55	1.13
F	<i>Cryptantha</i> sp.	a-	a-	b18	a-	a4	a-	.06	-	.01	-
F	<i>Delphinium nuttallianum</i>	b52	a2	a3	a1	a5	b36	.01	.00	.01	.46
F	<i>Descurainia pinnata</i> (a)	-	-	a-	a4	a-	b23	-	.00	-	.05
F	<i>Erigeron pumilus</i>	15	10	12	16	4	10	.09	.29	.06	.11
F	<i>Eriogonum ovalifolium</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Galium aparine</i> (a)	c47	a-	b10	ab3	a-	ab10	.17	.00	-	.56
F	<i>Gayophytum ramosissimum</i> (a)	-	-	a-	a-	b11	a-	-	-	.02	-
F	<i>Gilia</i> sp. (a)	-	-	a-	b8	b8	b17	-	.02	.01	.05
F	<i>Hackelia patens</i>	-	23	17	7	8	11	.26	.10	.14	.49
F	<i>Helianthus annuus</i> (a)	-	-	-	-	-	3	-	-	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	a1	b25	ab8	ab9	.00	.05	.02	.02
F	<i>Lewisia rediviva</i>	-	-	-	-	-	3	-	-	-	.00
F	<i>Lomatium</i> sp.	6	-	-	3	3	2	-	.06	.15	.15
F	<i>Lomatium triternatum</i>	15	1	-	-	-	6	-	-	-	.04
F	<i>Machaeranthera grindelioides</i>	-	-	-	-	-	19	-	-	-	.09
F	<i>Microsteris gracilis</i> (a)	-	-	a3	b63	a32	b91	.00	.16	.07	.90
F	<i>Navarretia intertexta</i> (a)	-	-	b20	a-	ab10	a-	.04	-	.02	-
F	<i>Penstemon cyananthus</i>	a3	b33	c79	a1	a10	ab8	.43	.00	.08	.07
F	<i>Phlox hoodii</i>	-	-	-	-	2	-	-	-	.00	-
F	<i>Phlox longifolia</i>	b128	c172	a57	a78	a54	a54	.17	.58	.49	.66
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	-	-	19	-	-	-	.11
F	<i>Schoenocrambe linifolia</i>	-	-	-	5	-	1	-	.01	-	.00
F	<i>Senecio multilobatus</i>	-	-	6	-	6	3	.06	-	.02	.04
F	Unknown forb-perennial	-	5	-	-	-	-	-	-	-	-
F	<i>Veronica biloba</i> (a)	-	-	a-	a-	b25	b36	-	-	.10	.16
Total for Annual Forbs		76	0	71	194	119	359	0.30	0.72	0.31	3.64
Total for Perennial Forbs		370	366	252	185	170	300	2.17	2.78	4.73	5.05
Total for Forbs		446	366	323	379	289	659	2.48	3.50	5.04	8.70

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	'11	'96	'01	'06	'11
B	Artemisia nova	35	32	25	26	1.13	2.18	2.44	3.01
B	Artemisia tridentata tridentata	57	49	47	41	4.94	5.21	7.03	5.10
B	Chrysothamnus nauseosus consimilis	7	9	6	7	.36	.53	.30	.71
B	Chrysothamnus viscidiflorus viscidiflorus	8	10	4	3	.04	.59	.15	.01
B	Gutierrezia sarothrae	8	7	7	3	.04	.01	.02	-
B	Juniperus osteosperma	3	6	6	7	4.12	3.54	5.19	6.63
B	Opuntia sp.	1	0	0	1	.00	-	.03	.03
B	Pinus monophylla	0	2	0	3	.38	.15	-	-
B	Purshia tridentata	9	8	5	8	1.57	1.25	1.53	2.08
Total for Browse		128	123	100	99	12.61	13.48	16.71	17.59

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 6

Species	Percent Cover		
	'01	'06	'11
Artemisia nova	-	2.90	3.51
Artemisia tridentata tridentata	-	6.84	6.59
Chrysothamnus nauseosus consimilis	-	.16	.35
Chrysothamnus viscidiflorus viscidiflorus	-	1.36	-
Gutierrezia sarothrae	-	.21	.13
Juniperus osteosperma	5.19	7.61	8.08
Pinus monophylla	3.00	-	-
Purshia tridentata	-	1.00	1.53

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 6

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	-	1.3	1.0
Artemisia tridentata tridentata	1.7	1.7	1.7
Purshia tridentata	1.3	1.7	-

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 6

Species	Trees per Acre			
	'96	'01	'06	'11
Juniperus osteosperma	47	87	70	85
Pinus monophylla	7	27	24	25

Average diameter (in)			
'96	'01	'06	'11
10.7	6.4	6.5	5.2
5.3	3.2	3.1	1.7

BASIC COVER--

Management unit 01, Study no: 6

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.50	5.75	31.63	42.52	35.96	42.73
Rock	.75	1.00	13.21	11.49	10.86	13.38
Pavement	18.00	13.75	6.57	10.76	11.02	7.28
Litter	55.00	51.50	39.79	42.78	31.26	33.53
Cryptogams	2.00	1.75	1.90	2.28	.38	1.62
Bare Ground	20.75	26.25	15.44	12.09	25.18	17.59

SOIL ANALYSIS DATA --

Management unit 01, Study no: 6, Study Name: Bovine Enclosure

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
17.7	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	'11	'01	'06	'11
Sheep	1	-	-	-	-	-	-
Rabbit	6	8	28	5	-	-	-
Deer	23	9	8	9	20 (50)	10 (25)	8 (17)
Cattle	-	-	1	1	-	-	4 (9)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 6

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia nova									
84	199	0	33	67	433	17	0	67	10/12
90	166	0	20	80	-	0	0	0	10/9
96	1360	10	82	7	20	34	0	0	10/18
01	1220	5	75	20	20	5	0	2	12/18
06	920	2	78	20	-	28	0	7	11/21
11	1080	20	63	17	20	9	0	13	11/21
Artemisia tridentata tridentata									
84	1532	9	28	63	-	33	20	67	15/11
90	3199	51	26	23	566	5	0	3	18/18
96	2040	17	56	27	100	22	3	3	22/28
01	1900	5	64	31	-	13	1	8	27/32
06	1560	1	59	40	320	36	6	32	24/41
11	1440	8	75	17	60	22	1	4	24/37

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus nauseosus consimilis</i>										
84	33	100	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	180	44	56	0	-	0	0	22	20/21	
01	240	0	42	58	-	8	8	17	17/15	
06	160	0	50	50	-	0	0	25	26/23	
11	180	0	56	44	-	22	0	22	23/25	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	232	28	57	14	-	14	14	0	10/15	
90	399	33	58	8	-	17	0	0	11/15	
96	220	0	100	0	-	0	0	0	12/18	
01	380	11	53	37	60	16	0	16	13/24	
06	120	0	100	0	-	0	0	0	13/24	
11	60	0	67	33	-	0	0	0	10/17	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	900	31	69	0	280	0	0	0	5/7	
01	520	0	100	0	-	0	0	0	4/7	
06	520	4	92	4	220	0	0	0	4/5	
11	160	0	100	0	-	0	0	100	2/4	
<i>Juniperus osteosperma</i>										
84	66	0	100	0	-	0	0	0	69/187	
90	33	0	100	0	-	0	0	0	236/276	
96	60	0	100	0	20	0	0	0	-/-	
01	140	57	29	14	-	0	0	14	4/7	
06	120	67	33	0	60	0	0	0	-/-	
11	140	57	43	0	40	0	0	0	31/24	
<i>Leptodactylon pungens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	6/15	
11	0	0	0	-	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
84	133	0	100	-	-	0	0	0	4/8	
90	199	17	83	-	-	0	0	0	6/15	
96	20	100	0	-	-	0	0	0	5/13	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	5/13	
11	20	0	100	-	-	0	0	0	5/26	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Pinus monophylla</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	40	100	0	-	20	0	0	0	-/-	
06	0	0	0	-	40	0	0	0	-/-	
11	60	100	0	-	-	0	0	0	41/26	
<i>Purshia tridentata</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	260	15	69	15	-	38	31	8	17/39	
01	220	9	82	9	-	18	18	0	19/38	
06	140	29	71	0	-	14	71	0	18/40	
11	300	7	93	0	-	13	87	47	16/35	

SOUTH SIDE EMIGRANT PASS - TREND STUDY NO. 1-7-11

Vegetation Type: Black Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Semidesert Stony Loam \(Black Sagebrush\), R028AY252UT](#)

Land Ownership: BLM

Elevation: 5,620 ft. (1,713 m)

Aspect: Southwest

Slope: 11%

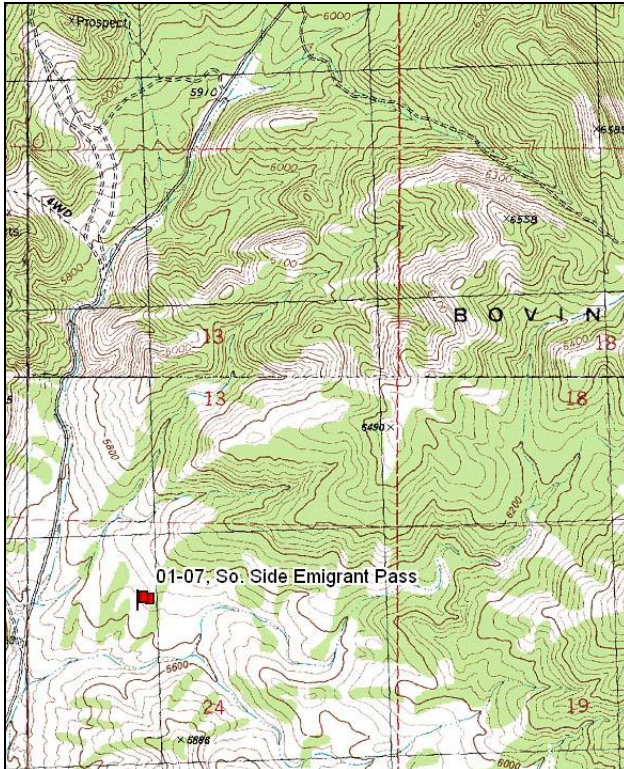
Transect bearing: 162° magnetic

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

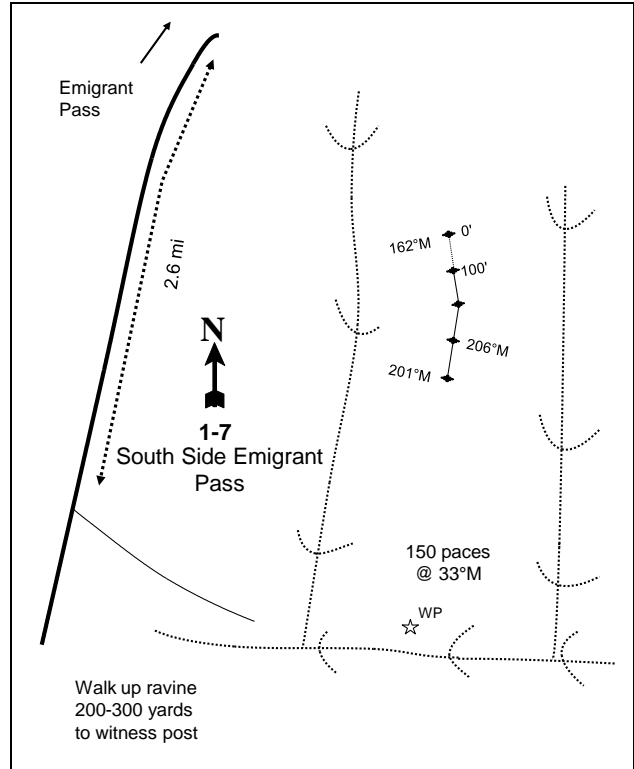
Directions:

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

GPS: NAD 83, UTM 12S 270844 E 4596873 N

SOUTH SIDE EMIGRANT PASS - TREND STUDY NO. 1-7

Site Information

Site Description: The study samples a black sagebrush (*Artemisia nova*) ridge on the south side of Emigrant Pass. Shallow draws containing a few Utah juniper (*Juniperus osteosperma*) trees are located to either side of the study area. The area is managed by the Bureau of Land Management (BLM) as part of the White Lake allotment. Deer pellet groups were sampled in low abundance in 2001, but in more moderate abundance since 2006. Elk pellet groups were high in abundance in 2001, but low in abundance since 2006. Sampled cattle sign has been minimal since 2001. Several sage-grouse pellet groups were sampled in 2006 (Table - Pellet Group Data).

Browse: Black sagebrush is the key browse species, and has provided nearly all of the browse cover on the site since 1996 (Table Browse Trends). The black sagebrush on the site is comprised of a dense population of moderately used plants. Decadence is moderate within the population. Recruitment of young black sagebrush plants was high at the outset of the study, but decreased markedly in 2001. Recruitment of young plants has been poor since that time. Other preferred browse species on the site include shadscale (*Atriplex confertifolia*), Nevada ephedra (*Ephedra nevadensis*), and green molly summer cypress (*Kochia americana*). All three species occur in relatively low numbers, with mostly light to moderate use. Shadscale density has steadily decreased over the course of the study. Other associated shrub species include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) and bud sagebrush (*Artemisia spinescens*) (Table - Browse Characteristics).

Herbaceous Understory: Grasses occur infrequently and produce limited cover. The most common species are Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Sitanion hystrix*), and the annual species cheatgrass (*Bromus tectorum*). Forbs are diverse, but also produce limited cover (Table - Herbaceous Trends).

Soil: The soil is part of the Tosser-Puett association, likely as part of the Tosser component. These soils occur on hillslopes, and parent material consists of alluvium derived from limestone and chert (Soil Survey Staff 2011). The soil is a sandy clay with a slightly alkaline soil reaction (pH 7.7). Phosphorus may have limited availability for plant growth and development at 3.9 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). The surface is very rocky and appears almost armored with extensive areas of pavement. Litter cover is scarce, and vegetation cover is limited almost exclusively to black sagebrush crowns. Bare ground cover is low (Table - Basic Cover). Pedestalling around sagebrush plants is common, but is not extreme. The soil erosion condition was classified as stable in 2001 and 2011, but was slight in 2006.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** The black sagebrush density decreased by 8% from 10,465 plants/acre to 9,665 plants/acre. Decadence increased from 15% to 30%, but poor vigor decreased from 10% to 2%. Recruitment of young black sagebrush plants remained very high at 41% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of black sagebrush decreased to 9%, and poor vigor stayed low at 2%. Recruitment of young black sagebrush plants decreased to 25%, but is still considered to be very good.
- **1996 to 2001 - stable (0):** The density of black sagebrush increased slightly from 11,500 plants/acre to 12,380 plants/acre, and cover increased from 17% to 19%. Decadence increased to 18%, and poor vigor increased to 4%. Recruitment of young black sagebrush plants decreased substantially to 5% of the population.
- **2001 to 2006 - slightly down (-1):** The black sagebrush density decreased 10% to 11,160 plants/acre, but cover increased to 24%. Decadence increased to 22%, and poor vigor increased to 9%.

Recruitment of young sagebrush plants remained very poor at 3%, but there were numerous seedlings sampled.

- **2006 to 2011 - stable (0):** Black sagebrush density remained similar at 10,520 plants/acre , but cover decreased slightly to 22%. Decadence decreased to 18%, but poor vigor increased to 11% of the population. Recruitment of young sagebrush plants remained very poor at 3%.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency of perennial grasses increased two-fold, but perennial grasses are not abundant on the site. There was a significant increase in the nested frequency of Indian ricegrass.
- **1990 to 1996 - stable (0):** There was a 20% increase in the sum of nested frequency of perennial grasses, but perennial grasses remain relatively rare on the site.
- **1996 to 2001 - slightly up (+1):** The perennial grass sum of nested frequency increased 38%, and cover increased from 1% to 2%. Cheatgrass increased significantly in nested frequency, but cover remained less than 1%.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial grasses decreased by 29%, but cover remained similar at 2%. Cheatgrass increased significantly in nested frequency, and cover increased slightly to just over 1%. Cheatgrass was the dominant grass in frequency and cover.
- **2006 to 2011 - stable (0):** The perennial grass sum of nested frequency decreased by 10%, and cover decreased to less than 1%. However, cheatgrass also decreased significantly in nested frequency, and cover decreased to near 0%.

Forb:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased by 23%.
- **1996 to 2001 - down (-2):** The perennial forb sum of nested frequency decreased by 24%, and cover decreased from 2% to 1%.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial forbs decreased by 25%, though cover remained similar.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs. The sum of nested frequency of annual forbs increased substantially.

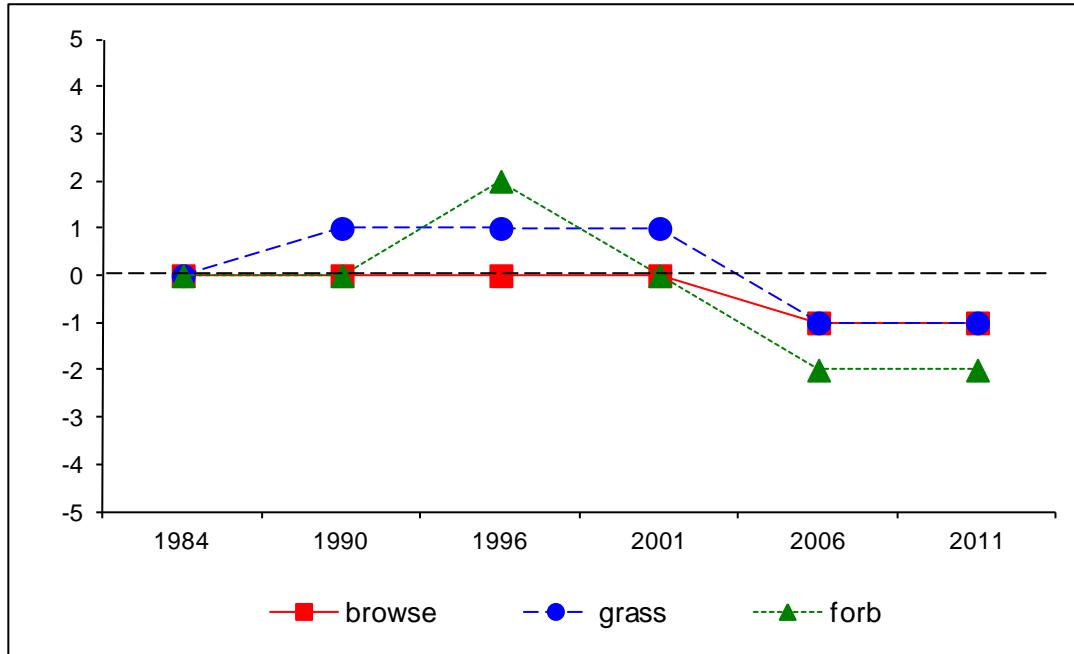
DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

Management unit 1, study no: 7

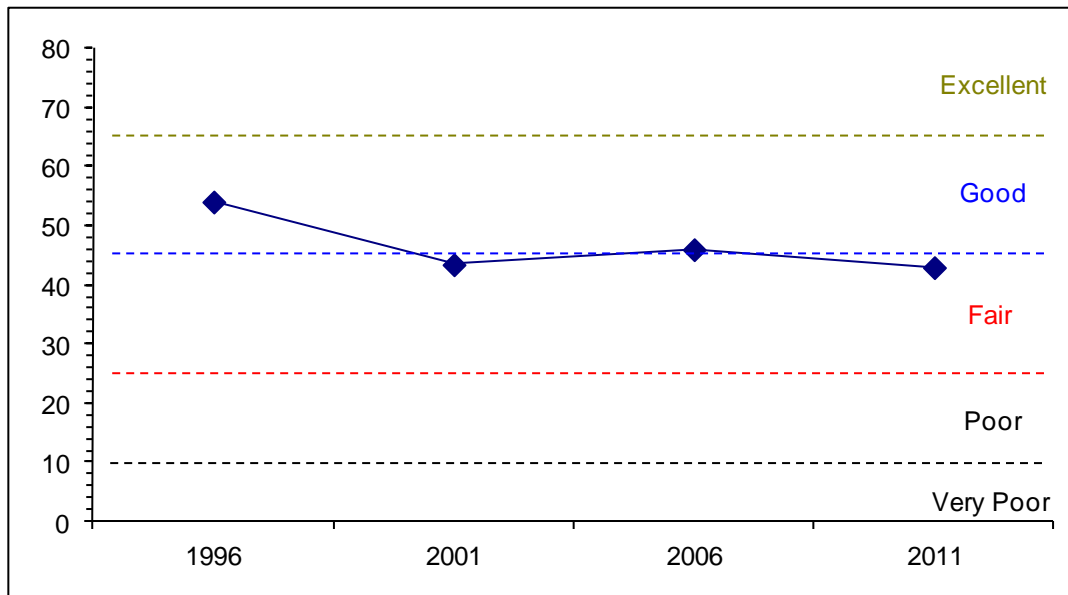
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	23.3	12.4	12.1	2.7	-0.1	3.7	0.0	54.0	Good
01	25.2	9.2	3.1	3.9	-0.5	2.5	0.0	43.4	Fair-Good
06	30.0	8.6	2.0	3.7	-0.9	2.6	0.0	46.0	Fair-Good
11	27.8	9.4	1.5	1.4	-0.1	2.8	0.0	42.9	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 7



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 7



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a-	a2	a-	b35	a1	a5	.00	.32	.03	.01
G	Bromus tectorum (a)	-	-	a51	b99	c249	a38	.13	.60	1.21	.08
G	Oryzopsis hymenoides	a26	c70	bc54	a20	ab29	ab35	.84	.37	.83	.24
G	Poa secunda	a3	a6	ab19	b43	b28	b39	.23	.74	.39	.37
G	Sitanion hystrix	ab15	ab9	cd31	b45	b43	a12	.26	.49	.58	.07
Total for Annual Grasses		0	0	51	99	249	38	0.12	0.60	1.21	0.07
Total for Perennial Grasses		44	87	104	143	101	91	1.34	1.93	1.84	0.69
Total for Grasses		44	87	155	242	350	129	1.47	2.53	3.06	0.77
F	Allium sp.	ab5	a-	ab3	a-	a-	b16	.00	-	-	.03
F	Artemisia ludoviciana	-	-	-	-	-	3	-	-	-	.00
F	Astragalus newberryi	a-	a-	b23	ab6	ab16	b1	.18	.02	.06	.00
F	Astragalus utahensis	ab18	b23	a9	a4	a4	ab25	.01	.04	.01	.15
F	Balsamorhiza hookeri	-	-	1	4	3	4	.00	.03	.15	.15
F	Castilleja chromosa	5	-	-	-	-	-	.00	-	-	-
F	Caulanthus crassicaulis	-	-	14	-	-	3	.06	-	-	.01
F	Crepis acuminata	3	-	-	-	-	-	-	-	-	-
F	Cryptantha sp.	d116	b58	c92	a18	ab35	a8	.47	.13	.12	.04
F	Cymopterus sp.	a-	a-	a8	b30	a-	ab13	.01	.13	-	.06
F	Descurainia pinnata (a)	-	-	-	1	3	3	-	.00	.00	.01
F	Erigeron argentatus	-	2	1	-	1	-	.00	-	.01	-
F	Erigeron pumilus	a-	a-	a3	b39	a-	a3	.00	.29	-	.03
F	Erigeron sp.	-	-	3	-	-	-	.03	-	-	-
F	Eriogonum ovalifolium	-	-	3	6	3	-	.00	.02	.00	-
F	Gilia sp. (a)	-	-	b38	b34	a-	c110	.08	.10	-	.26
F	Haplopappus acaulis	a4	b32	ab18	a6	ab19	ab20	.08	.03	.24	.46
F	Malcolmia africana	-	-	5	-	-	-	.01	-	-	-
F	Phlox hoodii	ab57	b43	ab34	ab28	a23	a21	.37	.22	.23	.18
F	Phlox longifolia	ab90	bc124	c133	bc126	abc96	a87	.56	.32	.46	.28
F	Ranunculus testiculatus (a)	-	-	a2	ab16	ab14	b19	.00	.03	.03	.12
F	Sisymbrium altissimum (a)	-	-	-	-	-	3	-	-	-	.00
F	Sphaeralcea coccinea	-	2	-	-	-	-	-	-	-	-
F	Sphaeralcea grossulariifolia	1	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	40	51	17	135	0.08	0.13	0.03	0.39
Total for Perennial Forbs		299	284	350	267	200	204	1.84	1.25	1.32	1.42
Total for Forbs		299	284	390	318	217	339	1.93	1.39	1.35	1.82

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	'11	'96	'01	'06	'11
B	Artemisia nova	99	99	100	100	17.45	19.28	23.78	21.46
B	Atriplex confertifolia	33	24	21	14	1.37	.95	1.18	.91
B	Chrysothamnus viscidiflorus stenophyllus	75	68	72	68	2.51	2.30	2.02	1.70
B	Ephedra nevadensis	0	1	2	2	-	-	-	-
B	Juniperus osteosperma	0	1	0	0	-	-	-	-
B	Kochia americana	23	22	25	11	.06	.10	.29	.04
B	Pinus edulis	0	0	0	1	-	-	.00	-
B	Tetradymia nuttallii	14	14	10	8	.30	1.83	.39	.42
Total for Browse		244	229	230	204	21.71	24.48	27.70	24.55

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 7

Species	Percent Cover	
	'06	'11
Artemisia nova	26.58	23.98
Atriplex confertifolia	.16	.20
Chrysothamnus viscidiflorus stenophyllus	3.31	2.26
Kochia americana	.08	.05
Tetradymia nuttallii	.13	.15

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 7

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	0.8	0.6	0.5

BASIC COVER--

Management unit 01, Study no: 7

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.25	9.75	25.04	30.18	30.17	27.15
Rock	5.75	11.00	11.69	5.50	8.19	11.06
Pavement	62.75	56.00	33.71	46.00	39.92	43.79
Litter	23.50	14.75	12.81	13.06	16.79	13.31
Cryptogams	1.50	1.50	2.55	2.16	1.70	1.73
Bare Ground	3.25	7.00	8.89	11.87	13.94	12.31

SOIL ANALYSIS DATA --

Management unit 01, Study no: 7, Study Name: South Side Emigrant Pass

Effective rooting depth (in)	pH	Sandy-Clay			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.2	7.7	55.9	9.1	35.0	1.4	3.9	172.8	0.6

PELLET GROUP DATA--

Management unit 01, Study no: 7

Type	Quadrat Frequency			
	'96	'01	'06	'11
Rabbit	16	5	48	-
Elk	-	48	1	2
Deer	17	-	18	8
Cattle	-	-	-	2
Sage Grouse	-	-	-	-

Days use per acre (ha)		
'01	'06	'11
-	-	-
71 (175)	-	-
5 (12)	27 (66)	25 (61)
-	2 (4)	4 (9)
-	9 groups/acre	-

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 7

		Age class distribution					Utilization			
Y	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia nova</i>										
84	10465	44	41	15	1866	49	18	10	8/11	
90	9665	41	30	30	2533	5	0	2	11/14	
96	11500	25	66	9	340	52	29	2	9/23	
01	12380	5	77	18	60	42	10	4	7/18	
06	11160	3	74	22	50020	42	19	9	9/21	
11	10520	3	79	18	60	28	1	11	9/22	
<i>Artemisia spinescens</i>										
84	1931	31	66	3	-	31	34	3	6/8	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	7/13	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	6/13	
<i>Atriplex confertifolia</i>										
84	2598	28	33	38	-	49	33	26	7/10	
90	1864	4	21	75	333	0	0	43	10/8	
96	920	13	83	4	40	41	9	0	9/15	
01	840	26	29	45	20	0	0	19	8/12	
06	680	21	68	12	40	6	3	3	10/16	
11	380	5	63	32	-	5	0	26	7/14	
<i>Chrysothamnus viscidiflorus stenophyllus</i>										
84	2865	56	40	5	66	14	28	2	7/11	
90	3331	54	16	30	199	0	0	4	11/13	
96	3100	6	81	13	300	3	0	3	8/15	
01	2580	4	60	36	20	2	2	10	5/10	
06	2940	7	67	25	180	9	13	13	7/13	
11	2660	4	79	17	-	11	0	11	6/12	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Ephedra nevadensis										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	16/19	
01	20	0	100	-	-	0	0	0	12/15	
06	40	0	100	-	-	0	100	0	11/13	
11	40	0	100	-	-	100	0	0	14/22	
Grayia spinosa										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	21/20	
Juniperus osteosperma										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	20	0	0	0	-/-	
01	20	100	0	-	-	0	0	0	-/-	
06	0	0	0	-	20	0	0	0	-/-	
11	0	0	0	-	20	0	0	0	-/-	
Kochia americana										
84	1864	57	32	11	-	11	14	11	2/2	
90	399	100	0	0	-	0	0	0	-/-	
96	960	40	60	0	100	0	0	0	4/6	
01	1100	44	49	7	20	4	0	4	¾	
06	1340	9	91	0	120	51	4	0	5/6	
11	380	11	89	0	-	5	5	0	2/3	
Pinus edulis										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	20	0	0	0	-/-	
11	20	100	0	-	20	0	0	0	-/-	
Tetradymia nuttallii										
84	265	25	0	75	-	25	25	50	-/-	
90	866	38	0	62	66	0	0	23	-/-	
96	280	0	14	86	-	7	0	36	16/24	
01	280	7	29	64	-	7	0	50	13/15	
06	200	10	50	40	-	0	0	10	17/21	
11	180	11	44	44	-	22	0	56	14/18	

MUD SPRINGS BASIN - TREND STUDY NO. 1-8-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Upland Juniper Savanna \(Utah Juniper\), R025XY322UT](#)

Land Ownership: BLM

Elevation: 5,580 ft. (1,701 m)

Aspect: Southeast

Slope: 7%

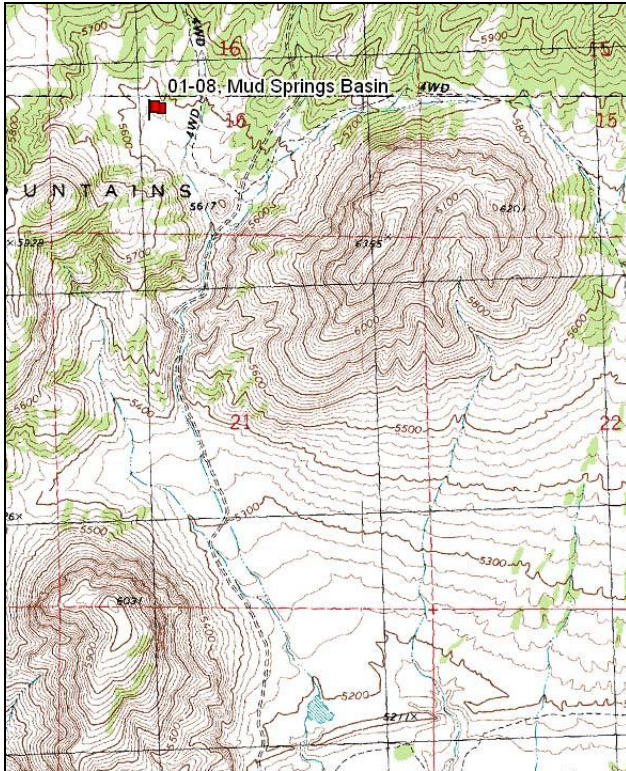
Transect bearing: 180° magnetic

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

Directions:

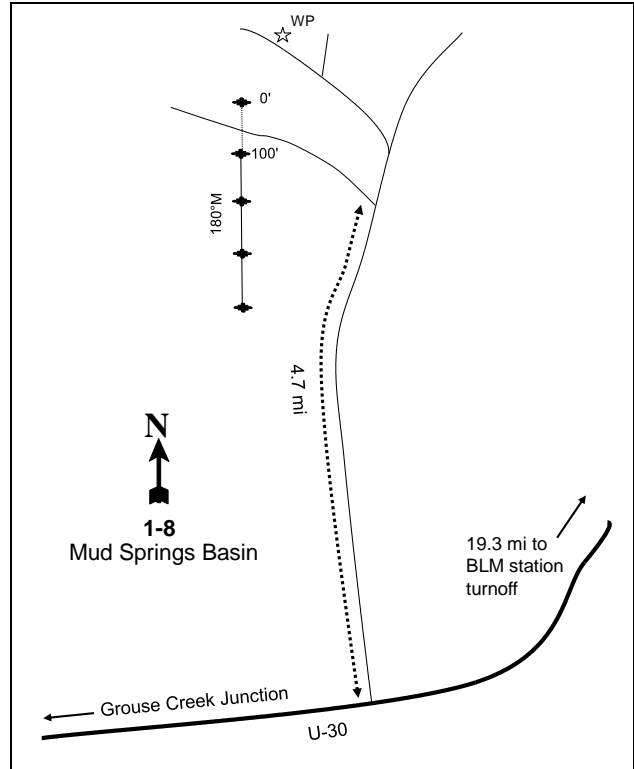
On U-30 proceed 19 miles southwest from the Rosebud BLM station turn-off and turn right (north) onto a gravel road just before mile marker 14. Proceed 4.7 miles and take a fork to the left for 0.3 miles. The transect intersects with the road. Look for the 100 foot stake on the left side of the road, and 0 foot stake will be found on the right hand side of the road. The 0 foot stake is marked by browse tag #7913. Bearing of the baseline is 180 degrees.

Map Name: Lucin NE



Township: 9N Range: 17W Section: 16

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 265978 E 4597940 N

MUD SPRINGS BASIN - TREND STUDY NO. 1-8

Site Information

Site Description: The study is located approximately two miles southwest of Mud Springs Basin, at the south end of the Grouse Creek Mountains. The site is located on land administered by the State Institutional Trust Lands Administration (SITLA). The small basin in which the study is located contains numerous small ridges occupied by fingers of Utah juniper (*Juniperus osteosperma*) and black sagebrush (*Artemisia nova*) separated by low areas (swales) occupied by the more deep rooted Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). The study samples a large sagebrush swale because of the importance of sagebrush during the winter. A road crosses the first line of the transect, and one of the sample belts is affected. Deer pellet groups were sampled in moderate abundance in 2001 and 2011, but low abundance in 2006. Cattle sign has been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The key browse species is Wyoming big sagebrush, which provides nearly all of the browse cover on the site (Table - Canopy Cover). There were a considerable number of rodent damaged plants encountered in 1984, but decadence was still relatively low. Wyoming big sagebrush is comprised of a moderately dense population of lightly utilized plants. Decadence and poor vigor have been moderate over the course of the sample years. Recruitment of young big sagebrush plants was good at the outset of the study, but has been poor since 2001. Other shrubs sampled include prickly phlox (*Leptodactylon pungens*), narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), black sagebrush, and Nevada ephedra (*Ephedra nevadensis*). Black sagebrush was sampled when the sampling design was expanded in 1996. Density of narrowleaf rabbitbrush was high in 1996, but has decreased since that time (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are fairly diverse and abundant, but the site has often been dominated by the annual species cheatgrass (*Bromus tectorum*). Native perennial grasses include western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and bottlebrush squirreltail (*Sitanion hystrix*). Cheatgrass has fluctuated in frequency and cover, but both measurements were high in 2001 and 2006. Forbs are not particularly abundant on the site, though diversity appears to vary based on the timing and amount of precipitation (Table - Herbaceous Trends).

Soil: The soil is in the Dahar-Codquin gravelly sandy loams, likely as part of the Dahar component. These soils occur on hillslopes, and parent material consists of alluvium and colluviums derived from sandstone and limestone (Soil Survey Staff 2011). The texture is a loam with a slightly alkaline reaction (pH 7.8) (Table - Soil Analysis Data). Bare interspaces have pavement covering the surface, but the soil beneath is easily erodible. Vegetation cover comes principally from sagebrush crowns, native grasses, and cheatgrass. Bare ground cover was low in most years, but was relatively high in 2011 (Table - Basic Cover). A number of small drainage channels traverse the area; however, none are deep or highly active. The soil erosion condition was classified as moderate in 2001, slight in 2006, and stable in 2011. Most signs of erosion are from pedestalling, flow patterns, and abundant rills.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of Wyoming big sagebrush decreased by 36% from 5,864 plants/acre to 3,731 plants/acre. Decadence increased from 14% to 29%, and poor vigor increased from 7% to 14%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined based on other parameters. Decadence of Wyoming big sagebrush remained similar at 25%, and poor vigor decreased slightly to 7%. Recruitment of young big sagebrush plants decreased from 34% to 12%, but is still considered to be good.

- **1996 to 2001 - slightly down (-1):** Wyoming big sagebrush decreased by 22% from 3,240 plants/acre to 2,540 plants/acre, but cover increased slightly from 12% to 14%. Decadence decreased to 19%, and poor vigor increased to 13%. Recruitment of young big sagebrush plants decreased to just 3% of the population. The weedy species narrowleaf rabbitbrush decreased by 42% from 3,300 plants/acre to 1,900 plants/acre, and cover decreased from 6% to 1%.
- **2001 to 2006 - down (-2):** The density of Wyoming big sagebrush decreased by 49% to 1,300 plants/acre, and cover decreased to 7%. Decadence increased to 35%, and poor vigor increased to 22%. There were no young big sagebrush plants sampled. Narrowleaf rabbitbrush decreased 55% in density to 860 plants/acre, and cover decreased to less than 1%.
- **2006 to 2011 - stable (0):** The density of Wyoming big sagebrush remained similar at 1,400 plants/acre, and cover increased to 9%. Decadence decreased to 19%, and poor vigor decreased to 14%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased two-fold.
- **1990 to 1996 - stable (0):** There was little change in the perennial grass sum of nested frequency.
- **1996 to 2001 - slightly down (-1):** The perennial grass sum of nested frequency remained similar, but cheatgrass increased significantly in nested frequency. Cover of perennial grasses decreased from 15% to 10%, and cover of cheatgrass increased from 5% to 13%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 12%. Cheatgrass nested frequency also remained similar, but cover increased to 27%.
- **2006 to 2011 - slightly up (+1):** There was little change in the sum of nested frequency of perennial grasses, and cover of perennial grasses increased to 13%. However, cheatgrass decreased significantly in nested frequency, and cover of cheatgrass decreased to 2%.

Forb:

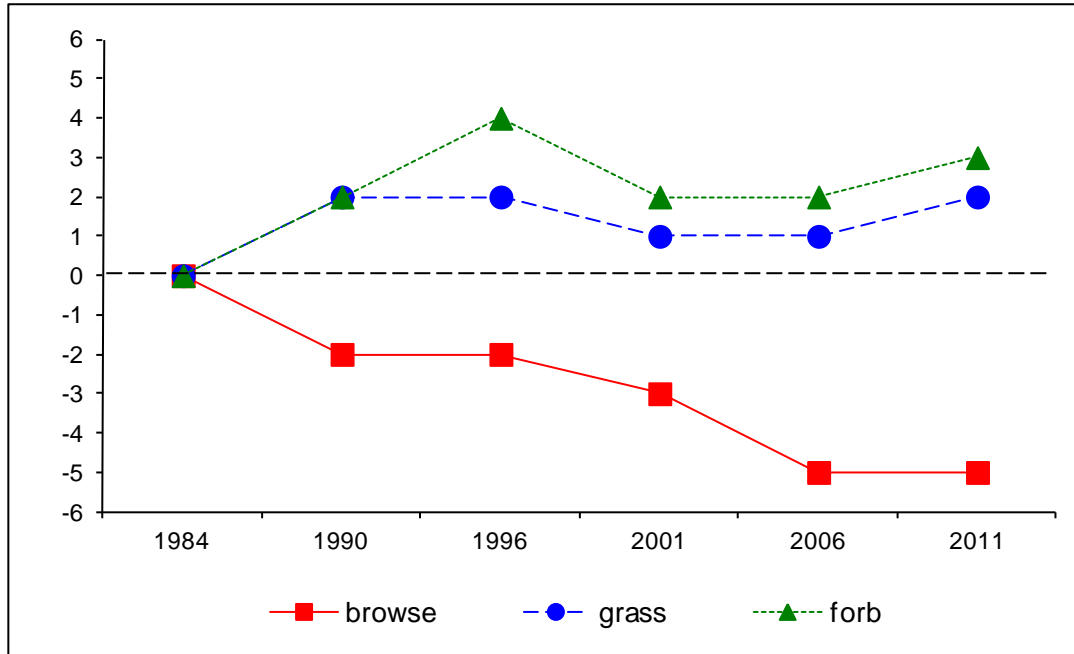
- **1984 to 1990 - up (+2):** The perennial forb sum of nested frequency increased more than two-fold, but forbs are not abundant on the site.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased two-fold.
- **1996 to 2001 - down (-2):** There was a 61% decrease in the sum of nested frequency of perennial forbs, and cover decreased from 3% to 1%.
- **2001 to 2006 - stable (0):** There was a 16% decrease in the sum of nested frequency of perennial forbs, but forbs are not abundant on the site. Cover of perennial forbs remained similar.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 48%, and cover increased to 2%. The sum of nested frequency of annual forbs also increased substantially, and cover increased from less than 1% to 8%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 1, study no: 8

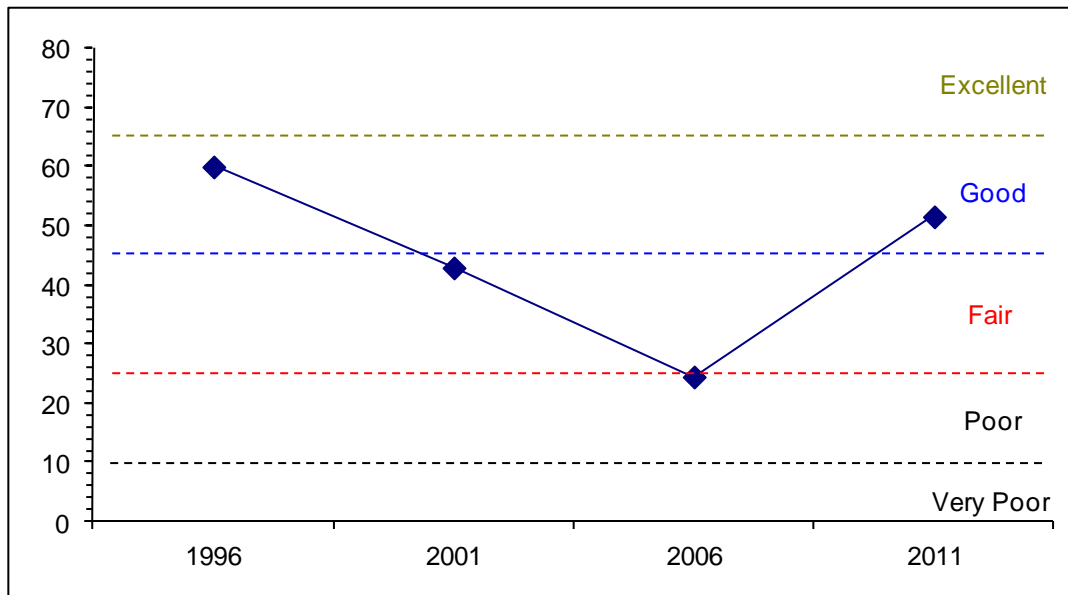
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.5	6.0	5.7	29.2	-4.0	6.7	0.0	60.0	Good
01	19.1	8.8	1.6	21.1	-9.7	2.1	0.0	42.9	Fair
06	10.9	5.8	0.7	24.8	-20.0	2.2	0.0	24.5	Poor-Fair
11	12.4	9.0	2.1	26.2	-1.4	3.2	0.0	51.5	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 8



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 8



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron smithii	a-	ab16	a-	b30	ab12	a10	-	.58	.08	.44
G	Agropyron spicatum	46	84	78	77	80	72	3.88	3.45	3.53	2.54
G	Bromus tectorum (a)	-	-	a154	b268	b295	a180	5.38	12.92	27.35	1.90
G	Oryzopsis hymenoides	24	27	34	35	27	28	2.56	1.57	1.19	.92
G	Poa secunda	a51	b182	b176	b179	b198	b159	6.24	4.49	7.14	7.85
G	Sitanion hystrix	b58	b63	b57	a21	a13	ab34	1.89	.45	.44	1.35
Total for Annual Grasses		0	0	154	268	295	180	5.38	12.92	27.35	1.90
Total for Perennial Grasses		179	372	345	342	330	303	14.59	10.55	12.40	13.12
Total for Grasses		179	372	499	610	625	483	19.97	23.47	39.75	15.03
F	Agoseris glauca	1	-	-	1	2	-	-	.00	.00	-
F	Allium sp.	-	-	-	2	-	6	-	.00	-	.02
F	Alyssum alyssoides (a)	-	-	a6	a-	b36	c95	.01	-	.17	2.97
F	Ambrosia artemisifolia	-	2	-	-	-	-	-	-	-	-
F	Androsace septentrionalis (a)	-	-	-	1	-	-	-	.00	-	-
F	Antennaria rosea	-	-	6	4	10	10	.07	.01	.15	.30
F	Arabis sp.	-	-	-	-	-	3	-	-	-	.00
F	Arenaria sp.	-	-	-	1	-	2	-	.00	-	.00
F	Astragalus beckwithii	8	-	6	3	-	2	.18	.03	-	.03
F	Astragalus cibarius	a5	a6	b32	ab18	b28	ab12	.47	.22	.32	.50
F	Astragalus newberryi	-	-	10	-	-	-	.07	-	-	-
F	Astragalus utahensis	-	8	1	-	1	2	.00	-	.00	.00
F	Balsamorhiza hookeri	ab2	a-	b7	ab1	ab2	a-	.30	.00	.06	.00
F	Calochortus flexuosus	3	-	-	-	-	3	-	-	-	.00
F	Camelina microcarpa (a)	-	-	c71	b26	a6	a-	.18	.14	.01	-
F	Castilleja chromosa	3	-	-	-	-	-	-	-	-	-
F	Chaenactis douglasii	-	-	1	-	-	-	.00	-	-	-
F	Chenopodium album (a)	-	-	-	-	-	1	-	-	-	.00
F	Chorispora tenella (a)	-	-	a4	a-	a8	b26	.01	-	.07	.90
F	Collinsia parviflora (a)	-	-	-	-	-	4	-	-	-	.01
F	Crepis acuminata	a1	ab15	ab10	a1	a2	b17	.25	.00	.16	.26
F	Cryptantha sp.	a-	a-	b32	a-	a-	b35	.35	-	-	.11
F	Descurainia pinnata (a)	-	-	b46	c79	a6	d141	.47	.33	.01	2.97
F	Erigeron pumilus	-	-	14	5	1	-	.05	.07	.03	-
F	Eriogonum ovalifolium	-	-	1	-	-	-	.00	-	-	-
F	Gayophytum ramosissimum(a)	-	-	b19	a-	a-	a-	.04	-	-	-
F	Gilia sp. (a)	-	-	a8	a4	a-	b40	.02	.01	-	.08
F	Hackelia patens	a-	b16	c71	a-	a-	a-	.18	-	-	-
F	Halogeton glomeratus (a)	-	10	-	-	-	-	-	-	-	-
F	Haplopappus acaulis	a-	a-	b20	a-	a-	a-	.46	-	-	-
F	Lappula occidentalis (a)	-	-	ab29	b41	a15	a21	.11	.13	.05	.10
F	Mentzelia albicaulis (a)	-	-	b21	a-	a-	a-	.08	-	-	-
F	Penstemon cyananthus	a-	a-	b17	a-	a-	a-	.05	-	-	-
F	Penstemon sp.	-	-	1	-	-	-	.00	-	-	-

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Phlox hoodii	a ³	ab ¹³	d ⁵⁴	cd ⁴⁹	bc ³¹	ab ⁶	.72	.45	.24	.01
F	Phlox longifolia	a ²⁹	b ⁶⁶	a ³⁰	ab ³⁷	a ²⁴	ab ⁵⁴	.16	.21	.09	.32
F	Ranunculus testiculatus (a)	-	-	a ⁻	a ⁷	a ²⁰	b ⁵¹	-	.01	.20	.17
F	Sisymbrium altissimum (a)	-	-	a ¹⁴	a ³	a ⁻	b ⁴²	.05	.00	-	.30
F	Sphaeralcea grossulariifolia	3	-	-	-	-	-	-	-	-	-
F	Stellaria jamesiana	-	-	-	-	2	-	-	-	.03	-
F	Taraxacum officinale	-	-	3	-	-	-	.00	-	-	-
F	Tragopogon dubius (a)	-	-	3	-	3	-	.03	-	.01	-
F	Unknown forb-perennial	-	27	-	-	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	a ³	a ⁻	ab ⁸	b ¹¹	.01	-	.04	.06
Total for Annual Forbs		0	10	224	161	102	432	1.02	0.64	0.58	7.58
Total for Perennial Forbs		58	153	316	122	103	152	3.36	1.03	1.10	1.60
Total for Forbs		58	163	540	283	205	584	4.39	1.68	1.69	9.18

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	'11	'96	'01	'06	'11
B	Artemisia nova	6	15	17	16	1.54	1.28	1.44	.66
B	Artemisia tridentata wyomingensis	75	65	39	45	11.66	13.98	7.30	9.25
B	Chrysothamnus viscidiflorus stenophyllus	48	39	24	24	5.67	1.29	.45	.48
B	Ephedra nevadensis	0	0	0	1	-	-	-	-
B	Juniperus osteosperma	2	1	1	1	.15	.15	.15	.85
B	Leptodactylon pungens	5	7	8	9	.33	.48	.12	.04
B	Opuntia polyacantha	0	2	3	5	.00	.03	.18	.03
Total for Browse		136	129	92	101	19.35	17.22	9.65	11.31

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 8

Species	Percent Cover	
	'06	'11
Artemisia nova	1.96	2.53
Artemisia tridentata wyomingensis	7.63	12.13
Chrysothamnus viscidiflorus stenophyllus	1.41	1.04
Juniperus osteosperma	.28	.75
Leptodactylon pungens	.26	.21
Opuntia polyacantha	.15	.10

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 8

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.0	2.1	1.2

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 8

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	23	52	29	31	9.6	6.7	9.6	13

BASIC COVER--

Management unit 01, Study no: 8

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	7.00	47.15	42.79	52.86	36.04
Rock	1.75	1.75	3.30	1.93	1.60	2.26
Pavement	12.00	21.25	13.01	12.39	10.67	19.07
Litter	70.25	39.00	41.55	31.90	32.35	21.12
Cryptogams	1.00	1.25	1.82	2.78	.29	1.21
Bare Ground	12.75	29.75	12.91	19.01	18.38	35.95

SOIL ANALYSIS DATA --

Management unit 01, Study no: 8, Study Name: Mud Springs Basin

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
20.3	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	10	2	18	10	-	-	-
Elk	-	1	-	-	-	-	-
Deer/ Antelope	53	22	3	8	32 (80)	8 (20)	23 (58)
Cattle	1	-	5	3	-	11 (27)	17 (43)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 8

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	320	6	25	69	-	19	69	31	8/25
01	840	5	55	40	-	0	0	12	7/22
06	940	9	83	9	-	0	0	9	11/23
11	680	21	47	32	-	0	0	32	11/25
<i>Artemisia tridentata wyomingensis</i>									
84	5864	34	52	14	25333	42	31	7	26/34
90	3731	34	37	29	466	0	0	14	22/22
96	3240	12	64	25	20	3	1	7	23/37
01	2540	3	78	19	60	6	.78	13	22/28
06	1300	0	65	35	200	5	0	22	24/33
11	1400	3	79	19	-	23	0	14	23/41
<i>Atriplex canescens</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>									
84	266	0	100	0	66	100	0	75	12/14
90	199	33	67	0	-	0	0	0	10/9
96	3300	8	89	2	-	0	0	.60	12/20
01	1900	9	60	31	-	0	0	11	9/14
06	860	2	98	0	20	0	0	0	9/16
11	880	2	93	5	-	2	0	5	7/14
<i>Ephedra nevadensis</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	0	0	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	20	0	0	100	-	0	100	100	14/29

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Gutierrezia sarothrae										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	9/13	
11	0	0	0	-	-	0	0	0	-/-	
Juniperus osteosperma										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	50	50	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	100	0	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	0	-/-	
Leptodactylon pungens										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	100	20	80	0	-	0	0	0	5/11	
01	280	0	100	0	20	0	0	0	6/7	
06	240	0	100	0	20	0	0	0	9/9	
11	280	7	71	21	-	0	0	21	5/8	
Opuntia polyacantha										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	5/14	
01	40	0	100	-	-	0	0	0	3/6	
06	60	0	100	-	-	0	0	0	5/9	
11	100	0	100	-	-	0	0	0	4/8	

KILGORE BASIN - TREND STUDY NO. 1-10-11

Vegetation Type: Black Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Semidesert Gravelly Loam \(Wyoming Big Sagebrush\) North, R028AY215UT](#)

Land Ownership: BLM

Elevation: 5,330 ft. (1,625 m)

Aspect: Southwest

Slope: 5%

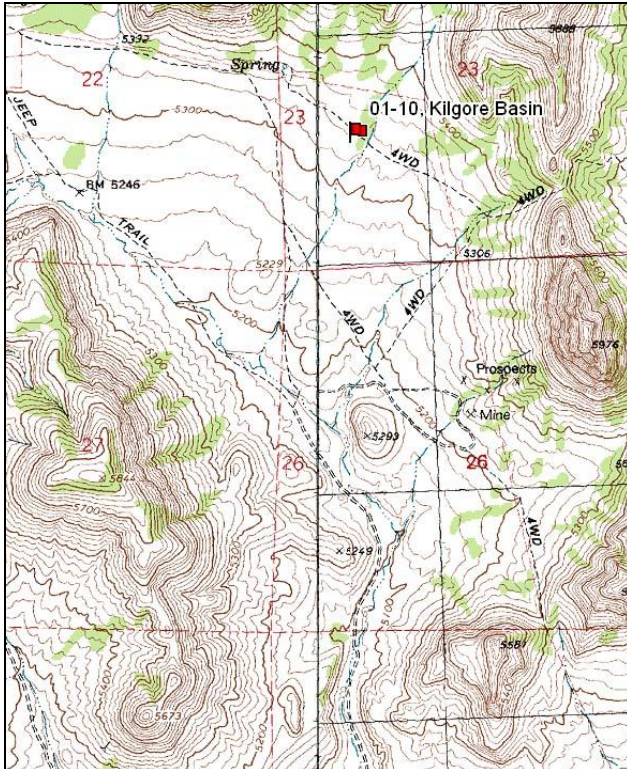
Transect bearing: 155° magnetic

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

Directions:

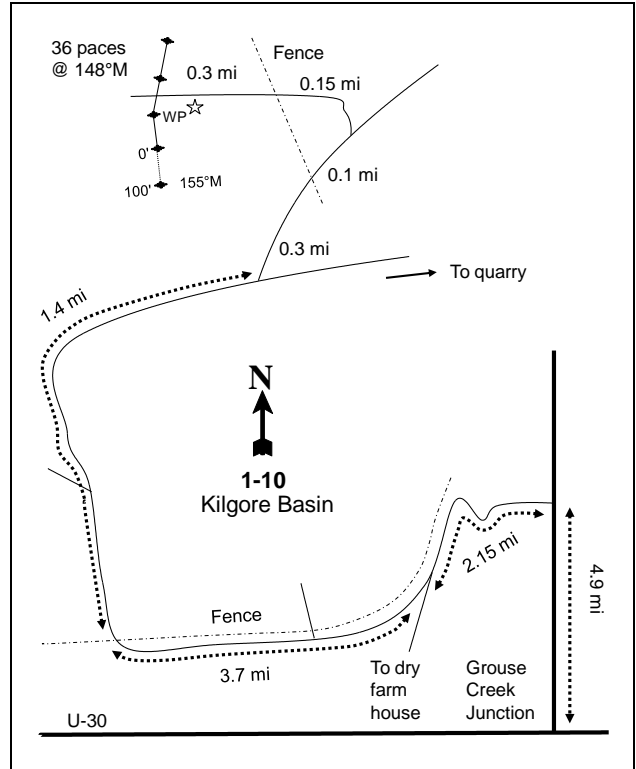
From the U-30/Grouse Creek Road junction, proceed north 4.9 miles on the Grouse Creek Road. Turn left (west) and travel 2.15 miles to a fork that leads to a dry farm. Stay on the main road at this fork (right) and continue 3.7 miles to a gate. Continue 1.2 miles to another fork. Stay right for 0.3 miles, 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. The 0-foot stake is marked by a red browse tag #7910. The baseline bearing is 155 degrees magnetic.

Map Name: Lucin NW



Township: 9N Range: 19W Section: 23

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 249603 E 4596725 N

KILGORE BASIN - TREND STUDY NO. 1-10

Site Information

Site Description: The study is located southwest of Grouse Creek 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 (*Artemisia nova*). Shrub interspaces are essentially barren of other vegetation. Plant diversity is low within the basin. The only variation is in small swales where the deeper rooted Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) predominate, along with a few patches of Utah juniper (*Juniperus osteosperma*) trees. The area is managed by the Bureau of Land Management (BLM) as part of the Kilgore allotment. Deer pellet groups were sampled in moderate abundance in 2001, but in low abundance since 2006. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data). Some sage-grouse droppings were noted in 2006, but none within the sample area.

Browse: Black sagebrush dominates the site, with scattered narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), shadscale (*Atriplex confertifolia*), winterfat (*Ceratoides lanata*), and spiny hopsage (*Grayia spinosa*) occurring in limited abundance. Black sagebrush consists of a dense population of light to moderately used plants. Decadence of black sagebrush has been moderate since 1996. Poor vigor was low in 1996 and 2001, but was more moderate in the other sample years. Recruitment of young black sagebrush plants has been mostly good throughout the course of the study. Seedlings were very abundant in 2006 (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is sparse and has poor species diversity. Perennial grasses are rare, but include bottlebrush squirreltail (*Sitanion hystrix*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Oryzopsis hymenoides*). The annual species cheatgrass (*Bromus tectorum*) and sixweeks fescue (*Vulpia octoflora*) have also been sampled. Cheatgrass was abundant in 2006, but has been rare in all other sample years. Forbs are also sparse on the site. Most forbs on the site are low-growing, xeric species with low palatability (Table - Herbaceous Trends).

Soil: The soil is in the Brobett-Plegomir association, which occurs on fan remnants. Parent material consists of alluvium derived from rhyolite, quartzite, sandstone, and quartzite (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a moderately alkaline soil reaction (pH 8.1) (Table - Soil Analysis Data). The bulk of the ground surface is occupied by rock and erosion pavement. Apart from shrub crowns, there is very little herbaceous cover (Table - Basic 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 classified as stable in 2001 and 2011, but slight in 2006.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was little change in the density of black sagebrush. Decadence and poor vigor remain high within the population.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of black sagebrush decreased from 66% to 26%, and poor vigor decreased from 28% to 1%. Recruitment of young black sagebrush plants increased slightly from 9% of the population to 12%.
- **1996 to 2001 - slightly up (+1):** Density of black sagebrush increased by 17% from 13,600 plants/acre to 15,960 plants/acre, though cover decreased slightly from 25% to 21%. Decadence remained similar at 22%, and poor vigor increased slightly to 7%. Recruitment of young plants remained similar at 10% of the population.

- **2001 to 2006 - down (-2):** Black sagebrush density decreased by 20% to 12,700 plants/acre, but cover remained similar at 22%. Decadence increased slightly to 31%, and poor vigor increased to 21%. Recruitment of young plants decreased to 5% of the population, which is considered to be poor.
- **2006 to 2011 - stable (0):** There was no notable change in the density of black sagebrush at 12,640 plants/acre, but cover decreased slightly to 20%. Decadence decreased slightly to 25%, and poor vigor decreased slightly to 16%. Recruitment of young plants increased to 15% of the population.

Grass:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 41%, but grasses were already rare on the site.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial grasses increased two-fold due to a significant increase in the nested frequency of bottlebrush squirreltail and Sandberg bluegrass.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover decreased from 2% to 1%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses and cover remained similar to the previous trend, but cheatgrass increased significantly in nested frequency. Cover of cheatgrass increased from less than 1% to 5%. Moreover, cheatgrass was the dominant species in both frequency and cover.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses decreased by 11%, but cover increased to 2%. Cheatgrass decreased significantly in nested frequency, and cover decreased to less than 1%.

Forb:

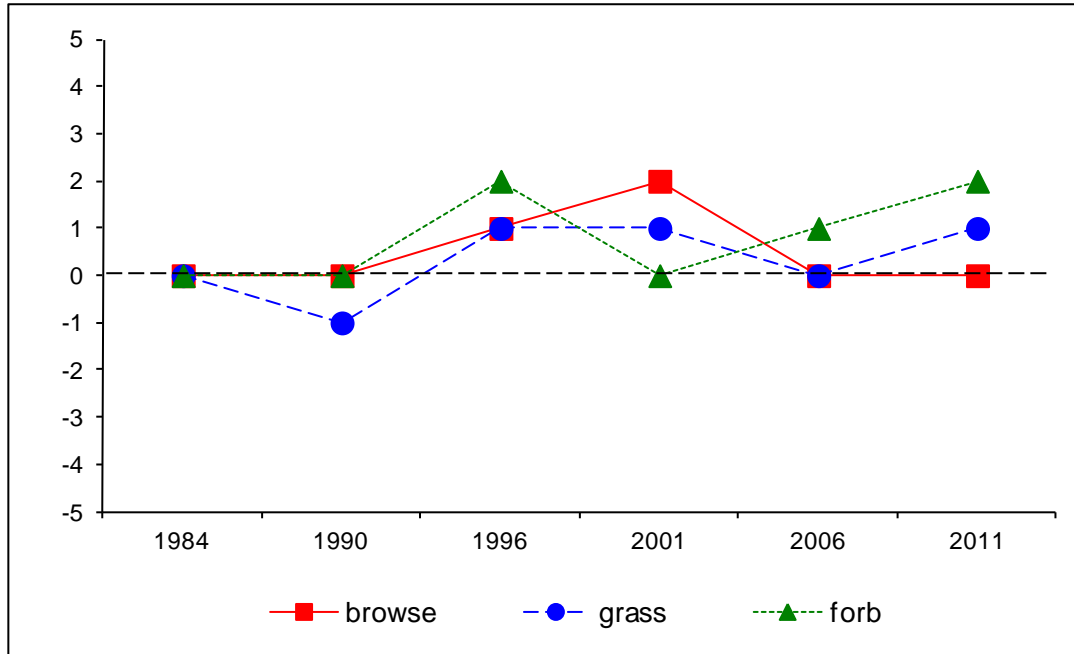
- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased by 50%.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 55%, and cover decreased from 2% to less than 1%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 20%, and cover increased to 2%.
- **2006 to 2011 - slightly up (+1):** There was a 30% increase in the sum of nested frequency of perennial forbs, but cover remained similar at 2%. The sum of nested frequency of annual forbs also increased substantially, and cover increased from near 0% to 3%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 1, study no: 10

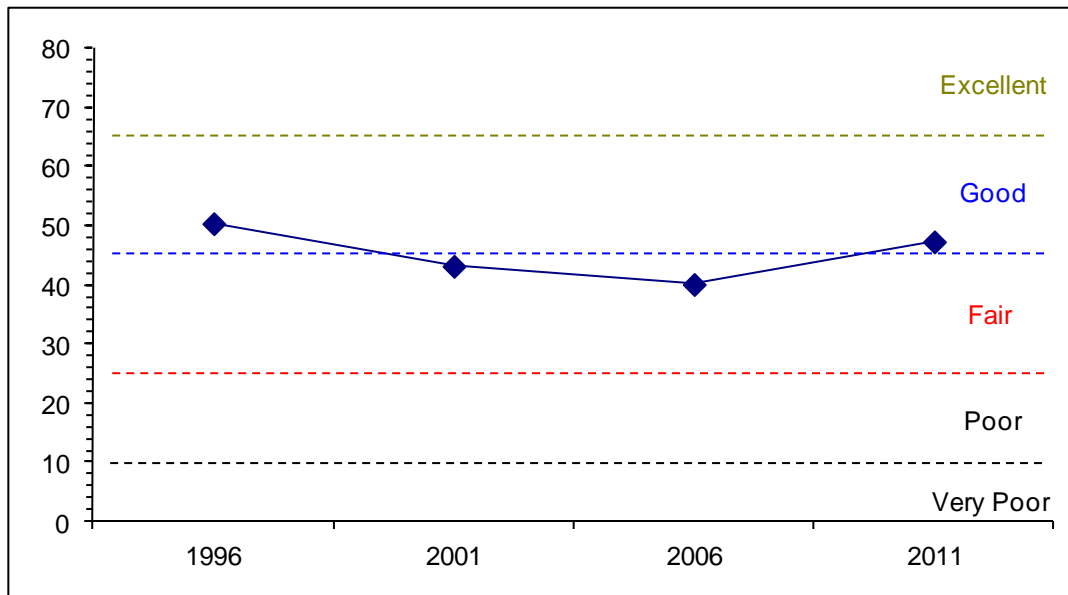
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	7.6	6.2	3.3	-0.2	3.5	0.0	50.4	Good
01	26.8	8.4	5.1	1.9	-0.4	1.3	0.0	43.2	Fair-Good
06	29.0	6.3	2.6	2.5	-3.5	3.1	0.0	40.1	Fair
11	25.4	7.5	7.6	3.8	-0.2	3.2	0.0	47.3	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 10



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 10



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Bromus tectorum (a)	-	-	a53	a53	b256	a74	.20	.52	4.60	.28
G	Oryzopsis hymenoides	a2	a-	a5	a-	b23	a7	.31	-	.16	.21
G	Poa secunda	b10	a-	b22	b22	b19	c42	.30	.11	.12	.35
G	Sitanion hystrix	abc73	a50	bc89	c97	abc80	ab60	1.02	.86	.98	1.36
G	Vulpia octoflora (a)	-	-	-	4	9	-	-	.01	.01	-
Total for Annual Grasses		0	0	53	57	265	74	0.20	0.53	4.62	0.28
Total for Perennial Grasses		85	50	116	119	122	109	1.63	0.97	1.26	1.92
Total for Grasses		85	50	169	176	387	183	1.83	1.50	5.89	2.21
F	Allium sp.	a8	a-	a-	a-	a-	b12	-	-	-	.07
F	Arabis drummondii	b12	a-	a-	a1	a-	a-	-	.01	-	-
F	Astragalus beckwithii	a7	a1	b29	a-	a12	a13	.42	-	.12	.19
F	Astragalus utahensis	a-	a-	a-	a-	a5	b8	-	-	.04	.10
F	Collinsia parviflora (a)	-	-	a-	a-	a-	b28	-	-	-	.08
F	Cruciferae	a-	a-	b11	a-	a-	a-	.03	-	-	-
F	Cryptantha sp.	a-	a-	b20	a-	b8	b16	.05	-	.02	.03
F	Descurainia pinnata (a)	-	-	a-	a-	b14	b29	-	-	.03	.12
F	Eriogonum ovalifolium	a-	a-	a-	a-	a2	b9	-	-	.00	.05
F	Gilia sp. (a)	-	-	a9	a-	a7	b202	.03	-	.02	2.82
F	Lappula occidentalis (a)	-	-	a11	a-	a11	b80	.04	-	.03	.23
F	Navarretia intertexta (a)	-	-	ab19	a-	b23	a6	.04	-	.06	.03
F	Phlox hoodii	a51	b87	ab61	a46	a48	a48	.65	.38	1.06	.85
F	Phlox longifolia	bc80	ab57	c94	abc51	a43	ab47	.58	.25	.30	.27
F	Townsendia sp.	-	-	3	-	-	-	.03	-	-	-
Total for Annual Forbs		0	0	39	0	55	345	0.11	0	0.15	3.30
Total for Perennial Forbs		158	145	218	98	118	153	1.77	0.64	1.56	1.58
Total for Forbs		158	145	257	98	173	498	1.88	0.64	1.71	4.88

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	'11	'96	'01	'06	'11
B	Artemisia nova	100	100	100	100	24.95	21.25	21.95	19.63
B	Artemisia tridentata wyomingensis	3	1	0	3	.03	-	-	.03
B	Atriplex confertifolia	18	10	16	14	1.43	.22	1.51	.85
B	Ceratoides lanata	0	4	0	2	-	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	76	79	84	88	5.37	3.79	5.50	6.59
B	Ephedra nevadensis	2	1	1	1	.03	-	.03	.00
B	Grayia spinosa	3	3	2	2	.30	-	.15	.15
B	Juniperus osteosperma	1	1	1	1	.15	.03	.15	.15
B	Kochia americana	2	1	4	1	-	-	.00	-
B	Opuntia sp.	7	2	2	1	.00	-	.03	-
Total for Browse		212	202	210	213	32.27	25.30	29.33	27.42

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 10

Species	Percent Cover	
	'06	'11
Artemisia nova	25.88	17.10
Artemisia tridentata wyomingensis	-	.31
Atriplex confertifolia	.70	.45
Chrysothamnus viscidiflorus stenophyllus	4.83	5.01
Grayia spinosa	.28	.45
Kochia americana	.15	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 10

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	0.8	1.0	0.6
Atriplex confertifolia	-	2.8	0.9

BASIC COVER--

Management unit 01, Study no: 10

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	0	5.50	36.16	30.06	33.62	34.40
Rock	11.00	6.75	11.82	4.40	5.07	4.84
Pavement	40.00	55.25	28.72	36.97	38.77	35.39
Litter	21.50	13.75	19.58	11.14	19.35	17.01
Cryptogams	1.50	1.50	1.84	.89	.98	1.10
Bare Ground	26.00	17.25	9.20	22.91	15.21	15.12

SOIL ANALYSIS DATA --

Management unit 01, Study no: 10, Study Name: Kilgore Basin

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.4	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	2	1	12	9	-	-	-
Elk	1	2	-	1	-	-	-
Deer	17	13	13	5	21 (51)	11 (26)	10 (25)
Cattle	1	2	6	3	5 (13)	14 (34)	8 (20)
Horse	-	-	-	-	-	-	1 (1)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 10

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia nova									
84	15931	6	47	47	1799	0	93	32	12/21
90	16199	9	24	66	933	30	36	28	9/17
96	13600	12	61	26	560	54	12	1	8/20
01	15960	10	68	22	40	22	.25	7	9/20
06	12700	5	64	31	117660	6	.15	21	8/18
11	12640	15	60	25	300	22	0	16	8/19
Artemisia spinescens									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	8/20
Artemisia tridentata wyomingensis									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	80	0	25	75	-	0	75	0	19/23
01	20	0	100	0	-	0	0	0	26/45
06	0	0	0	0	-	0	0	0	18/43
11	60	33	67	0	-	67	0	0	16/29

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Atriplex confertifolia</i>										
84	1398	5	24	71	-	67	14	19	12/12	
90	1398	10	29	62	-	0	10	24	7/10	
96	740	19	78	3	40	43	8	0	10/14	
01	360	33	61	6	40	0	6	6	8/11	
06	560	7	93	0	20	4	0	0	9/14	
11	500	8	64	28	-	0	0	24	7/14	
<i>Ceratoides lanata</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	120	33	67	-	20	0	0	0	3/3	
06	0	0	0	-	-	0	0	0	6/8	
11	80	25	75	-	-	75	0	0	3/5	
<i>Chrysothamnus viscidiflorus stenophyllus</i>										
84	3198	2	50	48	-	58	10	15	6/7	
90	3398	20	76	4	-	20	0	0	7/11	
96	4620	2	97	1	500	3	0	0	9/15	
01	4060	4	84	12	20	0	0	2	9/14	
06	4140	1	93	6	18020	0	0	.96	10/16	
11	5900	27	65	8	160	8	0	3	11/16	
<i>Ephedra nevadensis</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	60	0	67	33	-	33	67	0	9/13	
01	20	0	100	0	-	0	0	0	7/15	
06	60	100	0	0	-	0	100	0	12/16	
11	20	0	100	0	-	0	100	0	12/24	
<i>Grayia spinosa</i>										
84	66	0	100	0	-	0	100	100	16/4	
90	0	0	0	0	-	0	0	0	-/-	
96	100	0	40	60	-	100	0	60	15/33	
01	80	0	75	25	-	0	0	0	11/10	
06	60	0	100	0	-	0	0	0	14/26	
11	60	0	67	33	-	0	0	33	15/23	
<i>Juniperus osteosperma</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	100	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	100	0	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	100	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Kochia americana</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	0	100	-	-	0	0	0	2/4	
01	40	0	100	-	-	0	0	0	2/7	
06	140	14	86	-	-	29	71	0	5/6	
11	20	0	100	-	-	0	0	0	7/9	
<i>Opuntia sp.</i>										
84	66	0	100	0	-	0	0	0	4/4	
90	132	50	50	0	-	0	0	0	3/4	
96	140	29	57	14	-	0	0	0	4/8	
01	40	100	0	0	-	0	0	0	-/-	
06	40	50	50	0	-	0	0	0	5/7	
11	20	0	100	0	20	0	0	0	4/8	
<i>Sarcobatus vermiculatus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	21/38	
06	0	0	0	-	-	0	0	0	39/54	
11	0	0	0	-	-	0	0	0	34/57	

KIMBER RANCH - TREND STUDY NO. 1-11-11

Vegetation Type: Black Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Upland Shallow Loam \(Utah Juniper\), R025XY324UT](#)

Land Ownership: BLM

Elevation: 5,300 ft. (1,615 m)

Aspect: South

Slope: 20-25%

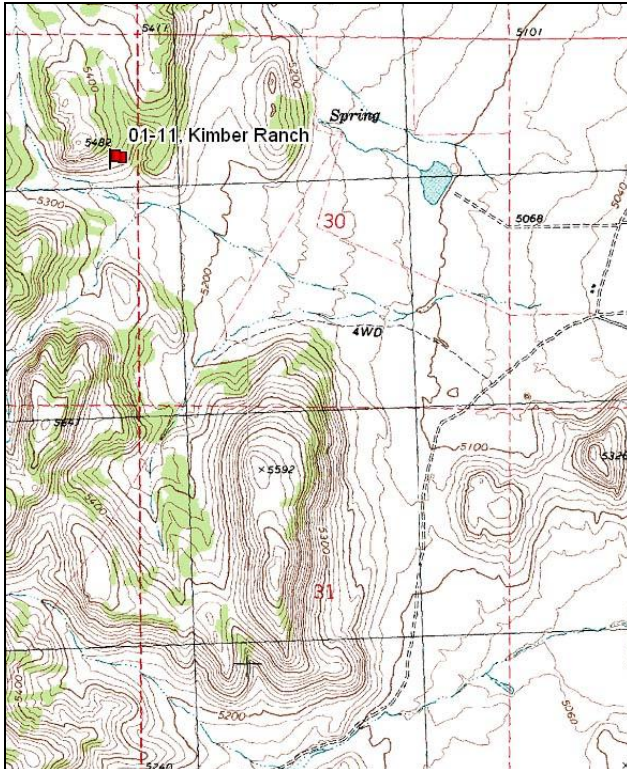
Transect bearing: 165° magnetic

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

Directions:

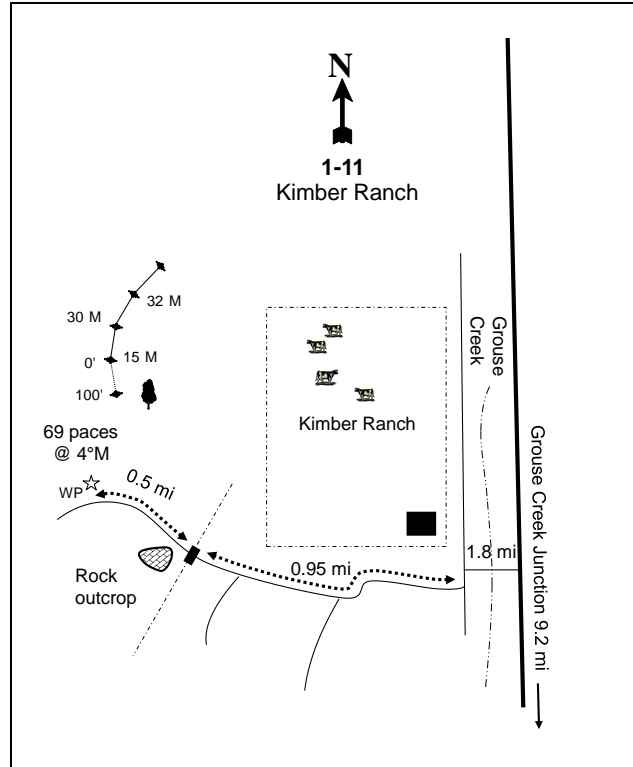
Proceed on U-30 to Grouse Creek junction, turn right and travel north 9.2 miles. Turn left at the ranch complex and proceed 1.8 miles to the Kimber Ranch. At the ranch house stay left for 0.05 miles. Stay left for another 0.25 miles, then turn right going west for 0.6 miles. Turn right for 0.1 miles 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



Township: 10N Range: 19W Section: 25

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 252633 E 4605281 N

KIMBER RANCH - TREND STUDY NO. 1-11

Site Information

Site Description: The study samples a hillside dominated by black sagebrush (*Artemisia nova*) southwest of Grouse Creek. The surrounding area is covered with patches of Utah juniper (*Juniperus osteosperma*), which provide important thermal and hiding cover for wildlife. The area is managed by the Bureau of Land Management (BLM) as part of the Dairy Valley allotment. Deer pellet groups have been sampled in moderate to high abundance since 2001. However, sampled elk and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: Browse composition is dominated by a low-growing, evenly spaced stand of black sagebrush. The population was noted as heavily hedged in 1984, but utilization has fluctuated between light to moderate use in the other sample years. The density of black sagebrush has steadily decreased since 1996. Decadence has been mostly moderate in the black sagebrush population. Recruitment of young black sagebrush plants was good at the outset of the study, but has been poor since 2006. Cheatgrass (*Bromus tectorum*) is prevalent on the site and may be inhibiting the recruitment of young plants. Other associated shrubs include Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), shadscale (*Atriplex confertifolia*), and green molley summer cypress (*Kochia americana*). However, none of these species are abundant (Table - Browse Characteristics). Utah juniper trees are scattered over the site in moderate, but stable density (Table - Point-Quarter Tree Data). The majority of the juniper trees (80%) were smaller than eight feet tall in 2011.

Herbaceous Understory: The herbaceous understory is composed mainly of grasses. Cheatgrass dominates the herbaceous component, and has provided over 60% of the grass cover since 1996. Perennial grasses are much less abundant, but include bluebunch wheatgrass (*Agropyron spicatum*), Thurber needlegrass (*Stipa thurberiana*), bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), and Sandberg bluegrass (*Poa secunda*). Forbs are very rare on the site, and provide very limited cover (Table - Herbaceous Trends).

Soil: This soil is part of the Rexmont-Shalper-Rock outcrop complex, which occurs on hills. Parent material consists of residuum or colluvium derived from rhyolite or other extrusive igneous rocks (Soil Survey Staff 2011). Soil texture is a clay loam that has a slightly alkaline soil reaction (pH 7.8) (Table - Soil Analysis Data). Vegetation and litter cover is comprised primarily of dead cheatgrass litter and shrub crowns, with large amounts of rock and pavement cover. Bare ground cover has been low to moderate over the sample years (Table - Basic Cover). The soil erosion condition was classified as slight in both 2001 and 2006, but was stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** Density of black sagebrush decreased by 9% from 5,665 plants/acre to 5,131 plants/acre. Decadence increased from 34% to 69%, and poor vigor increased from 15% to 29%. Recruitment of young black sagebrush plants decreased from 15% to 8% of the population.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of black sagebrush decreased to 17%, and poor vigor decreased to 3%. Recruitment of young black sagebrush plants increased slightly to 11% of the population.
- **1996 to 2001 - slightly down (-1):** Black sagebrush density decreased by 10% from 7,980 plants/acre to 7,200 plants/acre, though cover remained similar at 15%. Decadence increased slightly to 23%, and poor vigor increased to 8%. Recruitment of young black sagebrush plants increased slightly to 16%.

- **2001 to 2006 - slightly down (-1):** The density of black sagebrush decreased by 16% to 6,040 plants/acre, and cover decreased to 13%. Decadence increased to 33%, and poor vigor increased to 16%. Recruitment of young plants decreased to 8% of the population.
- **2006 to 2011 - stable (0):** There was a slight decrease in the density of black sagebrush to 5,500 plants/acre, and cover decreased slightly to 12%. Decadence decreased to 21%, but poor vigor remained similar at 14%. Recruitment decreased to just 4% of the population, and is considered to be poor.

Grass:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses decreased by 22%. Cheatgrass was included in the sample for the first time in 1996, and was a major component.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial grasses decreased by 27%, and cover decreased from 2% to 1%. Cheatgrass increased significantly in nested frequency, and cover increased from 3% to 11%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 4%. Cheatgrass decreased significantly in nested frequency, but cover remained similar at 11%.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover decreased slightly to 3%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 5%.

Forb:

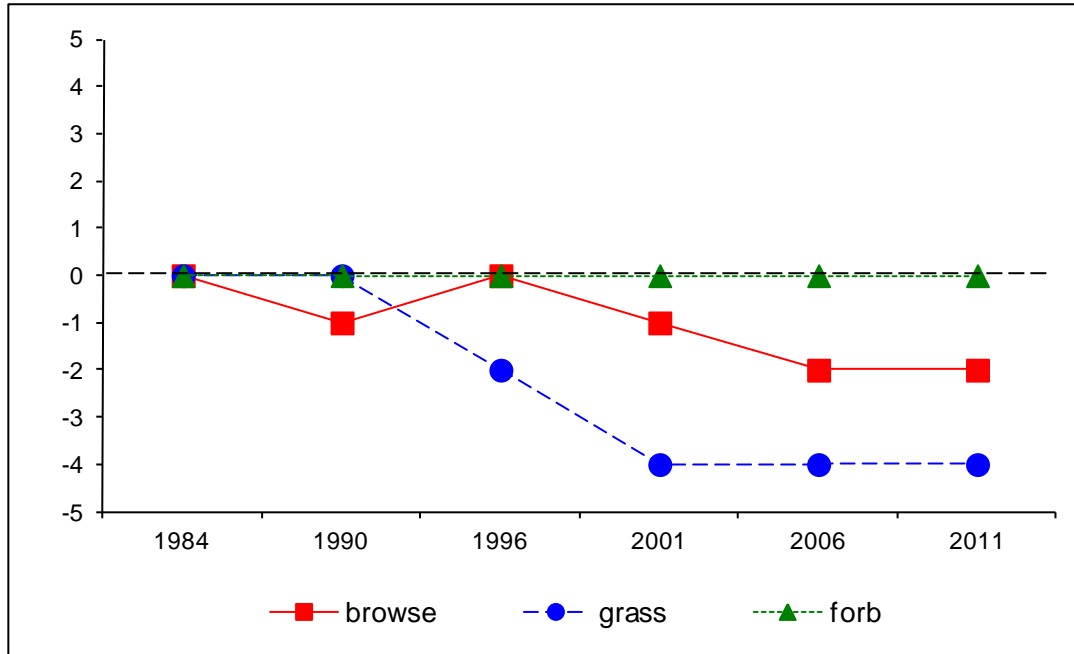
- **1984 to 1990 - stable (0):** Perennial forbs are rare on the site.
- **1990 to 1996 - stable (0):** Perennial forbs are rare on the site.
- **1996 to 2001 - stable (0):** Perennial forbs are rare on the site.
- **2001 to 2006 - stable (0):** Perennial forbs are rare on the site.
- **2006 to 2011 - stable (0):** Perennial forbs are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 1, study no: 11

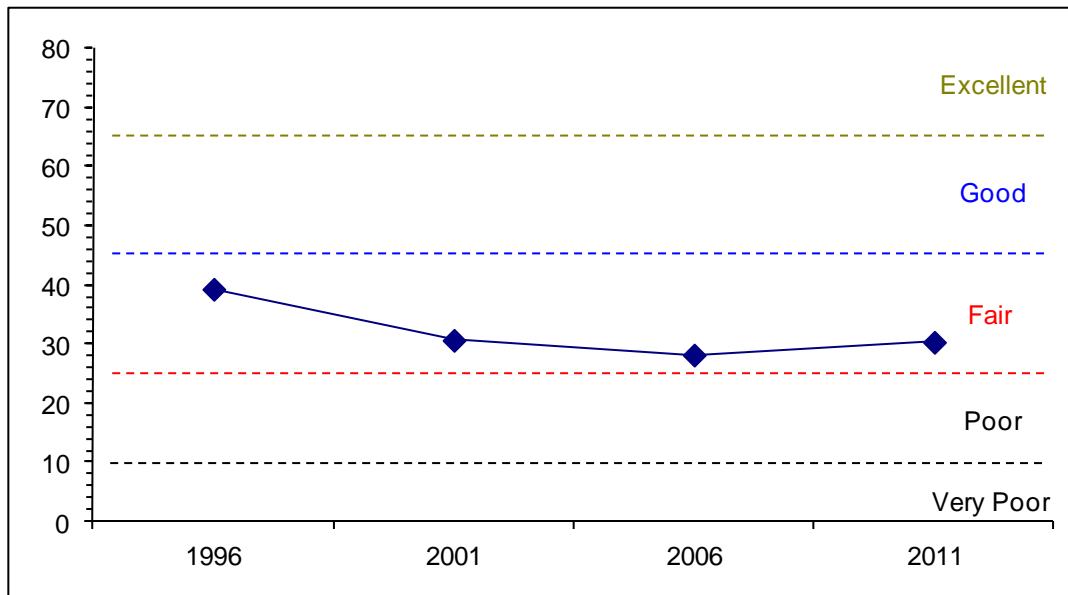
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	20.0	10.3	7.3	3.4	-2.4	0.6	0.0	39.3	Fair
01	20.2	8.0	8.0	2.5	-8.3	0.3	0.0	30.6	Fair
06	18.0	5.8	3.9	8.1	-7.9	0.3	0.0	28.2	Fair
11	17.1	8.9	2.3	5.0	-3.8	0.8	0.0	30.3	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 11



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 11



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron smithii	-	-	-	2	-	-	-	.00	-	-
G	Agropyron spicatum	a-	b9	c62	c61	c50	c73	.73	.74	1.92	1.61
G	Bromus tectorum (a)	-	-	b321	d362	c339	a240	3.11	11.06	10.57	5.00
G	Oryzopsis hymenoides	a4	ab21	b25	a8	b34	b38	.34	.10	1.12	.72
G	Poa secunda	6	8	-	10	-	1	.00	.07	-	.03
G	Sitanion hystrix	d79	cd58	bc43	ab21	abc29	a12	.41	.16	.65	.10
G	Stipa thurberiana	b99	b106	a28	a13	a6	a-	.21	.16	.37	-
G	Vulpia octoflora (a)	-	-	b22	ab21	a-	a3	.04	.06	-	.01
Total for Annual Grasses		0	0	343	383	339	243	3.15	11.13	10.57	5.01
Total for Perennial Grasses		188	202	158	115	119	124	1.70	1.23	4.07	2.48
Total for Grasses		188	202	501	498	458	367	4.86	12.37	14.65	7.49
F	Agoseris glauca	-	-	-	-	-	3	-	-	-	.03
F	Antennaria rosea	-	-	-	2	-	-	-	.03	-	-
F	Astragalus beckwithii	1	-	4	-	-	-	.01	-	-	-
F	Astragalus sp.	-	-	-	-	-	7	-	-	-	.06
F	Astragalus utahensis	ab11	a3	b23	a3	a6	ab11	.14	.03	.06	.03
F	Balsamorhiza hookeri	-	-	-	1	-	1	-	.03	.03	.00
F	Castilleja angustifolia	b28	a-	a6	a-	a1	a1	.02	-	.00	.00
F	Chaenactis douglasii	1	-	-	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	-	-	-	9	-	-	-	.01
F	Crepis acuminata	a-	a-	a-	a1	a1	b7	-	.03	.00	.21
F	Cryptantha sp.	-	-	3	-	2	-	.01	-	.00	-
F	Descurainia pinnata (a)	-	-	a3	b12	a-	c86	.00	.06	-	.52
F	Erigeron aphanactis	4	-	-	1	-	5	-	.00	-	.01
F	Eriogonum caespitosum	5	2	3	-	-	-	.00	-	-	-
F	Eriogonum ovalifolium	-	-	-	-	3	3	-	-	.03	.01
F	Gilia sp. (a)	-	-	a2	b114	a-	b131	.00	.34	-	1.12
F	Hymenopappus sp.	-	-	8	-	-	-	.06	-	-	-
F	Lappula occidentalis (a)	-	-	a-	b9	a-	b7	-	.03	-	.05
F	Lepidium sp. (a)	-	-	-	-	-	3	-	-	-	.00
F	Lygodesmia sp.	-	-	3	-	-	-	.03	-	-	-
F	Navarretia intertexta (a)	-	-	2	-	-	3	.01	-	-	.00
F	Orobancha fasciculata	-	1	6	2	-	-	.01	.00	-	-
F	Phlox longifolia	b13	ab9	ab6	ab14	a3	ab5	.02	.03	.00	.01
F	Streptanthus cordatus	-	1	-	-	-	-	-	-	-	-
F	Unknown forb-perennial	-	1	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	7	135	0	239	0.01	0.43	0	1.73
Total for Perennial Forbs		63	17	62	24	16	43	0.31	0.16	0.15	0.38
Total for Forbs		63	17	69	159	16	282	0.34	0.59	0.15	2.11

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	'11	'96	'01	'06	'11
B	Artemisia nova	98	93	96	91	14.88	15.18	13.32	11.68
B	Artemisia tridentata wyomingensis	0	3	4	14	-	.53	.71	1.64
B	Atriplex confertifolia	15	10	7	5	1.27	.48	.21	.48
B	Chrysothamnus viscidiflorus stenophyllus	16	20	18	20	.42	.46	.64	.71
B	Gutierrezia sarothrae	8	6	1	1	.00	-	-	.00
B	Juniperus osteosperma	2	3	3	3	1.62	1.63	1.63	2.26
B	Kochia americana	9	9	6	2	.07	.07	.15	.00
B	Opuntia sp.	0	1	0	0	.00	-	-	-
Total for Browse		148	145	135	136	18.29	18.36	16.68	16.80

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 11

Species	Percent Cover		
	'01	'06	'11
Artemisia nova	-	14.61	11.43
Artemisia tridentata wyomingensis	-	.61	2.81
Atriplex confertifolia	-	.58	.48
Chrysothamnus viscidiflorus stenophyllus	-	1.45	1.20
Juniperus osteosperma	2.20	1.66	3.65

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 11

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	0.7	0.9	1.2
Artemisia tridentata wyomingensis	-	1.1	1.9

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 11

Species	Trees per Acre			
	'96	'01	'06	'11
Juniperus osteosperma	56	60	54	60

Average diameter (in)			
'96	'01	'06	'11
4.0	5.0	6.5	5.2

BASIC COVER--

Management unit 01, Study no: 11

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.75	9.00	25.21	31.16	31.70	28.75
Rock	19.50	26.50	17.69	19.26	17.98	20.47
Pavement	40.50	43.50	37.90	35.37	21.46	30.79
Litter	35.75	17.75	12.99	16.33	19.96	15.25
Cryptogams	0	0	.08	.01	.42	1.12
Bare Ground	2.50	3.25	6.77	10.06	22.68	16.62

SOIL ANALYSIS DATA --

Management unit 01, Study no: 11, Study Name: Kimber Ranch

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	6	-	15	8	-	-	-
Horse	1	-	-	-	-	-	-
Elk	-	-	2	-	-	-	7 (17)
Deer	17	15	22	21	27 (66)	36 (89)	48 (117)
Cattle	-	7	1	4	4 (11)	2 (4)	12 (29)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 11

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia nova									
84	5665	15	51	34	-	8	88	15	7/17
90	5131	8	23	69	-	21	0	29	9/15
96	7980	11	72	17	340	56	2	3	12/24
01	7200	16	62	23	-	3	2	8	9/20
06	6040	8	59	33	1760	10	4	16	10/23
11	5500	4	75	21	-	40	1	14	8/21
Artemisia tridentata wyomingensis									
84	1531	52	30	17	-	22	52	9	17/21
90	398	17	33	50	-	0	0	17	11/14
96	0	0	0	0	-	0	0	0	-/-
01	60	0	67	33	-	0	0	33	24/23
06	100	0	100	0	-	40	0	0	18/29
11	340	6	82	12	-	47	6	6	15/33

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Atriplex confertifolia</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	880	57	43	0	120	16	0	0	9/17	
01	380	32	37	32	-	0	0	21	14/26	
06	380	11	84	5	-	0	0	5	14/23	
11	140	14	57	29	20	29	0	29	12/22	
<i>Chrysothamnus nauseosus hololeucus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	26/51	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	17/27	
<i>Chrysothamnus viscidiflorus stenophyllus</i>										
84	1465	5	73	23	-	36	0	5	11/15	
90	998	0	80	20	-	0	0	20	11/16	
96	420	0	100	0	40	0	0	0	11/20	
01	520	12	77	12	-	0	0	4	8/16	
06	480	8	92	0	-	4	0	0	10/15	
11	580	0	97	3	-	3	0	0	9/19	
<i>Grayia spinosa</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	29/42	
11	0	0	0	-	-	0	0	0	17/30	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	360	6	94	0	20	0	0	0	7/9	
01	160	0	50	50	-	0	0	38	4/5	
06	20	100	0	0	-	0	0	0	-/-	
11	20	0	100	0	-	0	0	0	-/-	
<i>Juniperus osteosperma</i>										
84	66	100	0	-	-	0	0	0	-/-	
90	66	0	100	-	-	0	0	0	65/55	
96	40	0	100	-	-	0	0	0	-/-	
01	60	33	67	-	-	0	0	0	-/-	
06	60	67	33	-	-	0	0	0	-/-	
11	60	0	100	-	-	33	0	0	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Kochia americana</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	460	30	65	4	20	4	0	0	4/6	
01	340	47	53	0	-	0	0	0	4/4	
06	140	14	86	0	-	0	0	0	5/5	
11	40	50	50	0	-	0	0	0	2/4	
<i>Opuntia sp.</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	66	100	0	-	-	0	0	100	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	4/2	
11	0	0	0	-	-	0	0	0	-/-	

RED BUTTE ENCLOSURE - TREND STUDY NO. 1-12-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Upland Loam \(Browse\), R025XY312UT](#)

Land Ownership: BLM

Elevation: 6,590 ft. (2,009 m)

Aspect: West

Slope: 10%

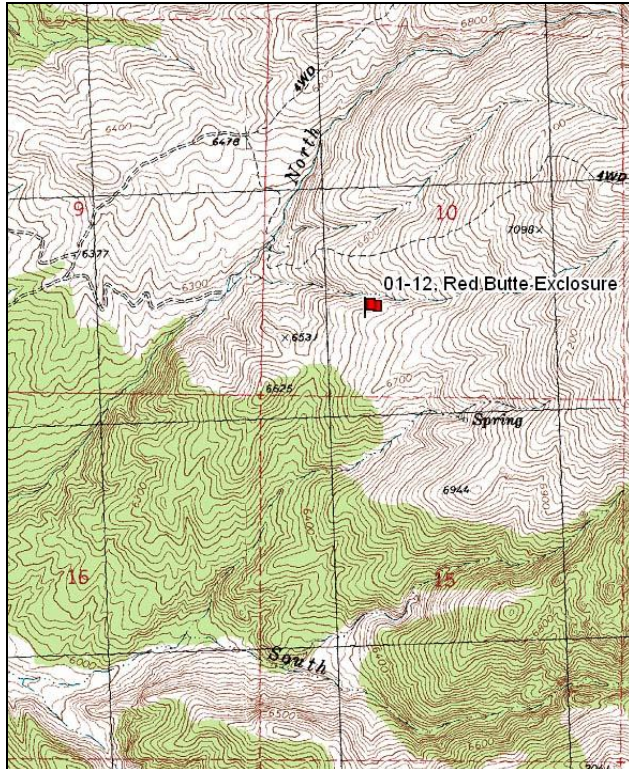
Transect bearing: 165° magnetic

Belt placement: line 1 (11 & 95 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 8ft.

Directions:

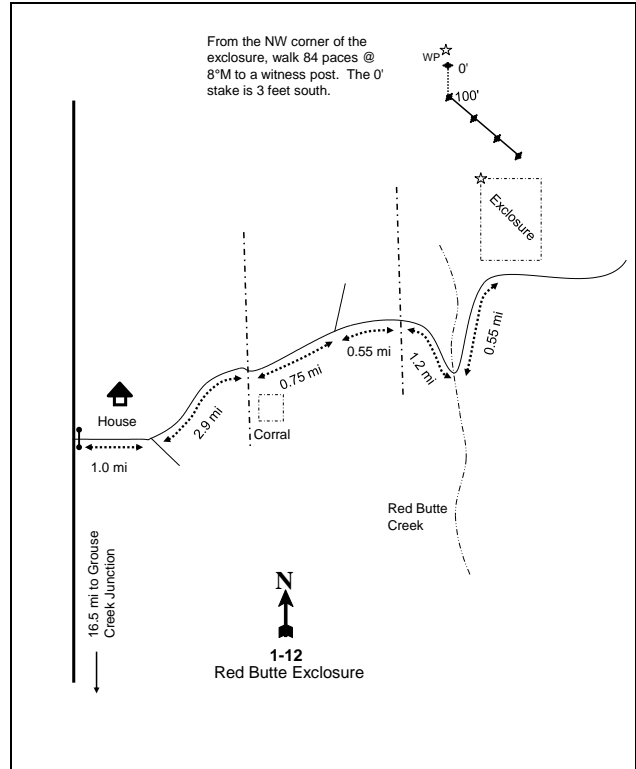
A four-wheel drive vehicle is needed to access this study. Proceed about 16.5 miles north from Grouse Creek Junction and turn right onto Ingham Canyon Road. Travel 1.0 miles to the first significant fork and turn left. Proceed 2.9 miles to a fence with a corral on the east side. Continue east and north 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 enclosure. From the northwest corner of the enclosure, walk 84 paces at 8 degrees magnetic to the 0-foot stake of the baseline, this is marked by browse-tag #7915. Bearing of the baseline is 165 degrees magnetic and turns to 91 degrees magnetic after the 100 foot stake.

Map Name: Ingham Canyon



Township: 11N Range: 17W Section: 10

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 268107 E 4618627 N

RED BUTTE EXCLOSURE - TREND STUDY NO. 1-12

Site Information

Site Description: This study is located on the west slope of the Grouse Creek Mountains, adjacent to the Red Butte enclosure. 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 (*Artemisia tridentata* ssp. *tridentata*) and grass, with a mixture of mountain brush. The area is managed by the Bureau of Land Management (BLM) as part of the Ingham Allotment. Deer pellet groups have been sampled in moderate abundance since 2001. The abundance of sampled cattle sign was low in 2001 and 2011, with more moderate abundance sampled in 2006 (Table - Pellet Group Data). Cattle were in the area in 1984 and 2006. Some sage-grouse and moose pellet groups have been seen on the site, but neither have been sampled within the pellet group transect.

Browse: Shrubs are abundant and provide the majority of the vegetation cover on the site. The key browse species are basin big sagebrush and antelope bitterbrush (*Purshia tridentata*), which combined provide the majority of browse cover (Table - Browse Trends). Big sagebrush appears to be a hybrid of both basin big sagebrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but was all classified as basin big sagebrush for the purpose of this study. The sagebrush population is a moderately dense stand of lightly used plants. Decadence and poor vigor of sagebrush were high at the outset of the study, but have been more moderate since 1996. Recruitment of young sagebrush plants has fluctuated over the sample years, but has been good the majority of the time. The antelope bitterbrush population is less dense than sagebrush, but has displayed mostly moderate to heavy use. Recruitment of young bitterbrush plants has been poor over the course of the study. Decadence of bitterbrush was moderately high at the outset of the study, but has been mostly good since 1996. Vigor of bitterbrush has been mostly good. Poor vigor was high in 2011 because most plants were still dormant at the time of sampling due to the late, cold, and wet spring. A few Utah serviceberry (*Amelanchier utahensis*) plants are also scattered across the site. Mountain snowberry (*Symphoricarpos oreophilus*) is not considered to be a preferred browse species, but is as abundant as sagebrush and bitterbrush in the area. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is also prevalent on the site (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses comprise an important part of the herbaceous understory. Thickspike wheatgrass (*Agropyron dasystachyum*) and Sandberg bluegrass (*Poa secunda*) provide nearly all of the perennial grass cover. Other perennial grass species occur much less frequently. The annual species cheatgrass (*Bromus tectorum*) is abundant, and dominated the herbaceous component early in the study. However, cheatgrass has steadily decreased in frequency and cover since 1996. 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 (*Balsamorhiza sagittata*), narrowleaf lomatium (*Lomatium triternatum*), tapertip hawksbeard (*Crepis acuminata*), and penstemon (*Penstemon* sp.) (Table - Herbaceous Trends).

Soil: The soil is part of the Bullump series, which occurs on valley sides and hills. The parent material consists of colluviums and alluvium derived from quartzite and mica schist (Soil Survey Staff 2011). The soil has a sandy loam texture with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). Although numerous areas of bare ground are exposed, bare ground cover is moderately low. The thickness and permanence of vegetation and litter cover on the remaining area has prevented serious soil loss. There is also a moderate amount of surface rock and pavement cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2011, but was slight in 2006 due to pedestalling, small rills, and flow patterns.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was little change in either the sagebrush or bitterbrush density. Decadence of sagebrush remained high at 53%, but decadence of bitterbrush decreased from 50% to 25%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 24%, and decadence of bitterbrush decreased to 5%. Recruitment of young sagebrush plants increased from 11% to 15%.
- **1996 to 2001 - stable (0):** The density of sagebrush decreased slightly from 1,440 plants/acre to 1,320 plants/acre, and cover decreased from 10% to 8%. Decadence increased slightly to 35%, and poor vigor increased slightly from 8% to 12%. Recruitment of young sagebrush plants decreased to 5%. Density of bitterbrush remained similar at 720 plants/acre, but cover increased from 7% to 11%. Decadence of bitterbrush increased to 31%, but poor vigor remained low.
- **2001 to 2006 - stable (0):** Sagebrush density remained similar at 1,400 plants/acre, and cover remained similar at 8%. Decadence decreased slightly to 29%, and poor vigor remained similar at 14%. Recruitment of young sagebrush plants increased slightly to 9%. Bitterbrush density increased by 19% to 860 plants/acre, but cover decreased slightly to 10%. Decadence of bitterbrush decreased to 0%.
- **2006 to 2011 - slightly up (+1):** Density of sagebrush increased by 24% to 1,740 plants/acre, but cover decreased slightly to 7%. Most of the increase in density was due to an increase in the recruitment of young plants to 24% of the population. Decadence of sagebrush decreased to 15%, but poor vigor remained similar at 15%. Bitterbrush decreased in density 21% to 680 plants/acre, and cover decreased to 4%. Bitterbrush plants displaying poor vigor increased to 56% of the population because most plants were still dormant at the time of sampling due to the late, cold, and wet spring. Stickyleaf low rabbitbrush has steadily decreased in density over the course of the study, from 3,640 plants/acre in 1996 to 1,380 plants/acre. Cover also decreased from 6% in previous years to just over 2%.

Grass:

- **1984 to 1990 - up (+2):** The perennial grass sum of nested frequency increased 43%.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses decreased 23%. Cheatgrass was included in the sample for the first time, and was the dominant grass species.
- **1996 to 2001 - stable (0):** There was a 13% decrease in the sum of nested frequency of perennial grasses, but cheatgrass also decreased significantly in nested frequency. Cover of perennial grasses remained similar, but cheatgrass cover decreased from 15% to 11%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency and cover of perennial grasses remained similar, but cheatgrass decreased significantly in nested frequency. Cover of cheatgrass decreased to 4%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses changed little, but cover increased from 5% to 8%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

Forb:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial forbs decreased by 33%.
- **1996 to 2001 - stable (0):** The sum of nested frequency of perennial forbs remained similar, though cover increased slightly from 7% to 9%.

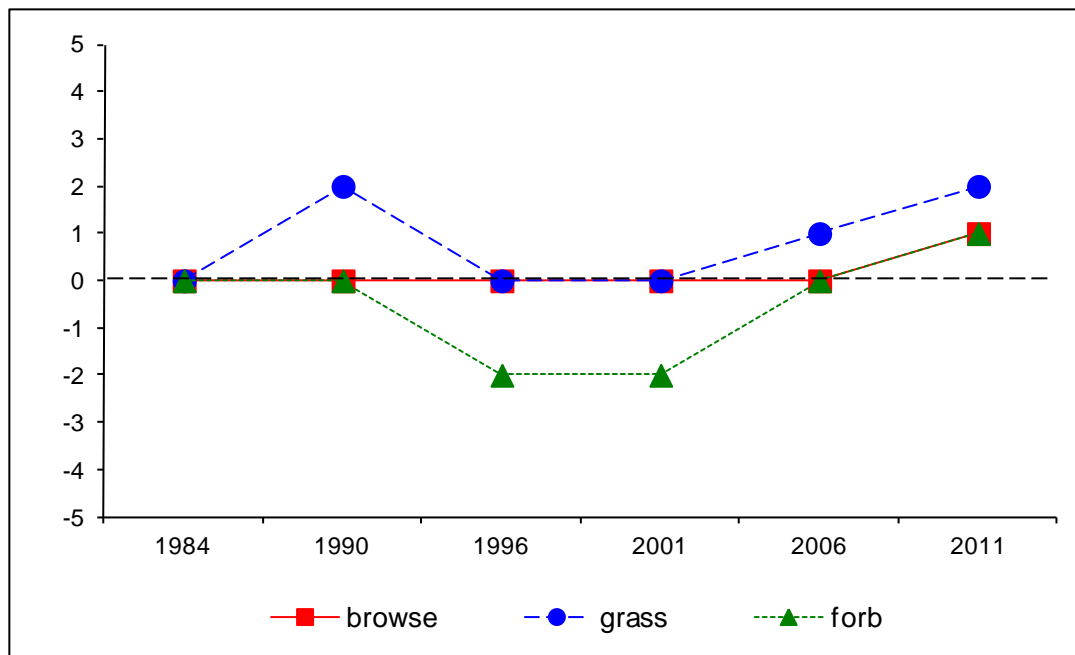
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased by 48%, and cover increased to 14%.
- **2006 to 2011 - slightly up (+1):** There was a 19% increase in the sum of nested frequency of perennial forbs, though cover decreased slightly to 9%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 1, study no: 12

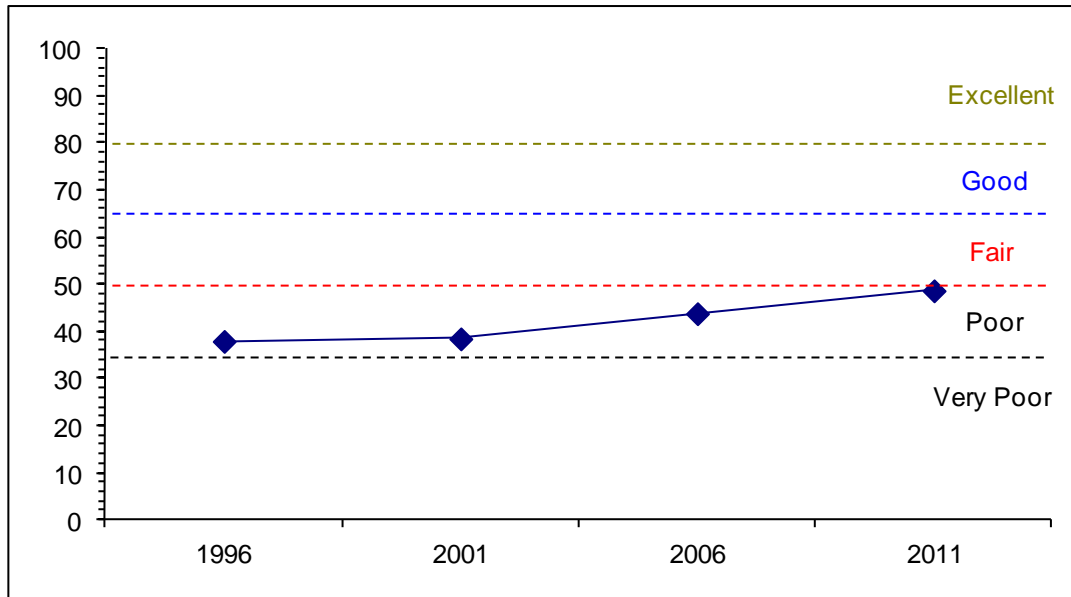
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	22.6	9.9	5.9	10.9	-11.5	0.0	0.0	37.9	Poor
01	26.9	5.3	3.3	11.1	-8.1	0.0	0.0	38.4	Poor
06	23.9	11.2	2.0	9.6	-2.9	0.0	0.0	43.8	Poor
11	15.0	11.6	7.8	16.3	-2.0	0.0	0.0	48.6	Poor-Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 12



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 12



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	cd237	d267	bc185	ab176	ab150	a131	2.44	3.51	1.66	2.61
G	Agropyron spicatum	a-	a-	b21	a-	a4	a5	.56	-	.06	.15
G	Bromus anomalus	-	-	-	3	-	-	-	.03	-	-
G	Bromus tectorum (a)	-	-	d320	c273	b224	a100	15.28	10.79	3.85	2.67
G	Koeleria cristata	2	-	5	-	2	-	.18	-	.04	-
G	Oryzopsis hymenoides	-	-	8	4	-	-	.04	.03	-	-
G	Poa fendleriana	a7	b102	a-	a-	a1	a5	-	-	.03	.06
G	Poa secunda	a47	a47	b91	b92	b126	b124	2.19	1.93	2.92	5.25
G	Sitanion hystrix	-	1	13	5	12	12	.04	.03	.07	.04
G	Stipa comata	-	1	-	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	320	273	224	100	15.28	10.79	3.85	2.67
Total for Perennial Grasses		293	418	323	280	295	277	5.47	5.54	4.79	8.13
Total for Grasses		293	418	643	553	519	377	20.75	16.34	8.65	10.80
F	Agoseris glauca	b66	ab43	ab57	a31	c125	ab44	.15	.17	1.56	.33
F	Allium acuminatum	b94	a36	a21	b107	a29	b127	.06	.42	.06	1.08
F	Antennaria rosea	-	8	3	-	3	3	.15	-	.03	.03
F	Arabis sp.	a-	a1	ab10	a-	b17	a-	.02	-	.12	-
F	Artemisia ludoviciana	-	-	-	-	-	2	-	-	-	.00
F	Astragalus beckwithii	13	-	5	8	6	18	.03	.21	.03	.35
F	Astragalus cibarius	ab16	b26	ab25	a7	ab17	a-	.18	.07	.31	-
F	Astragalus convallarius	-	2	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	60	60	56	45	42	45	5.59	6.66	8.22	2.74
F	Camelina microcarpa (a)	-	-	1	3	3	-	.00	.00	.00	-

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Chaenactis douglasii</i>	-	-	-	-	-	3	-	-	-	.30
F	<i>Chenopodium fremontii</i> (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	a217	a230	a223	b304	1.45	5.28	.90	10.89
F	<i>Collomia linearis</i> (a)	-	-	ab15	ab19	b32	a2	.04	.04	.14	.03
F	<i>Comandra pallida</i>	2	7	1	7	2	-	.00	.18	.00	-
F	<i>Cordylanthus ramosus</i> (a)	-	-	-	3	-	-	-	.15	-	-
F	<i>Crepis acuminata</i>	b56	b70	a9	a17	a16	a34	.02	.48	.55	.68
F	<i>Cryptantha</i> sp.	a-	a-	b27	a-	b49	a2	.08	-	.12	.03
F	<i>Cryptantha</i> sp.(a)	-	-	a-	a-	a-	b33	-	-	-	1.20
F	<i>Cymopterus</i> sp.	-	-	-	-	-	2	-	-	-	.03
F	<i>Delphinium nuttallianum</i>	b22	b18	a-	b21	b17	c54	-	.06	.04	.58
F	<i>Descurainia pinnata</i> (a)	-	-	-	2	-	6	-	.00	-	.01
F	<i>Eriogonum umbellatum</i>	-	6	6	4	3	3	.18	.03	.15	.01
F	<i>Gayophytum ramosissimum</i> (a)	-	-	1	12	8	1	.00	.04	.02	.00
F	<i>Gilia</i> sp. (a)	-	-	-	-	7	-	-	.00	.01	-
F	<i>Hackelia patens</i>	ab11	ab13	ab16	a1	b19	ab6	.14	.03	.62	.33
F	<i>Haplopappus acaulis</i>	-	-	7	-	2	7	.03	-	.03	.06
F	<i>Holosteum umbellatum</i> (a)	-	-	3	-	-	-	.00	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	-	2	3	-	-	.00	.00	-
F	<i>Lithophragma parviflora</i>	a-	a-	a-	a-	a11	b87	-	-	.05	.93
F	<i>Lithospermum ruderales</i>	-	-	-	3	-	-	-	.01	-	-
F	<i>Lomatium triternatum</i>	ab21	ab24	a3	ab24	ab23	b27	.01	.22	.32	.14
F	<i>Lupinus argenteus</i>	-	-	-	1	-	3	-	.03	-	.00
F	<i>Machaeranthera</i> spp	-	-	4	-	-	-	.01	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	c92	b61	a10	-	.72	.13	.07
F	<i>Nemophila breviflora</i> (a)	-	-	-	-	3	-	-	-	.03	-
F	<i>Orogenia linearifolia</i>	-	-	-	-	-	1	-	-	-	.03
F	<i>Phlox longifolia</i>	d154	e217	bc81	ab54	cd122	a40	.56	.46	1.25	.26
F	<i>Polygonum douglasii</i> (a)	-	-	b46	a-	b46	a-	.10	-	.17	-
F	<i>Ranunculus inamoenus</i>	-	-	-	-	-	80	-	-	-	.91
F	<i>Ranunculus testiculatus</i> (a)	-	-	a2	a-	a3	b18	.00	-	.00	.43
F	<i>Sedum lanceolatum</i>	-	-	6	-	1	-	.01	-	.00	-
F	<i>Senecio integerrimus</i>	-	-	-	-	-	6	-	-	-	.06
F	<i>Tragopogon dubius</i> (a)	-	-	-	3	-	-	.00	.03	-	-
F	Unknown forb-perennial	a4	a-	b13	a-	a-	a3	.07	-	-	.01
F	<i>Veronica biloba</i> (a)	-	-	a3	a8	b42	a16	.00	.06	.46	.11
F	<i>Viguiera multiflora</i>	-	-	8	11	-	-	.04	.04	-	-
Total for Annual Forbs		0	0	288	375	431	390	1.63	6.37	1.89	12.76
Total for Perennial Forbs		519	531	358	341	504	597	7.39	9.12	13.50	8.95
Total for Forbs		519	531	646	716	935	987	9.02	15.50	15.40	21.72

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	'11	'96	'01	'06	'11
B	Amelanchier utahensis	3	1	1	1	.30	.00	-	.03
B	Artemisia tridentata tridentata	48	51	51	51	9.52	8.38	7.52	6.68
B	Chrysothamnus nauseosus consimilis	2	1	1	3	.15	-	.15	.18
B	Chrysothamnus viscidiflorus viscidiflorus	76	73	62	45	6.46	6.42	5.61	2.45
B	Eriogonum microthecum	2	2	2	0	.15	.15	-	-
B	Opuntia sp.	49	45	52	36	3.35	2.71	2.36	1.76
B	Purshia tridentata	31	31	31	25	6.71	10.81	9.68	4.39
B	Symphoricarpos oreophilus	53	50	51	46	6.17	8.47	8.93	9.11
Total for Browse		264	254	251	207	32.82	36.95	34.27	24.62

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 12

Species	Percent Cover	
	'06	'11
Artemisia tridentata tridentata	11.23	8.63
Chrysothamnus nauseosus consimilis	-	.38
Chrysothamnus viscidiflorus viscidiflorus	7.50	1.93
Opuntia sp.	1.70	.90
Purshia tridentata	11.16	8.73
Symphoricarpos oreophilus	14.63	9.05

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 12

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata tridentata	2.9	1.5	0.9
Purshia tridentata	0.9	0.6	0.2

BASIC COVER--

Management unit 01, Study no: 12

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.00	11.50	56.69	62.91	51.35	57.49
Rock	1.75	1.00	4.32	3.58	3.66	4.11
Pavement	3.00	2.50	4.30	4.63	8.68	5.50
Litter	59.25	54.25	59.50	47.27	36.26	44.75
Cryptogams	2.50	.75	.34	.25	.76	.59
Bare Ground	30.50	30.00	6.39	10.42	17.04	10.04

SOIL ANALYSIS DATA --

Management unit 01, Study no: 12, Study Name: Red Butte Exclosure

Effective rooting depth (in)	pH	Sandy-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
20.3	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	2	12	1	-	-	-
Elk	-	-	-	1	-	-	-
Deer	6	7	11	5	21 (53)	18 (45)	32 (79)
Cattle	4	4	7	6	2 (4)	31 (75)	7 (16)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 12

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier utahensis									
84	0	0	0	0	-	0	0	0	-/-
90	266	100	0	0	-	0	0	0	-/-
96	60	0	33	67	-	0	33	0	24/26
01	20	0	100	0	-	100	0	0	27/26
06	20	0	100	0	-	0	0	0	32/33
11	20	0	100	0	-	0	0	0	31/32
Artemisia tridentata tridentata									
84	2331	11	29	60	666	43	6	23	33/33
90	2532	11	37	53	-	13	3	3	24/30
96	1440	15	61	24	80	15	0	8	28/35
01	1320	5	61	35	-	2	0	12	28/37
06	1400	9	63	29	2700	11	4	14	32/43
11	1740	24	61	15	40	5	0	15	32/39
Cercocarpus montanus									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	30/52

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus nauseosus consimilis</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	100	0	100	0	-	0	0	0	21/20	
01	40	0	100	0	-	0	0	0	21/30	
06	20	0	0	100	-	0	0	100	26/27	
11	60	0	33	67	-	0	0	100	16/23	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	4065	28	39	33	133	20	0	2	11/10	
90	3931	42	31	27	266	12	7	5	15/17	
96	3640	9	91	0	-	2	0	0	17/27	
01	2940	4	82	14	20	1	0	5	15/19	
06	2240	5	87	8	-	0	0	.89	17/25	
11	1380	6	67	28	-	7	0	39	14/21	
<i>Eriogonum microthecum</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	60	0	100	-	-	33	0	0	10/11	
01	40	0	100	-	-	0	0	0	10/17	
06	40	0	100	-	-	50	0	0	11/16	
11	0	0	0	-	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
84	1599	0	100	0	-	0	0	0	4/3	
90	798	33	42	25	199	8	0	33	4/10	
96	1820	5	91	3	-	0	0	5	5/16	
01	2080	10	86	5	-	0	0	4	4/12	
06	2140	2	94	4	-	0	0	2	5/16	
11	1140	7	86	7	-	0	0	47	3/15	
<i>Purshia tridentata</i>										
84	266	0	50	50	-	25	75	25	11/13	
90	265	0	75	25	-	0	0	0	13/17	
96	780	8	87	5	-	36	3	3	24/47	
01	720	8	61	31	-	53	17	0	30/62	
06	860	0	100	0	480	35	40	0	31/53	
11	680	3	91	6	-	12	53	56	26/47	
<i>Symphoricarpos oreophilus</i>										
84	4465	85	15	0	-	0	0	0	17/46	
90	532	12	88	0	266	25	0	0	10/15	
96	3820	40	59	2	140	2	1	.52	17/38	
01	2820	16	84	1	-	.70	0	.70	19/38	
06	2960	23	74	3	-	0	3	0	19/36	
11	3160	32	67	1	160	2	0	.63	17/32	

RAFT RIVER NARROWS - TREND STUDY NO. 1-13-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: Not Available

Land Ownership: BLM

Elevation: 5,700 ft. (1,737 m)

Aspect: Southwest

Slope: 30-35%

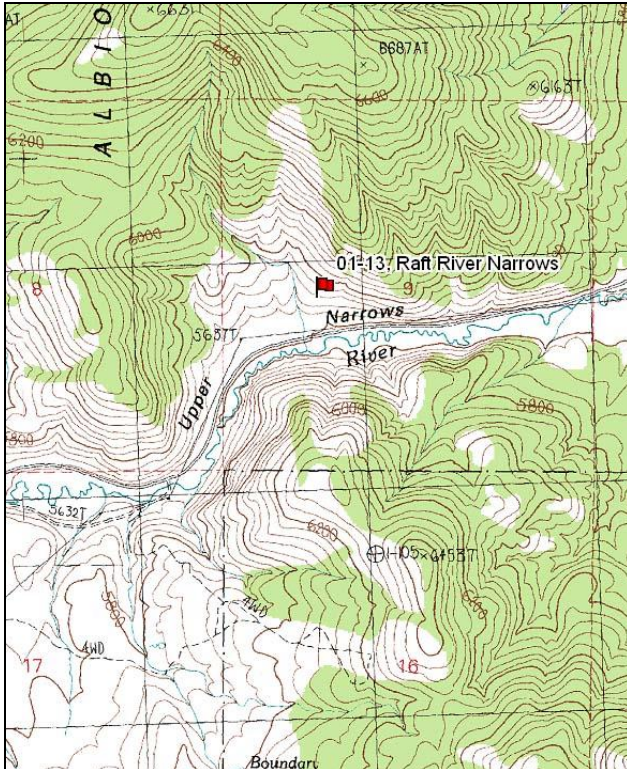
Transect bearing: 160° magnetic

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

Directions:

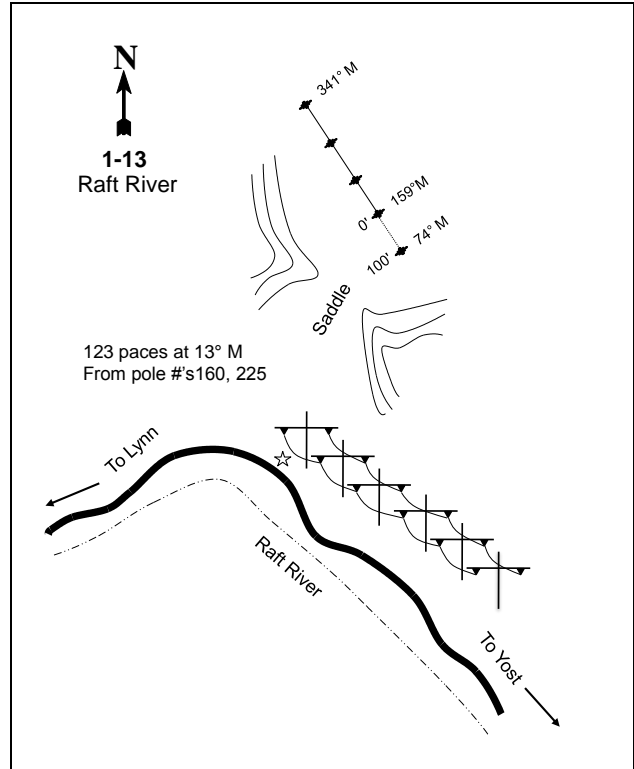
From Lynn proceed to the bridge over the Raft River just before the Upper Narrows. Proceed east 0.95 miles from the bridge to a set of double power poles (#'s 160 and 225). From the northernmost pole, walk 123 paces at 13 degrees magnetic, to the 0-foot stake of the frequency baseline, marked with browse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



Township: 14N Range: 16W Section: 9

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 276739 E 4648042 N

RAFT RIVER NARROWS - TREND STUDY NO. 1-13

Site Information

Site Description: The study is located on important winter range in the Upper Raft River Narrows. 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 were burned. The area is managed by the Bureau of Land Management (BLM) as part of the Junction Creek allotment. Deer pellet groups have been sampled in low to moderate abundance since 2001. Other wildlife presence appears to be minimal. Sampled cattle sign has been low since 2001 (Table - Pellet Group Data). 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.

Browse: Browse composition is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), which has provided over 80% of the browse cover since 2001 (Table - Browse Trends). In the unburned sections of the study, the sagebrush population is dense, with a good amount of recruitment and low decadence. Utilization of sagebrush has been mostly light, with the exception of 1984 when utilization was heavy. Black greasewood (*Sarcobatus vermiculatus*) is found in low density on the study, but in greater numbers at the bottom of the hill. Narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) plants were very numerous early in the study, but density decreased following the wildfire. Other less abundant shrubs include shadscale (*Atriplex confertifolia*), broom snakeweed (*Gutierrezia sarothrae*), and threadleaf rubber rabbitbrush (*C. nauseosus* ssp. *consimilis*) (Table - Browse Characteristics). Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) dominates the flat areas down slope where the soil is significantly deeper.

Herbaceous Understory: The herbaceous understory is depleted. Cheatgrass (*Bromus tectorum*) is the most abundant species, providing the majority of the herbaceous cover. Perennial grasses are not abundant, but include bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread (*Stipa comata*). Perennial forb species are very sparse, and the forb composition is dominated by annual species (Table - Herbaceous Trends).

Soil: The soil is in the Solak-Rock outcrop association, which occurs on mountain slopes. The parent material consists of colluvium and residuum derived from quartzite, limestone, and schist (Soil Survey Staff 2011). Soil texture is a sandy clay loam, and the soil reaction is moderately alkaline (pH 8.2). Phosphorus may have limited availability for plant growth and development at 3.6 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Soils are rocky on the surface and throughout the profile. The soil is easily disturbed on the 30-35% slope. However, vegetation and litter cover, primarily provided by cheatgrass, is high and appears to be sufficient to control erosion (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was little change in the density of Wyoming big sagebrush. Decadence remained high at 48%, and poor vigor increased from 9% to 20%.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 4%, and poor vigor decreased to 1%. Recruitment of young sagebrush plants increased substantially, with young plants comprising 84% of the population.
- **1996 to 2001 - stable (0):** The density of Wyoming big sagebrush decreased 55%, from 15,500 plants/acre to 7,020 plants/acre, but most of this decrease is due to a decrease in the recruitment of young plants which was extremely high in 1996. The density of mature plants increased on the site.

Recruitment of young sagebrush plants remained very good at 47% of the population. Cover of sagebrush decreased from 15% to 10%. Part of the transect was burned in 2000, removing sagebrush from several sample belts.

- **2001 to 2006 - slightly down (-1):** The sagebrush density decreased 30% to 4,920 plants/acre, but cover remained similar at 9%. Again, most of the decrease in density was due to a decrease in the recruitment of young plants to 8% of the population. Decadence increased from 7% to 18%, and poor vigor increased from 3% to 9%.
- **2006 to 2011 - stable (0):** Density of sagebrush decreased by 10% to 4,420 plants/acre, but cover increased to 13%. Recruitment of young sagebrush plants increased to 28% of the population. Decadence decreased to 4%, and poor vigor decreased to 2%.

Grass:

- **1984 to 1990 - slightly up (+1):** There was an increase in the sum of nested frequency of perennial grasses, but perennial grasses remained rare. Sandberg bluegrass increased significantly in nested frequency.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased, but remained fairly rare on the site. Data for the annual species cheatgrass was included for the first time, and the species dominates the herbaceous understory.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses and cover remained similar, but cheatgrass increased significantly in nested frequency. Cover of cheatgrass increased from 3% to 13%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses increased by 23%, and cover increased to 6%. However, cheatgrass increased significantly in nested frequency, and cover increased to 17%.
- **2006 to 2011 - slightly up (+1):** There was little change in the sum of nested frequency, though cover decreased slightly to 4%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 8%.

Forb:

- **1984 to 1990 - stable (0):** Perennial forbs are very rare on the site.
- **1990 to 1996 - stable (0):** Perennial forbs are very rare on the site.
- **1996 to 2001 - stable (0):** Perennial forbs are very rare on the site.
- **2001 to 2006 - stable (0):** Perennial forbs are very rare on the site.
- **2006 to 2011 - stable (0):** Perennial forbs are very rare on the site.

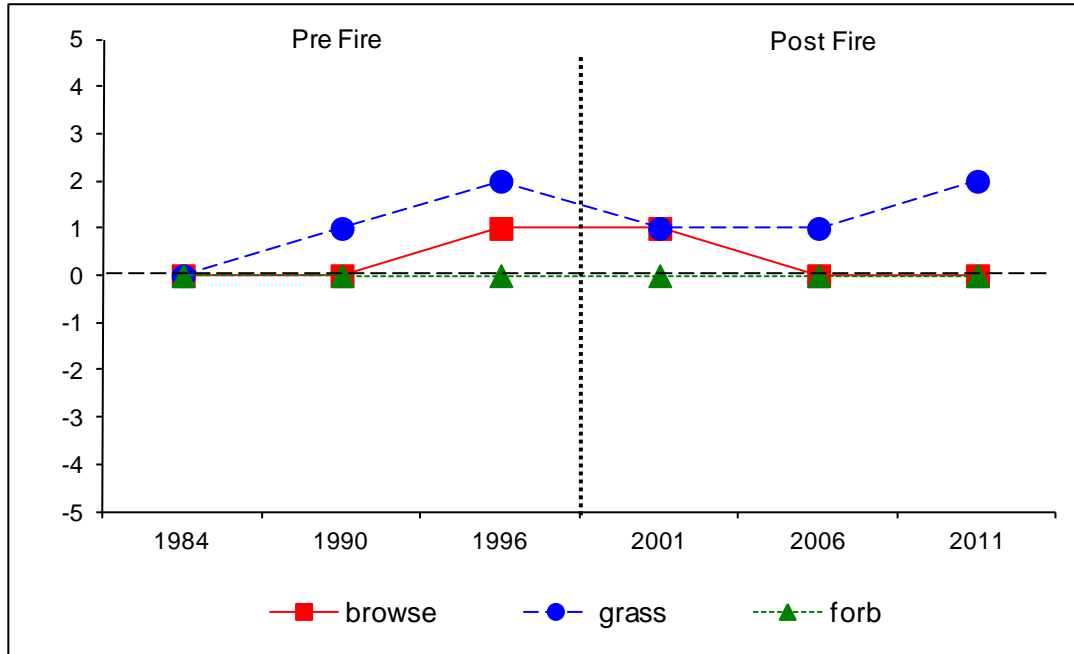
DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

Management unit 1, study no: 13

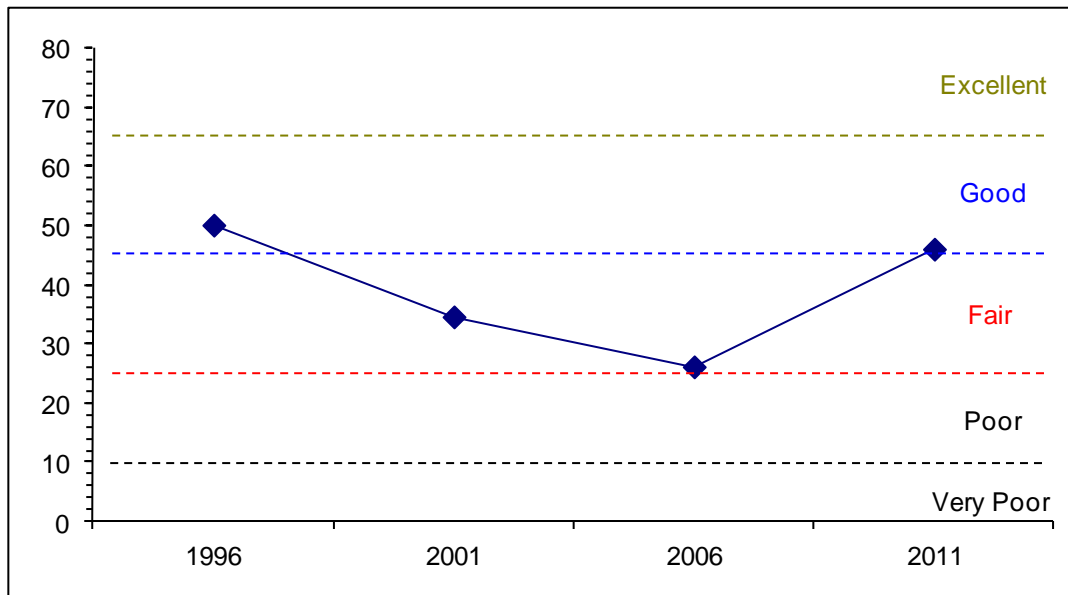
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	18.3	13.8	15.0	3.9	-2.7	1.8	0.0	50.1	Good
01	12.2	12.9	15.0	4.0	-9.8	0.3	0.0	34.6	Fair
06	11.3	9.6	4.0	12.1	-12.5	1.6	0.0	26.2	Poor-Fair
11	16.3	13.8	14.0	7.2	-5.6	0.4	0.0	46.1	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 1, Study no: 13



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
Management unit 1, Study no: 13



HERBACEOUS TRENDS--

Management unit 01, Study no: 13

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a8	ab10	ab12	ab19	ab25	b23	.31	.28	1.02	.36
G	Bromus tectorum (a)	-	-	a287	b334	c364	ab309	3.48	13.07	16.60	7.48
G	Oryzopsis hymenoides	a5	ab8	ab11	ab9	c16	c31	.07	.45	1.91	1.22
G	Poa secunda	a3	b35	b44	bc55	cd72	d92	.68	.53	2.32	1.81
G	Sitanion hystrix	ab16	ab13	b35	ab14	ab12	a4	.56	.11	.16	.18
G	Stipa comata	a-	a-	b16	b17	b15	a-	.31	.64	.63	-
G	Vulpia octoflora (a)	-	-	11	-	16	6	.07	-	.04	.01
Total for Annual Grasses		0	0	298	334	380	315	3.55	13.07	16.64	7.49
Total for Perennial Grasses		32	66	118	114	140	150	1.94	2.02	6.06	3.58
Total for Grasses		32	66	416	448	520	465	5.50	15.10	22.71	11.08
F	Allium sp.	-	-	-	-	-	3	-	-	-	.03
F	Alyssum alyssoides (a)	-	-	a11	a5	b132	c168	.02	.01	2.73	1.07
F	Arabis sp.	-	3	4	-	-	-	.01	-	-	-
F	Astragalus beckwithii	a6	a4	b19	a3	ab7	ab10	.22	.00	.63	.05
F	Astragalus sp.	-	-	-	-	-	-	-	-	.00	-
F	Castilleja chromosa	-	-	5	1	4	-	.06	.00	.00	-
F	Castilleja linariaefolia	-	-	-	-	3	-	-	-	.00	-
F	Caulanthus crassicaulis	-	-	2	-	-	-	.03	-	-	-
F	Chaenactis douglasii	a1	a16	b36	a4	ab9	ab3	.16	.03	.05	.00
F	Chenopodium leptophyllum(a)	-	-	-	-	-	3	-	-	-	.00
F	Collinsia parviflora (a)	-	-	4	-	6	-	.01	-	.01	-
F	Cryptantha sp.	-	-	9	-	-	3	.04	-	-	.03
F	Delphinium nuttallianum	-	-	-	1	-	3	-	.00	-	.00
F	Descurainia pinnata (a)	-	-	a23	b100	a8	b78	.07	1.49	.03	.16
F	Erigeron pumilus	a1	a-	b11	ab6	ab4	ab6	.10	.03	.03	.03
F	Eriogonum caespitosum	-	3	5	-	-	-	.04	-	-	-
F	Eriogonum ovalifolium	-	-	-	-	2	-	-	-	.06	-
F	Gayophytum ramosissimum(a)	-	-	-	3	-	-	-	.00	-	-
F	Gilia sp. (a)	-	-	a7	b106	a-	c140	.02	.43	-	.50
F	Lactuca serriola (a)	-	-	1	11	-	4	.00	.10	-	.01
F	Lappula occidentalis (a)	-	-	a15	a26	a29	b119	.03	.12	.08	.33
F	Machaeranthera canescens	-	-	3	-	4	6	.00	-	.01	.01
F	Microsteris gracilis (a)	-	-	a-	a-	a4	b12	-	-	.01	.02
F	Oenothera caespitosa	-	-	5	-	-	-	.03	-	-	-
F	Phlox hoodii	5	5	9	6	-	-	.15	.06	-	-
F	Phlox longifolia	-	-	-	-	-	2	-	-	-	.03
F	Ranunculus testiculatus (a)	-	-	-	-	-	6	-	-	-	.01
F	Sisymbrium altissimum (a)	-	-	a-	a-	b78	c167	-	-	.31	2.87
F	Tragopogon dubius (a)	-	-	1	-	-	-	.00	-	.00	-
Total for Annual Forbs		0	0	62	251	257	697	0.16	2.15	3.19	5.01
Total for Perennial Forbs		13	31	108	21	33	36	0.88	0.14	0.81	0.20
Total for Forbs		13	31	170	272	290	733	1.05	2.29	4.00	5.21

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	96	60	61	56	14.67	9.76	9.03	13.06
B	Atriplex confertifolia	2	3	2	0	-	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	91	37	42	36	7.21	.36	1.00	1.08
B	Leptodactylon pungens	1	0	0	0	-	-	-	-
B	Opuntia sp.	16	8	8	7	1.12	.41	.00	.06
B	Sarcobatus vermiculatus	2	2	2	4	.15	.63	.63	.38
Total for Browse		208	110	115	103	23.16	11.17	10.68	14.59

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 13

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	9.55	10.88
Chrysothamnus viscidiflorus stenophyllus	1.41	2.34
Opuntia sp.	-	.35
Sarcobatus vermiculatus	1.54	.96

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 13

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.3	0.9	1.4

BASIC COVER--

Management unit 01, Study no: 13

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.00	5.50	30.90	29.56	37.43	32.81
Rock	18.25	24.50	26.53	21.75	21.67	25.45
Pavement	10.50	31.00	8.90	19.43	9.73	16.85
Litter	56.50	31.75	29.68	21.09	28.21	18.29
Cryptogams	.50	2.25	2.19	3.12	3.04	.60
Bare Ground	12.25	5.00	12.53	10.47	8.54	10.69

SOIL ANALYSIS DATA --

Management unit 01, Study no: 13, Study Name: Raft River Narrows

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.6	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	'11
Rabbit	4	6	11	9
Elk	-	-	-	-
Deer	15	2	19	6
Cattle	-	-	4	3

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	-	2 (5)
11 (28)	27 (66)	23 (58)
-	1 (2)	8 (20)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 13

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata wyomingensis</i>									
84	2598	6	42	51	-	8	92	9	26/42
90	2498	7	45	48	66	15	4	20	27/31
96	15500	84	11	4	14200	2	.12	.64	24/37
01	7020	47	46	7	40	.28	0	3	23/27
06	4920	8	74	18	80	35	20	9	22/26
11	4420	28	68	4	20	7	0	2	18/24
<i>Artemisia tripartita tripartita</i>									
84	199	0	83	17	-	0	100	0	13/17
90	0	0	0	0	-	0	0	0	-/-
96	0	0	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	0	0	0	0	-	0	0	0	-/-
<i>Atriplex confertifolia</i>									
84	33	0	100	0	-	0	0	0	9/9
90	33	0	0	100	-	0	0	0	-/-
96	40	50	50	0	-	0	0	0	13/21
01	60	0	100	0	-	0	0	0	10/13
06	40	0	100	0	-	0	0	0	12/20
11	0	0	0	0	-	0	0	0	18/38
<i>Chrysothamnus nauseosus consimilis</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	36/40
01	0	0	0	-	-	0	0	0	25/32
06	0	0	0	-	-	0	0	0	19/26
11	0	0	0	-	-	0	0	0	25/35

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Chrysothamnus viscidiflorus stenophyllus</i>									
84	7331	18	35	47	66	46	12	2	7/9
90	6664	7	62	31	33	0	0	8	8/10
96	6360	22	61	16	640	4	0	4	12/19
01	1120	7	48	45	-	0	0	30	8/11
06	1400	9	80	11	20	3	0	7	11/14
11	1360	28	66	6	-	1	0	1	13/20
<i>Grayia spinosa</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	53/61
<i>Leptodactylon pungens</i>									
84	598	83	17	-	-	0	0	0	3/2
90	0	0	0	-	-	0	0	0	-/-
96	20	0	100	-	-	0	0	0	9/10
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Opuntia sp.</i>									
84	166	0	100	0	-	0	0	0	6/7
90	498	40	60	0	33	0	0	0	5/9
96	340	12	76	12	20	0	0	6	4/14
01	160	13	75	13	-	0	0	0	4/9
06	160	13	75	13	-	0	0	13	4/9
11	140	0	100	0	-	0	0	0	4/11
<i>Sarcobatus vermiculatus</i>									
84	33	0	0	100	-	100	0	0	-/-
90	33	0	100	0	-	0	0	0	35/35
96	40	0	100	0	-	0	0	0	36/62
01	40	50	50	0	-	0	0	0	-/-
06	40	0	100	0	-	0	0	0	39/48
11	80	0	75	25	-	0	0	25	30/41

BROAD HOLLOW - TREND STUDY NO. 1-14-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R025XY412UT](#)

Land Ownership: USFS

Elevation: 6,500 ft. (1,981 m)

Aspect: Southwest

Slope: 12%

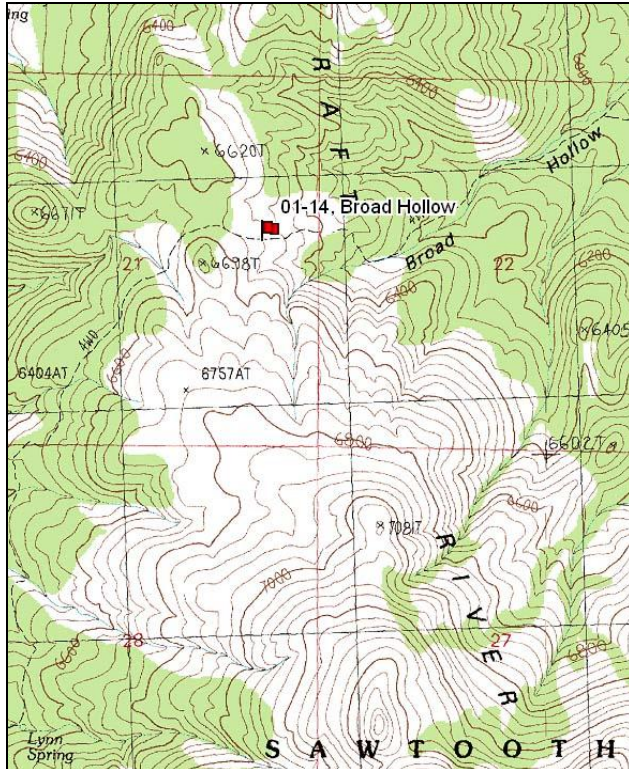
Transect bearing: 160° magnetic

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

Directions:

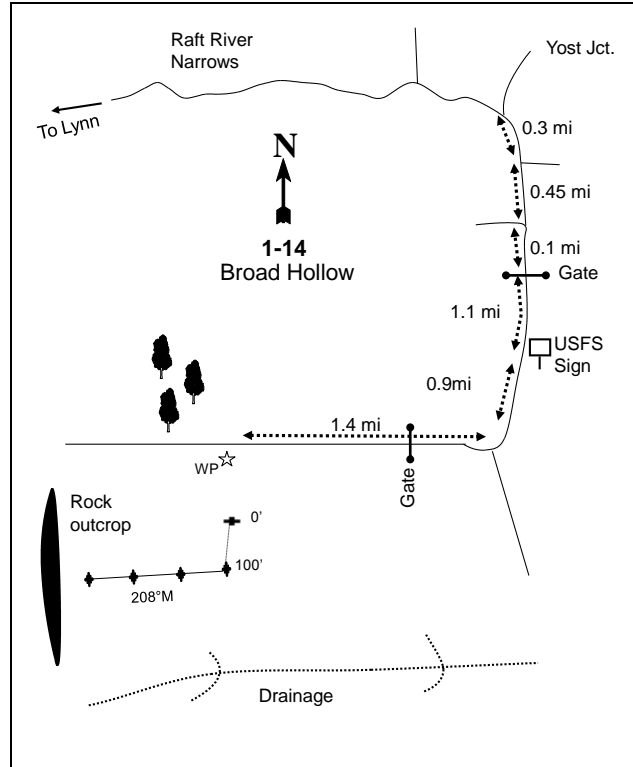
From the junction of U-30 and the Morris Ranch Road, proceed 29.2 miles to the Yost junction, passing through Lynn and crossing the Raft River. Turn right and proceed past the creek and the cattleguard for 0.3 miles. Turn right and proceed 0.45 miles and take the left fork (right fork leads to a bridge). 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



Township: 14N Range: 16W Section: 21

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 277577 E 4644920 N

BROAD HOLLOW - TREND STUDY NO. 1-14

Site Information

Site Description: This study is located on Forest Service land northeast of Lynn in upper Broad Hollow. The vegetation is dominated by a mix of mountain brush species. Utah juniper (*Juniperus osteosperma*) may have been more dominant prior to 1984, when the study was established. Prior to 1984, there is evidence of a fire that reduced juniper in the area. After the study was sampled in 1996, another fire, likely the McMillan fire, burned the upper half of the transect. The Forest Service manages the area as part of the Broad Hollow pasture of the West End allotment. Deer pellet groups have been sampled in moderate to moderately high abundance since 2001. Occupancy by other wildlife appears to be minimal. Sampled cattle sign has been low since 2001 (Table - Pellet Group Data).

Browse: The browse component is a mixture of mountain brush species, several of which are preferred species. The key browse species are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and Utah serviceberry (*Amelanchier utahensis*). The sagebrush on the site is a moderately dense population that has displayed mostly light to moderate use. Density of sagebrush has steadily decreased since 1996. Decadence of sagebrush has been somewhat moderate, but vigor has been good. Recruitment of young sagebrush plants was excellent in the early sample years, but has been poor since 2006. Bitterbrush has a smaller density, but has received moderate to heavy use. Decadence has remained low and vigor has been good. Serviceberry occurs in relatively low numbers, with mostly light to moderate use. Mountain snowberry (*Symphoricarpos oreophilus*) is also very abundant, but is not a preferred browse species and receives little use. Snowberry density increased after the fire, as this species is fire tolerant and can resprout. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is an abundant increaser shrub. The density of low rabbitbrush has decreased at each reading, but remains prevalent on the site (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory has a diverse composition, which also provides substantial ground cover. Among perennial grasses, the most prevalent are thickspike wheatgrass (*Agropyron dasystachyum*) and Sandberg bluegrass (*Poa secunda*). Other grasses include Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), needle-and-thread (*Stipa comata*), and occasional clumps of Great Basin wildrye (*Elymus cinereus*). The annual species cheatgrass (*Bromus tectorum*) is prevalent on the site and has dominated the herbaceous understory through much of the study, but has decreased substantially since 1996. Forbs are also productive and include several desirable species. Important forbs include arrowleaf balsamroot (*Balsamorhiza sagittata*), narrowleaf lomatium (*Lomatium triternatum*), cryptantha (*Cryptantha* sp.), sulfur eriogonum (*Eriogonum umbellatum*), and tapertip hawksbeard (*Crepis acuminata*). Arrowleaf balsamroot is the dominant forb, making up most of the forb cover for each sampling period (Table - Herbaceous Trends).

Soil: The soil is in the Parkay-Broad Canyon families association, which occurs on mountain slopes. Parent material consists of colluvium derived from quartzite, schist, and gneiss (Soil Survey Staff 2011). The soil has a sandy loam texture, and a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). The soil surface is quite rocky in places. Vegetation and litter cover is good with the exception of some of the larger shrub interspaces where bare soil can be found (Table - Basic Cover). The erosion condition was classified as stable in 2001 and 2011, but was slight in 2006.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density of sagebrush decreased 9% from 1,465 plants/acre to 1,331 plants/acre, and decadence increased from 5% to 20%. Bitterbrush density decreased 33% from

998 plants/acre to 665 plants/acre, but decadence also decreased from 20% to 10%. Recruitment of young plants remained very good for both species.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 5%. Recruitment of young sagebrush plants decreased from 45% to 19%, but is still considered to be good. Decadence of bitterbrush decreased to 2%. Recruitment of young bitterbrush plants decreased from 40% to 11%, but is still considered to be good.
- **1996 to 2001 - down (-2):** The density of both sagebrush and bitterbrush decreased due to the fire that burned the upper half of the transect in 1996. Density of sagebrush decreased 51% from 2,880 plants/acre to 1,400 plants/acre, and cover decreased slightly from 10% to 8%. Decadence of sagebrush increased to 11%. Density of bitterbrush decreased by 40% from 900 plants/acre to 540 plants/acre, but cover remained similar. Decadence increased from 2% to 11%.
- **2001 to 2006 - slightly down (-1):** The density of sagebrush decreased by 20% to 1,120 plants/acre, though cover remained similar at 7%. Decadence increased to 23%, but poor vigor remained low at 2%. Recruitment of young sagebrush plants decreased from 17% to 9%. Density of bitterbrush remained similar at 560 plants/acre, and cover increased slightly from 4% to 5%. Decadence decreased to 7%, and poor vigor decreased to 4%. Recruitment of young bitterbrush decreased from 15% to 4%.
- **2006 to 2011 - slightly down (-1):** Sagebrush density decreased by 14% to 960 plants/acre, and cover decreased slightly to 6%. Decadence remained similar at 21%, and poor vigor increased to 17%. Recruitment of young sagebrush plants decreased to 6% of the population. The bitterbrush population remained similar.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased 36%, with a significant increase in the nested frequency of Sandberg bluegrass.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 10%. Cheatgrass dominated, but data was not collected for annual species in past readings.
- **1996 to 2001 - up (+2):** There was a 27% increase in the sum of nested frequency of perennial grasses, and cover increased 7% to 15%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 12% to 6%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 18%, and cover decreased to 11%. Cheatgrass nested frequency and cover remained similar.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses decreased by 9%, and cover decreased to 8%. However, there was a significant decrease in the nested frequency of cheatgrass, and cover decreased from 7% to 3%.

Forb:

- **1984 to 1990 - stable (0):** The perennial forb sum of nested frequency remained similar.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased 79%.
- **1996 to 2001 - down (-2):** There was a 61% decrease in the sum of nested frequency of perennial forbs, though cover remained similar at 6%. The sum of nested frequency of annual forbs and cover increased substantially.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased three-fold, and cover increased to 8%.
- **2006 to 2011 - down (-2):** The perennial forb sum of nested frequency decreased by 41%, and cover decreased to 4%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

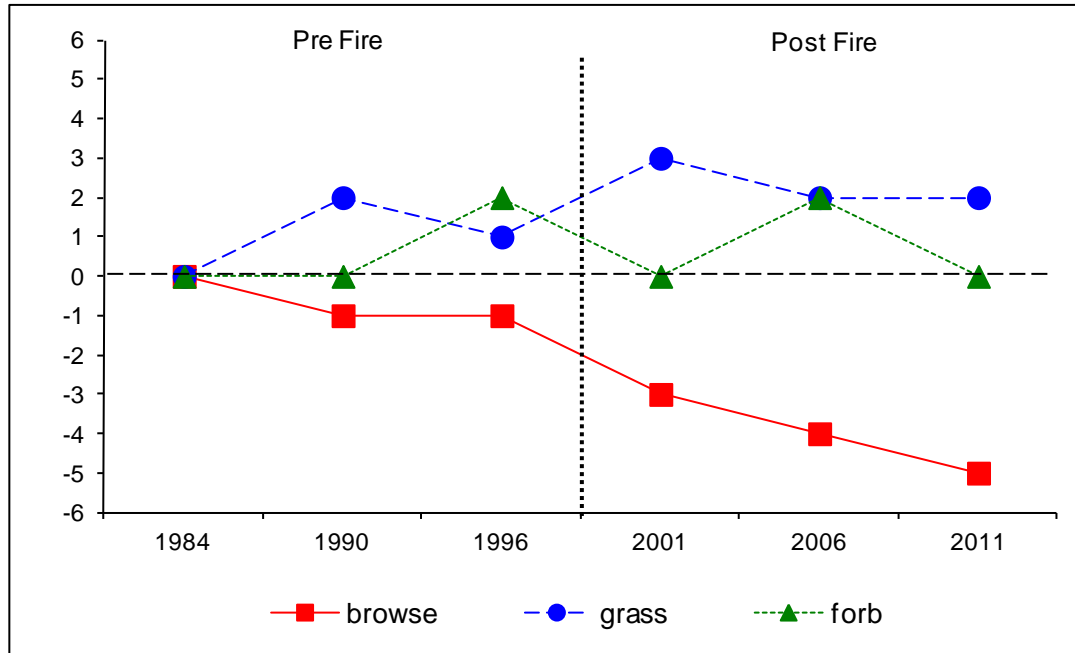
Management unit 1, study no: 14

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	21.2	13.9	7.2	13.0	-9.2	10.0	0.0	56.0	Fair
01	17.6	12.2	10.0	30.0	-4.8	10.0	0.0	74.9	Good
06	21.2	9.8	2.9	22.2	-5.0	10.0	0.0	61.0	Fair
11	16.4	11.6	1.4	15.9	-2.4	7.9	0.0	50.9	Poor-Fair

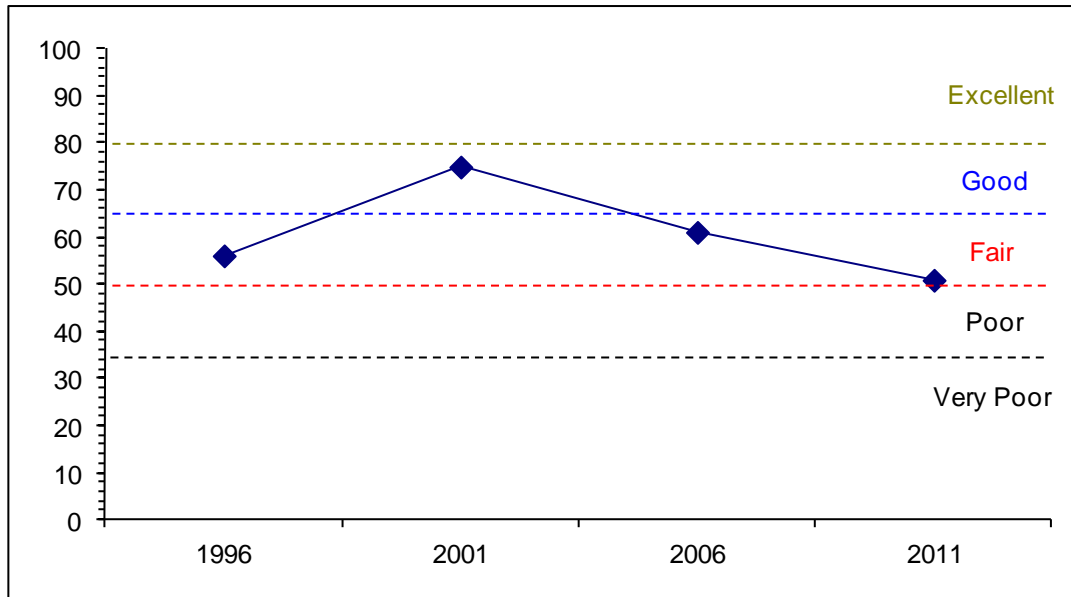
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 1, Study no: 14



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 14



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

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a152	a135	a131	b194	a146	a113	1.80	6.03	1.59	1.39
G	Agropyron spicatum	9	-	21	14	11	12	.47	.18	.51	.36
G	Bromus tectorum (a)	-	-	c363	b290	b302	a262	12.29	6.40	6.71	3.21
G	Elymus cinereus	3	-	1	1	4	-	.03	.15	.24	.15
G	Melica bulbosa	-	-	-	3	4	-	-	.03	.01	-
G	Oryzopsis hymenoides	a1	a4	b15	a-	a3	a2	.54	.01	.03	.03
G	Poa fendleriana	b27	ab20	a2	a-	a3	a3	.00	-	.03	.00
G	Poa secunda	a55	b174	bc150	bc204	bc173	c186	3.32	8.05	8.18	5.97
G	Sitanion hystrix	4	1	9	-	-	4	.02	-	-	.03
G	Stipa comata	ab26	b42	a10	a16	a9	a-	.28	.56	.48	-
G	Vulpia octoflora (a)	-	-	3	-	-	-	.00	-	-	-
Total for Annual Grasses		0	0	366	290	302	262	12.30	6.40	6.71	3.21
Total for Perennial Grasses		277	376	339	432	353	320	6.48	15.02	11.08	7.94
Total for Grasses		277	376	705	722	655	582	18.78	21.43	17.79	11.15
F	Agoseris glauca	ab39	a12	b52	a10	b45	ab29	.11	.03	.21	.40
F	Alyssum alyssoides (a)	-	-	a10	b51	a21	b71	.02	.26	.04	.64
F	Arabis sp.	a3	a4	b27	a4	a5	a4	.08	.03	.03	.03
F	Astragalus beckwithii	5	3	3	-	1	6	.18	-	.00	.01
F	Astragalus utahensis	-	2	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	a9	a11	b35	ab28	b33	b40	3.65	4.26	5.84	2.75
F	Calochortus nuttallii	-	3	-	-	-	3	-	-	-	.00
F	Chaenactis douglasii	6	6	4	-	2	-	.01	-	.00	-
F	Chenopodium leptophyllum(a)	-	-	-	-	8	7	-	-	.03	.02

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Collinsia parviflora</i> (a)	-	-	a155	b221	a191	b254	.47	2.85	.88	2.61
F	<i>Collomia linearis</i> (a)	-	-	2	6	-	-	.00	.01	-	-
F	<i>Comandra pallida</i>	-	-	5	3	3	6	.01	.00	.00	.04
F	<i>Crepis acuminata</i>	54	66	43	39	34	50	.51	1.16	.73	.40
F	<i>Cryptantha</i> sp.	a-	a-	b55	a-	c123	a3	.15	-	.43	.00
F	<i>Descurainia pinnata</i> (a)	-	-	a4	ab9	a3	b21	.01	.17	.01	.05
F	<i>Eriogonum umbellatum</i>	b12	ab7	a1	a3	a3	a-	.03	.03	.00	-
F	<i>Galium bifolium</i> (a)	-	-	-	-	6	3	-	-	.01	.00
F	<i>Gayophytum ramosissimum</i> (a)	-	-	a1	a4	b31	a7	.00	.01	.06	.01
F	<i>Hackelia patens</i>	a3	ab17	ab18	a3	b31	ab17	1.07	.07	1.09	.19
F	<i>Lappula occidentalis</i> (a)	-	-	a10	ab27	ab16	b30	.02	.11	.04	.10
F	<i>Lathyrus brachycalyx</i>	-	-	-	1	-	-	-	.00	-	-
F	<i>Lepidium</i> sp. (a)	-	-	3	-	-	-	.00	-	-	-
F	<i>Lithospermum ruderales</i>	-	-	-	-	3	4	-	-	.01	.06
F	<i>Lomatium triternatum</i>	3	2	-	4	-	2	-	.03	-	.03
F	<i>Machaeranthera canescens</i>	-	-	3	-	2	4	.03	-	.00	.01
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b9	b13	b18	-	.02	.05	.08
F	<i>Navarretia intertexta</i> (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Phlox hoodii</i>	b5	a1	a-	a-	a-	a-	-	-	-	-
F	<i>Phlox longifolia</i>	12	5	7	3	4	-	.01	.01	.01	-
F	<i>Polygonum douglasii</i> (a)	-	-	b5	a-	c43	a-	.01	-	.08	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	a3	a3	a6	b37	.00	.01	.03	.07
F	<i>Senecio multilobatus</i>	-	3	1	-	-	3	.15	-	-	.01
F	<i>Tragopogon dubius</i> (a)	b18	a3	a-	a2	a-	a1	-	.00	-	.00
Total for Annual Forbs		18	3	193	333	338	449	0.55	3.46	1.25	3.60
Total for Perennial Forbs		151	142	254	98	289	171	6.02	5.65	8.39	3.95
Total for Forbs		169	145	447	431	627	620	6.58	9.11	9.64	7.56

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	'11	'96	'01	'06	'11
B	Amelanchier utahensis	5	11	5	4	2.00	1.87	2.84	2.46
B	Artemisia tridentata vaseyana	70	35	35	33	9.48	7.55	7.53	5.71
B	Chrysothamnus nauseosus consimilis	0	0	0	3	-	-	.15	.21
B	Chrysothamnus viscidiflorus viscidiflorus	78	78	77	54	6.49	7.71	9.85	2.92
B	Eriogonum microthecum	1	2	2	1	.03	-	-	-
B	Juniperus osteosperma	0	0	0	1	-	-	-	-
B	Leptodactylon pungens	4	4	2	2	.30	.18	.30	.36
B	Opuntia sp.	53	58	57	60	4.37	2.50	3.59	3.65
B	Purshia tridentata	28	21	17	16	4.19	3.54	5.03	3.74
B	Symphoricarpos oreophilus	35	35	41	38	7.39	9.31	8.52	6.10
B	Yucca sp.	-	-	-	-	-	-	-	.15
Total for Browse		274	244	236	212	34.27	32.70	37.84	25.32

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 14

Species	Percent Cover	
	'06	'11
Amelanchier utahensis	2.91	3.13
Artemisia tridentata vaseyana	7.75	9.19
Chrysothamnus nauseosus consimilis	-	.11
Chrysothamnus viscidiflorus viscidiflorus	11.28	3.59
Opuntia sp.	2.54	3.50
Purshia tridentata	5.33	3.79
Symphoricarpos oreophilus	19.31	11.26

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 14

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier utahensis	2.7	3.1	0.5
Artemisia tridentata vaseyana	1.5	0.9	0.6
Purshia tridentata	1.2	0.8	0.3

BASIC COVER--

Management unit 01, Study no: 14

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.00	13.00	49.77	56.67	55.03	43.54
Rock	7.00	6.50	2.10	1.54	2.07	1.29
Pavement	1.00	1.00	1.33	.85	2.25	.39
Litter	62.50	46.25	62.24	50.53	38.86	48.22
Cryptogams	1.00	2.50	1.36	1.20	1.83	1.41
Bare Ground	26.50	30.75	10.75	15.88	20.92	19.55

SOIL ANALYSIS DATA --

Management unit 01, Study no: 14, Study Name: Broad Hollow

Effective rooting depth (in)	pH	Sandy-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.5	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	17	6	50	10	-	-	-
Elk	-	-	1	2	1 (2)	-	-
Deer	32	17	10	13	29 (71)	31 (76)	47 (116)
Cattle	3	2	3	2	11 (27)	1 (2)	-

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 14

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier utahensis									
84	133	0	100	0	-	100	0	0	31/32
90	66	0	100	0	-	0	100	100	33/28
96	100	0	100	0	-	80	0	0	43/62
01	340	71	29	0	140	6	0	0	50/55
06	100	0	80	20	-	40	0	20	50/57
11	80	0	100	0	-	25	0	0	48/60
Artemisia tridentata vaseyana									
84	1465	45	50	5	733	50	5	0	14/19
90	1331	45	35	20	-	35	15	0	16/17
96	2880	19	76	5	140	10	0	0	21/32
01	1400	17	71	11	-	9	3	4	22/33
06	1120	9	68	23	60	25	5	2	24/39
11	960	6	73	21	-	21	6	17	23/37

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus nauseosus consimilis</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	21/30	
01	0	0	0	0	-	0	0	0	31/43	
06	0	0	0	0	-	0	0	0	31/39	
11	60	0	33	67	-	100	0	67	21/30	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	7064	17	69	14	599	16	0	8	17/26	
90	5598	19	37	44	66	18	6	5	16/14	
96	4700	14	82	4	-	4	0	0	16/22	
01	4100	2	93	5	-	0	0	0	14/19	
06	3420	2	87	11	240	.58	.58	4	15/23	
11	2180	4	55	41	-	29	6	37	15/20	
<i>Eriogonum microthecum</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	5/9	
01	60	0	100	-	-	0	0	0	9/14	
06	40	0	100	-	-	0	0	0	7/17	
11	20	0	100	-	-	0	0	0	11/22	
<i>Juniperus osteosperma</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	0	-/-	
<i>Leptodactylon pungens</i>										
84	865	23	77	0	-	0	0	0	10/12	
90	665	10	80	10	-	0	0	10	5/9	
96	140	0	100	0	-	0	0	0	11/13	
01	120	0	100	0	-	0	0	0	8/9	
06	80	50	25	25	140	0	0	0	7/11	
11	40	0	100	0	-	0	0	0	8/15	
<i>Opuntia sp.</i>										
84	999	0	100	0	-	0	0	0	3/8	
90	1864	32	64	4	-	0	0	18	4/17	
96	2520	6	84	10	-	0	0	4	4/17	
01	4340	14	78	8	-	0	0	6	4/13	
06	2660	1	98	2	-	0	0	2	4/17	
11	3020	2	98	0	-	0	.66	5	4/20	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Purshia tridentata										
84	998	27	53	20	-	53	27	7	20/31	
90	665	40	50	10	66	60	30	0	19/20	
96	900	11	87	2	20	31	24	0	23/43	
01	540	15	74	11	-	56	22	7	24/53	
06	560	4	89	7	60	36	32	4	27/51	
11	540	0	96	4	-	78	15	7	34/63	
Symphoricarpos oreophilus										
84	2532	29	71	0	-	18	0	0	23/23	
90	1798	15	63	22	66	4	4	4	19/29	
96	1420	17	79	4	60	3	0	1	27/47	
01	1820	24	76	0	80	0	0	0	26/45	
06	1960	14	81	5	-	2	0	0	25/46	
11	1800	24	68	8	-	3	1	16	23/41	
Tetradymia canescens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	14/36	
01	0	0	0	-	-	0	0	0	17/35	
06	0	0	0	-	-	0	0	0	12/33	
11	0	0	0	-	-	0	0	0	11/23	

CEDAR HILLS - TREND STUDY NO. 1-15-11

Vegetation Type: Pinyon-Juniper

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: Not Available

Land Ownership: BLM

Elevation: 5,800 ft. (1,768 m)

Aspect: Southwest

Slope: 5%

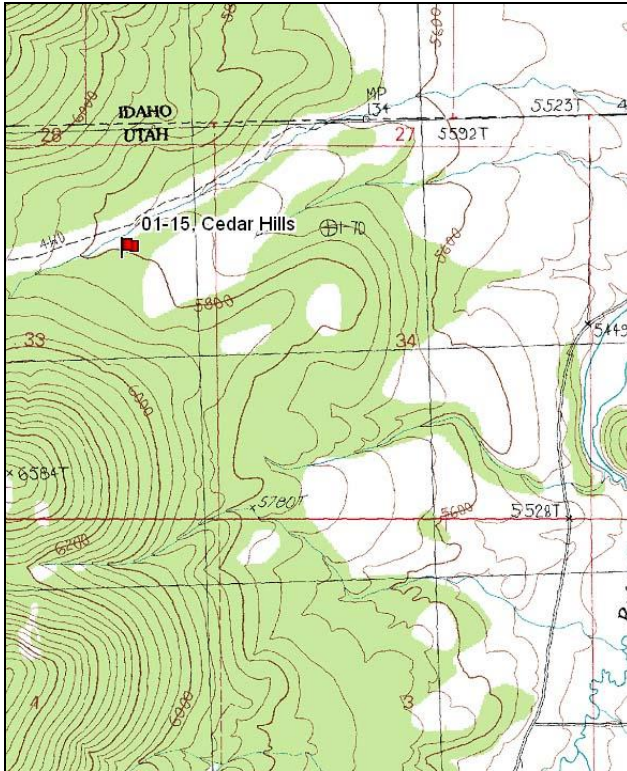
Transect bearing: 173° magnetic

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

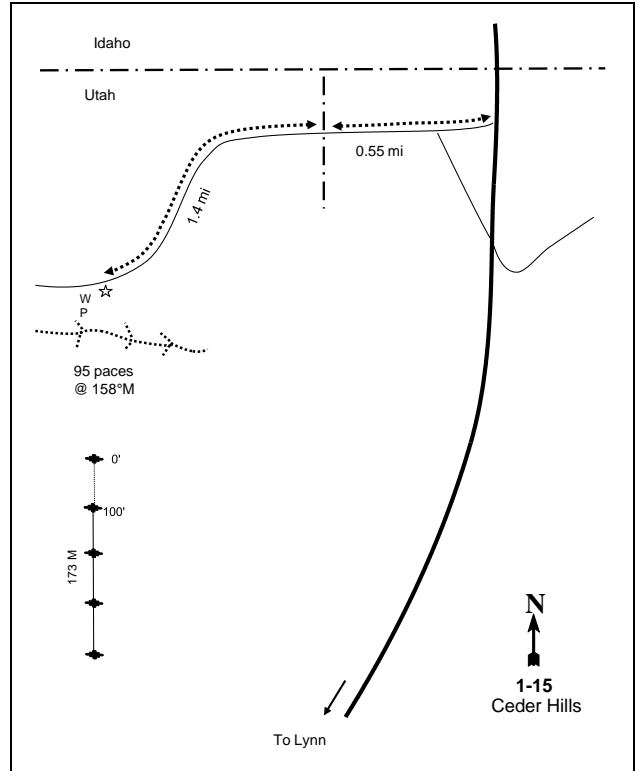
Directions:

From the town of Lynn, drive north to the cattleguard at the Utah-Idaho border. 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

GPS: NAD 83, UTM 12S 277610 E 4651636 N

CEDAR HILLS - TREND STUDY NO. 1-15

Site Information

Site Description: The trend study is located west of Yost in the Albion Mountains, in an area called Cedar Hills, on the Utah-Idaho border. The area was dominated by singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) when the study was established in 1990. In 2000, a large wildfire burned the area and changed the area from tree dominance to herbaceous species. It is apparent that the burned area was aeriually seeded, but no method was used to cover seed with many dead standing trees remaining on the study. Seed mix information was not available. The area is managed by the Bureau of Land Management as part of the Junction Creek allotment. Pellet group frequency indicated only minor presence by wildlife. However, sampled cattle sign was moderate in 2006, though it was low in 2011. Following the fire in 2001, pellet groups by wildlife or livestock were not observed (Table - Pellet Group Data).

Browse: Singleleaf pinyon and Utah juniper dominated the area prior to the fire, with very high densities for both species (Table - Point-Quarter Tree Data). The populations of both trees were mostly mature. The wildfire in 2000 eliminated all juniper and pinyon trees. Prior to the fire, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the most abundant browse species. The sagebrush population was moderately dense, with high decadence and poor vigor. Following the fire, only a small population of mountain big sagebrush has reestablished on the site. Decadence is low, and vigor is good within the population. Without competition from pinyon and juniper trees, sagebrush plants have been much larger since 2006 than they were prior to the fire. Utilization of sagebrush has been light throughout the study years. Other browse species are rare on the site (Table - Browse Characteristics)

Herbaceous Understory: Prior to the fire, the herbaceous understory was fair for a pinyon-juniper dominated site. Sandberg bluegrass (*Poa secunda*) was the most abundant grass, but thickspike wheatgrass (*Agropyron dasystachyum*) and bluebunch wheatgrass (*A. spicatum*) were also common. Following the fire, thickspike wheatgrass and bluebunch wheatgrass increased, and Sandberg bluegrass decreased. Thickspike wheatgrass is now the dominant grass on the site. No seed mix was available, but likely seeded perennial grasses sampled following the fire include crested wheatgrass (*A. cristatum*), Basin wildrye (*Elymus cinereus*), Russian wildrye (*E. junceus*), and Indian ricegrass (*Oryzopsis hymenoides*). All have occurred at low frequency and cover. The weedy species cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*) have also been sampled following the fire. Forbs are diverse, but are only moderately abundant. At least four different milkvetch (*Astragalus spp.*) species have been sampled. Hoods phlox (*Phlox hoodii*) was abundant prior to the fire, but was rare in 2006. Lewis flax (*Linum lewisii*) was first sampled in 2006, and may have been seeded after the fire.

Soil: The soil is in the Solak-Rock outcrop association, which occurs on mountain slopes. Parent material consists of colluvium and residuum derived from quartzite, limestone, and schist (Soil Survey Staff 2011). The soil is a fine-textured clay loam, with a slightly alkaline soil reaction (pH 7.8) (Table - Soil Analysis Data). Bare ground cover was high immediately following the fire, but has been low in the other sample years. The fire also reduced the cryptogam cover. Vegetation and litter cover have been high since 2006 (Table - Basic Cover). The soil erosion condition was classified as moderate in 2001, with erosion limited only by the gentle terrain, but has been stable since 2006.

Trend Assessments

Browse:

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of mountain big sagebrush decreased from 87% to 45%, and poor vigor decreased from 57% to 22%.

- **1996 to 2001 - down (-2):** A wildfire burned the site and surrounding area, effectively removing all browse from the site.
- **2001 to 2006 - slightly up (+1):** A small population of sagebrush has reestablished on the site at 120 plants/acre. The plants are healthy, with vigorous growth.
- **2006 to 2011 - slightly up (+1):** Density of sagebrush increased three-fold to 360 plants/acre. Decadence and poor vigor remained low.

Grass:

- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1996 to 2001 - down (-2):** Following the fire, the sum of nested frequency of perennial grass decreased 47%, and cover decreased slightly from 6% to 4%. There was a significant decrease in the nested frequency of Sandberg bluegrass, but a significant increase in nested frequency of thickspike wheatgrass.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial grasses increased over two-fold, and cover increased to 37%. Crested wheatgrass, thickspike wheatgrass, and Sandberg bluegrass increased significantly in nested frequency. However, cheatgrass also increased significantly in nested frequency, and cover increased from no sampled cover to 3%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grasses increased 32%, though cover decreased to 27%. There was a significant increase in the nested frequency of crested wheatgrass and Sandberg bluegrass. Cheatgrass decreased significantly, and cover decreased to near 0%.

Forb:

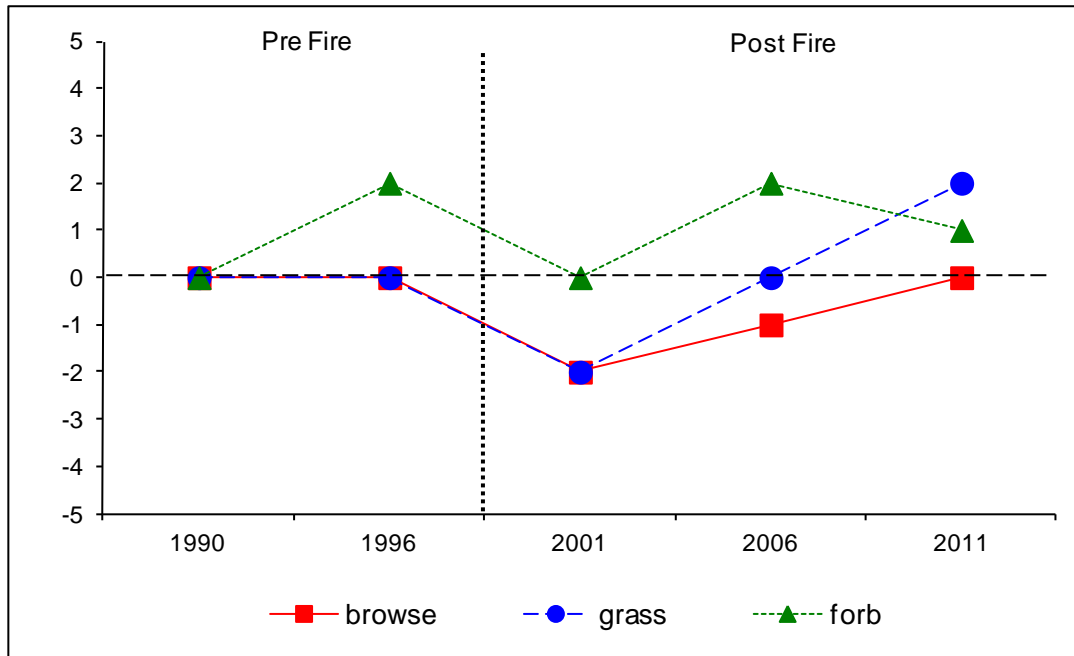
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased nearly two-fold.
- **1996 to 2001 - down (-2):** Following the fire, there was an 87% decrease in the sum of nested frequency of perennial forbs, and cover decreased from 8% to less than 1%.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased over four-fold, and cover increased to 5%. The sum of nested frequency of annual forbs and cover also increased substantially.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 19%, but cover remained similar.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 1, study no: 15

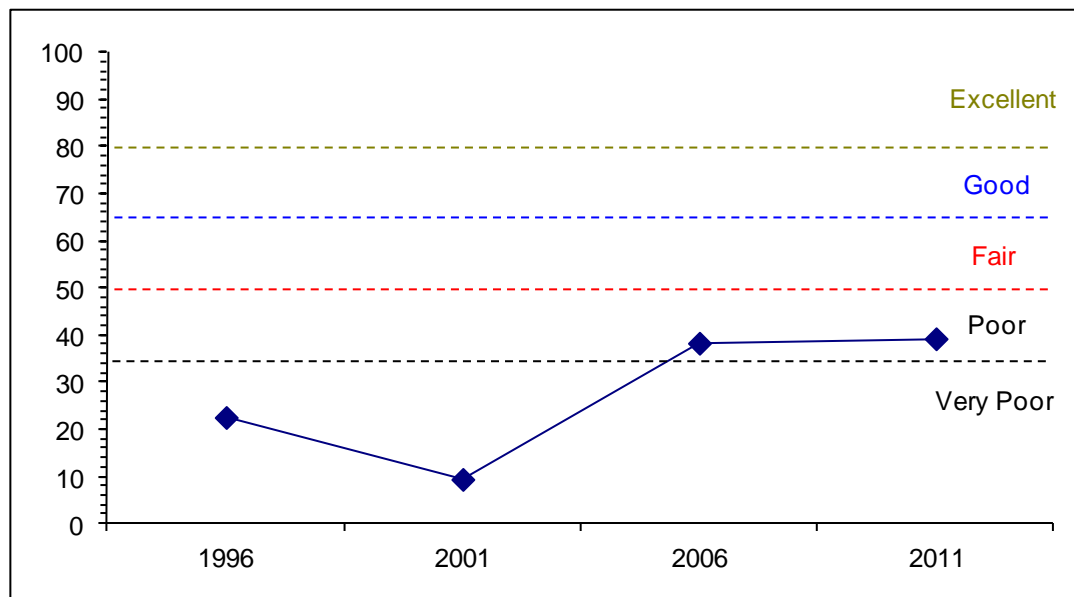
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	1.6	0.0	0.0	11.0	0.0	10.0	0.0	22.6	Very Poor
01	0.0	0.0	0.0	8.4	0.0	1.0	0.0	9.4	Very Poor
06	1.3	0.0	0.0	30.0	-2.5	9.6	0.0	38.3	Poor
11	0.3	0.0	0.0	30.0	0.0	9.0	0.0	39.3	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 1, Study no: 15



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 1, Study no: 15



HERBACEOUS TRENDS--

Management unit 01, Study no: 15

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a-	a-	a-	b26	c37	-	-	1.18	2.34
G	Agropyron dasystachyum	a76	a60	b135	c292	c309	.76	3.40	29.27	16.03
G	Agropyron spicatum	abc37	c71	a12	ab24	bc52	.48	.33	4.19	2.99
G	Bromus tectorum (a)	-	a-	a-	c87	b29	-	-	3.37	.06
G	Elymus cinereus	-	-	-	-	5	-	-	-	.03
G	Elymus junceus	-	-	-	2	6	-	-	.15	.48
G	Oryzopsis hymenoides	-	-	-	3	5	-	-	.18	.30
G	Poa bulbosa	-	-	-	-	3	-	-	-	.00
G	Poa canbyi	-	-	-	6	-	-	-	.30	-
G	Poa secunda	d256	d269	a66	b116	c200	4.23	.47	1.98	4.84
G	Sitanion hystrix	-	2	-	3	4	.01	-	.15	.09
Total for Annual Grasses		0	0	0	87	29	0	0	3.37	0.06
Total for Perennial Grasses		369	402	213	472	621	5.49	4.21	37.43	27.12
Total for Grasses		369	402	213	559	650	5.49	4.21	40.81	27.18
F	Agoseris glauca	a-	a2	a5	b44	ab20	.00	.04	.20	.04
F	Allium sp.	-	-	-	4	1	-	-	.01	.00
F	Alyssum alyssoides (a)	-	a-	a-	b146	c271	-	-	.73	2.03
F	Antennaria rosea	a1	b10	a-	a-	a-	.08	-	-	-
F	Arabis sp.	a3	b19	a-	a1	a-	.04	-	.00	-
F	Astragalus beckwithii	-	116	-	35	110	2.27	-	1.70	3.53
F	Astragalus calycosus	-	-	-	2	-	-	-	.00	-
F	Astragalus cibarius	a-	a-	a-	b53	a8	-	-	1.19	.12
F	Astragalus convallarius	-	3	-	-	2	.00	-	-	.00
F	Astragalus sp.	ab6	b11	ab7	a-	a-	.08	.02	-	-
F	Astragalus utahensis	a3	b21	a6	a5	a-	.13	.01	.03	.00
F	Camelina microcarpa (a)	-	a-	a-	b40	a-	-	-	.18	-
F	Castilleja chromosa	-	4	-	-	-	.01	-	-	-
F	Caulanthus crassicaulis	-	-	-	-	-	.00	-	-	-
F	Chaenactis douglasii	a10	a13	a4	b35	a6	.05	.01	.26	.01
F	Chenopodium album (a)	-	-	3	-	-	-	.00	-	-
F	Chenopodium leptophyllum(a)	-	-	-	4	7	-	-	.01	.01
F	Collinsia parviflora (a)	-	a87	a127	b225	b219	.18	.65	1.72	.67
F	Crepis acuminata	a3	a9	a6	ab16	b27	.10	.02	.42	.50
F	Cryptantha sp.	ab7	ab5	a-	b16	a-	.04	-	.03	-
F	Descurainia pinnata (a)	-	a-	a1	a4	b44	-	.03	.01	.12
F	Epilobium brachycarpum (a)	-	a-	a-	c81	b16	-	-	.25	.06
F	Erigeron pumilus	-	1	-	1	1	.00	-	.00	.00
F	Erigeron sp.	2	6	-	-	-	.04	-	-	-
F	Fritillaria atropurpurea	-	-	5	1	-	-	.01	.00	-
F	Gayophytum ramosissimum(a)	-	-	-	8	-	-	-	.04	-
F	Hackelia patens	-	-	1	-	-	-	.00	-	-
F	Haplopappus acaulis	b9	c25	a-	a-	a-	.38	-	-	-
F	Lactuca serriola (a)	-	a-	a-	b71	a4	-	-	.23	.01

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Lappula occidentalis (a)	-	-	-	5	2	-	-	.01	.00
F	Linum lewisii	-	-	-	9	5	-	-	.21	.01
F	Machaeranthera grindelioides	-	-	-	1	3	-	-	.00	.00
F	Microsteris gracilis (a)	-	a-	a-	a13	b95	-	-	.02	.20
F	Penstemon sp.	ab2	b14	a-	ab8	ab7	.43	-	.22	.07
F	Phlox hoodii	b111	c178	a3	a3	a5	3.77	.00	.01	.07
F	Ranunculus testiculatus (a)	-	a-	a-	a-	b12	-	-	-	.03
F	Senecio multilobatus	ab14	b29	a3	b21	a5	.07	.00	.39	.01
F	Sisymbrium altissimum (a)	-	a-	a-	b30	a2	-	-	.19	.00
F	Taraxacum officinale	-	-	1	-	3	-	.00	-	.03
F	Townsendia sp.	-	4	-	-	-	.01	-	-	-
F	Tragopogon dubius (a)	-	-	-	-	1	-	-	-	.03
F	Zigadenus paniculatus	a-	a-	b20	a5	ab8	.01	.37	.03	.05
Total for Annual Forbs		0	87	131	627	673	0.18	0.68	3.42	3.20
Total for Perennial Forbs		171	470	61	260	211	7.55	0.50	4.77	4.49
Total for Forbs		171	557	192	887	884	7.73	1.19	8.19	7.69

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	'06	'11	'96	'06	'11
B	Artemisia tridentata vaseyana	35	4	12	1.05	1.02	.24
B	Chrysothamnus nauseosus consimilis	1	2	4	.03	.03	.18
B	Chrysothamnus viscidiflorus viscidiflorus	7	4	5	.04	.03	.91
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	4	3	.30	.41	.03
Total for Browse		94	14	24	12.84	1.50	1.37

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 15

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	1.11	1.35
Chrysothamnus nauseosus consimilis	-	.41
Chrysothamnus viscidiflorus viscidiflorus	.28	.86
Symphoricarpos oreophilus	.03	.05

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 15

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	-	3.0	1.7

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 15

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	407	-	-	-	3.8	-	-	-
Pinus monophylla	101	-	-	-	5.1	-	-	-

BASIC COVER--

Management unit 01, Study no: 15

Cover Type	Average Cover %				
	'90	'96	'01	'06	'11
Vegetation	4.00	26.79	6.07	48.36	43.20
Rock	1.50	.71	.24	.93	.33
Pavement	11.25	9.01	13.58	3.52	2.82
Litter	54.75	40.83	11.15	38.81	56.55
Cryptogams	7.75	12.89	0	1.12	5.95
Bare Ground	20.75	9.32	72.24	17.68	12.36

SOIL ANALYSIS DATA --

Management unit 01, Study no: 15, Study Name: Cedar Hills

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
12.7	7.8	30.7	40.0	29.3	3.0	6.7	390.4	0.6

PELLET GROUP DATA--

Management unit 01, Study no: 15

Type	Quadrat Frequency			Days use per acre (ha)	
	'96	'06	'11	'06	'11
Rabbit	14	4	1	-	-
Deer	4	2	-	1 (2)	-
Cattle	-	7	5	30 (73)	3 (7)

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

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>									
90	2232	1	12	87	-	1	0	57	20/18
96	1160	9	47	45	-	7	0	22	15/18
01	0	0	0	0	-	0	0	0	-/-
06	120	0	100	0	2280	0	0	0	31/31
11	360	22	72	6	340	17	0	0	33/31
<i>Chrysothamnus nauseosus consimilis</i>									
90	0	0	0	-	-	0	0	0	-/-
96	20	100	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	80	100	0	-	-	0	0	0	22/26
11	120	17	83	-	-	0	0	0	25/32
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
90	665	30	5	65	-	0	0	30	7/8
96	200	20	80	0	-	0	0	0	7/7
01	0	0	0	0	-	0	0	0	-/-
06	120	0	100	0	-	0	0	0	13/16
11	120	0	100	0	-	0	0	0	16/23
<i>Juniperus osteosperma</i>									
90	499	7	87	7	-	0	0	7	108/61
96	900	18	80	2	-	0	0	2	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	0	0	0	0	-	0	0	0	-/-
<i>Opuntia sp.</i>									
90	0	0	0	-	-	0	0	0	-/-
96	20	0	100	-	-	0	0	0	5/9
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Pinus monophylla</i>									
90	66	0	100	-	166	0	0	0	157/97
96	180	56	44	-	180	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-

		Age class distribution			Utilization				
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus									
90	33	0	100	-	-	0	0	0	6/9
96	160	75	25	-	20	0	0	0	11/17
01	0	0	0	-	-	0	0	0	-/-
06	140	57	43	-	-	0	0	0	12/22
11	80	0	100	-	-	0	0	0	14/31

NUT PINE HILLS - TREND STUDY NO. 1-16-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Summer (Fawning habitat)

NRCS Ecological Site Description: [Upland Stony Loam \(Pinyon-Utah Juniper\), R028AY338UT](#)

Land Ownership: USFS

Elevation: 6,850 ft. (2,088 m)

Aspect: Southwest

Slope: 20-23%

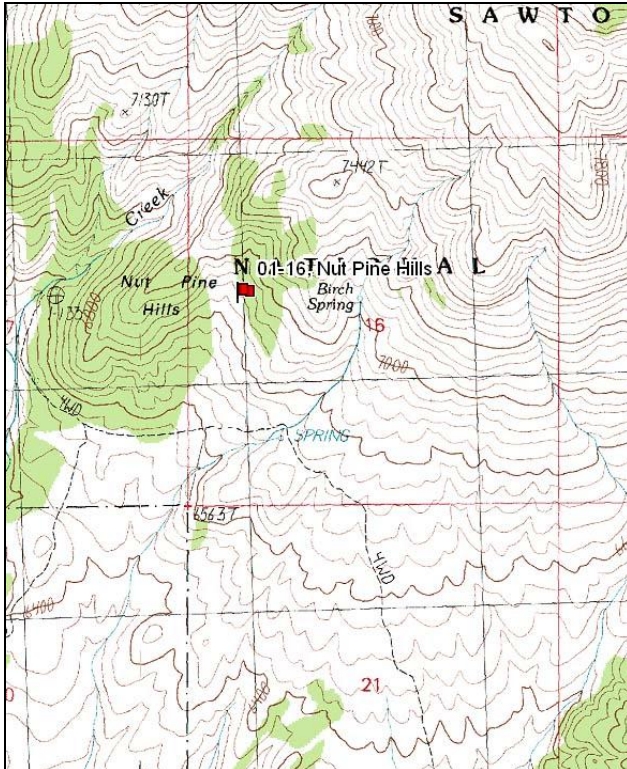
Transect bearing: 155° magnetic

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

Directions:

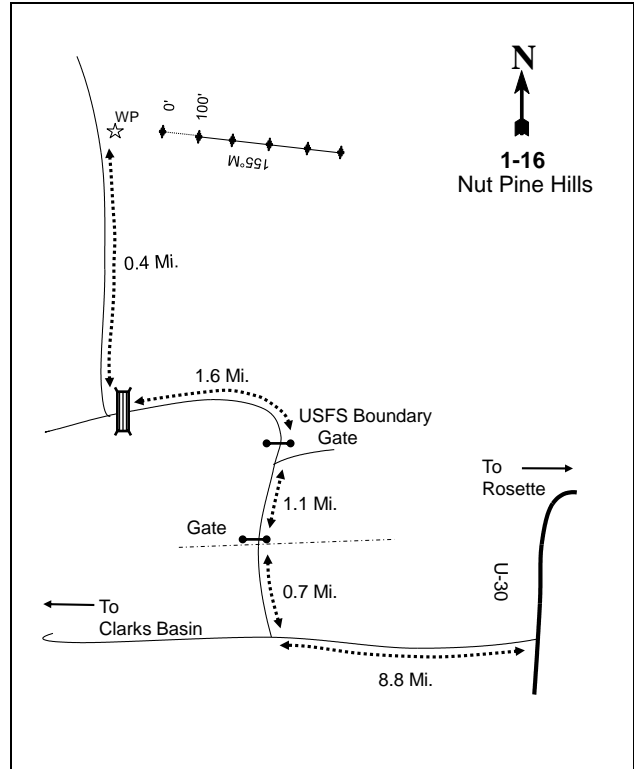
From U-30, travel the road to Clark's Basin for 8.8 miles. Turn right and travel 0.7 miles to a gate. Continue 1.1 miles to a gate marking the forest boundary. Continue 1.6 miles to another gate. Just after the cattleguard turn right and proceed 0.4 miles to a witness post. The zero foot stake is just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

Map Name: Dennis Hill



Township: 13N Range: 15W Section: 16

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 285907 E 4636548 N

NUT PINE HILLS - TREND STUDY NO. 1-16

Site Information

Site Description: The study monitors important deer winter range on the south slope of the Raft River Mountains. The area supports a mixed mountain brush community with scattered singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) trees. The area is administered by the Sawtooth National Forest as part of the Nut Pines Hills pasture in the Rosette allotment. Pellet groups have been sampled at moderately heavy to heavy abundance by deer since 2001. Deer were on the site at the time of sampling in 1996 and 2011. Sampled deer pellet groups are often fresh indicating spring and early summer presence. Presence by other wildlife species appears to be minimal. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The site is dominated by browse species. Sixteen shrub or tree species have been sampled on the site over the course of the study. Key species include Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and antelope bitterbrush (*Purshia tridentata*). The serviceberry is a moderately dense population comprised of mostly large, mature plants, though recruitment of young serviceberry plants is good. Vigor has been good and decadence moderate. Utilization of serviceberry has been light to moderate. Mountain big sagebrush is a moderately dense stand of lightly used plants. Utilization has been light and vigor good, though decadence has increased to moderate levels over the course of the study. Recruitment of young sagebrush plants has been mostly poor. Antelope bitterbrush is more abundant than the other preferred species, and has displayed moderate to heavy use. Vigor and decadence of bitterbrush are good, though recruitment of young plants has been somewhat poor. Mountain snowberry (*Symphoricarpos oreophilus*) is also one of the most abundant species on the site, but is not preferred and has shown light use. Other shrubs found include small numbers of black sagebrush (*Artemisia nova*), threadleaf rubber rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *consimilis*), mountain low rabbitbrush (*C. viscidiflorus* ssp. *lanceolatus*), slenderbush eriogonum (*Eriogonum microthecum*), broom snakeweed (*Gutierrezia sarothrae*), chokecherry (*Prunus virginiana*), wax currant (*Ribes cereum* ssp. *cereum*), Woods rose (*Rosa woodsii*), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics). A few tree size and high-lined curlleaf mahogany (*Cercocarpus ledifolius*) are found in the area, but have not been sampled. The density of the scattered juniper and pinyon trees has remained relatively stable (Table - Point-Quarter Tree Data), but juniper canopy cover has slightly increased since 2001 (Table - Canopy Cover).

Herbaceous Understory: Grasses are diverse, but only moderately abundant on the site. The more abundant species include thickspike wheatgrass (*Agropyron dasystachyum*), bluebunch wheatgrass (*A. spicatum*), and Sandberg bluegrass (*Poa secunda*). The annual species cheatgrass (*Bromus tectorum*) is present, but in very low numbers. Forbs are also diverse, and are fairly abundant. Several useful species are present including Wyoming paint cup (*Castilleja linariaefolia*), sulfur eriogonum (*Eriogonum umbellatum*), lambstongue groundsel (*Senecio integerrimus*), and lobeleaf groundsel (*S. multilobatus*) (Table - Herbaceous Trends). These and other forbs provide useful spring forage for big game.

Soil: The soil is in the Clavicon-Rock Outcrop complex, which occurs on hillslopes. Parent material consists of colluvium and residuum derived from limestone, chert, and dolomite (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a moderately alkaline soil reaction (pH 8.1) (Table - Soil Analysis Data). Vegetation and litter cover are abundant, which adequately protect the soil from serious erosion. Pavement is concentrated on the surface in isolated open interspaces (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2011, but slight in 2006.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** Density of serviceberry decreased by 23% from 860 plants/acre to 660 plants/acre, but cover increased from 4% to 8%. Density of mountain big sagebrush increased by 30% from 1,140 plants/acre to 1,480 plants/acre, and cover increased from 4% to 7%. Recruitment of young sagebrush plants decreased from 12% to 5% of the population. Bitterbrush density remained similar at 1,440 plants/acre, and cover increased from 12% to 16%.
- **2001 to 2006 - stable (0):** Density of mountain big sagebrush increased by 11% to 1,640 plants/acre, but cover remained similar at 7%. Density of serviceberry and bitterbrush remained similar at 680 plants/acre and 1,320 plants/acre, respectively. However, cover of serviceberry and bitterbrush decreased to 6% to 12%, respectively.
- **2006 to 2011 - slightly up (+1):** Density of bitterbrush increased by 48% to 1,960 plants/acre, though cover remained similar. Density of serviceberry and mountain big sagebrush remained similar at 620 plants/acre and 1,600 plants/acre, respectively. Cover of serviceberry remained similar at 6%, but cover of sagebrush decreased to 5%. Many of the browse species were just breaking dormancy due to the late, cold, and wet spring.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased by 19%, and cover increased from 6% to 15%. Cheatgrass decreased significantly in nested frequency, though cover remained similar at near 0%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover decreased to 7%.
- **2006 to 2011 - down (-2):** There was a 26% decrease in the sum of nested frequency of perennial grasses, and cover decreased slightly to 6%.

Forb:

- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 54%, though cover remained similar at 6%.
- **2001 to 2006 - up (+2):** There was a 50% increase in the sum of nested frequency of perennial forbs, and cover increased to 9%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 12%, and cover decreased to 5%.

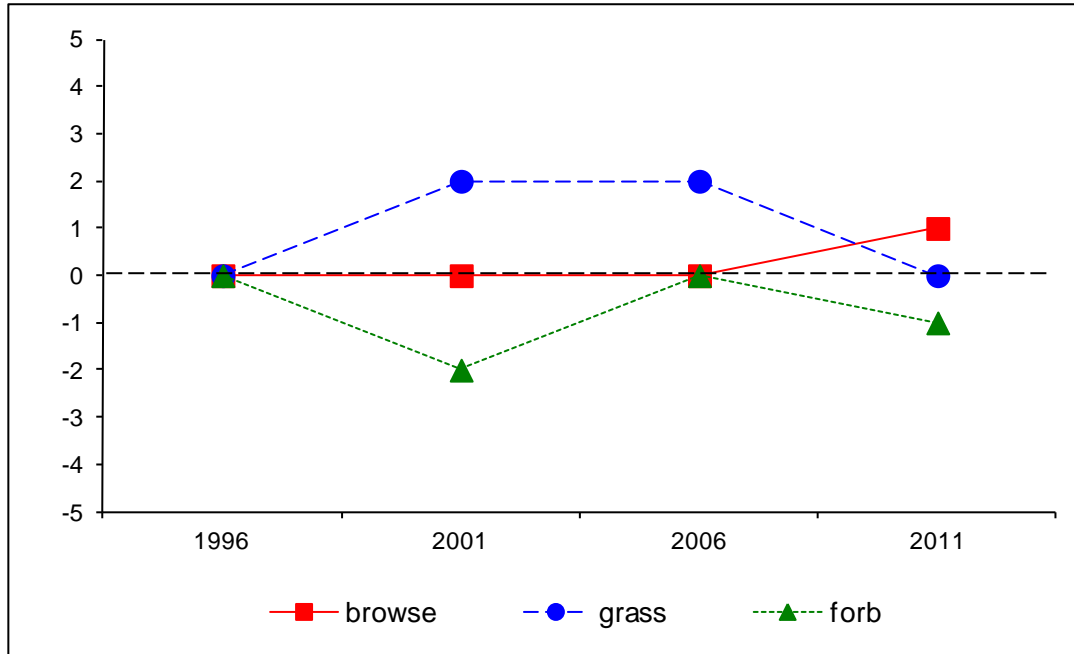
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 1, study no: 16

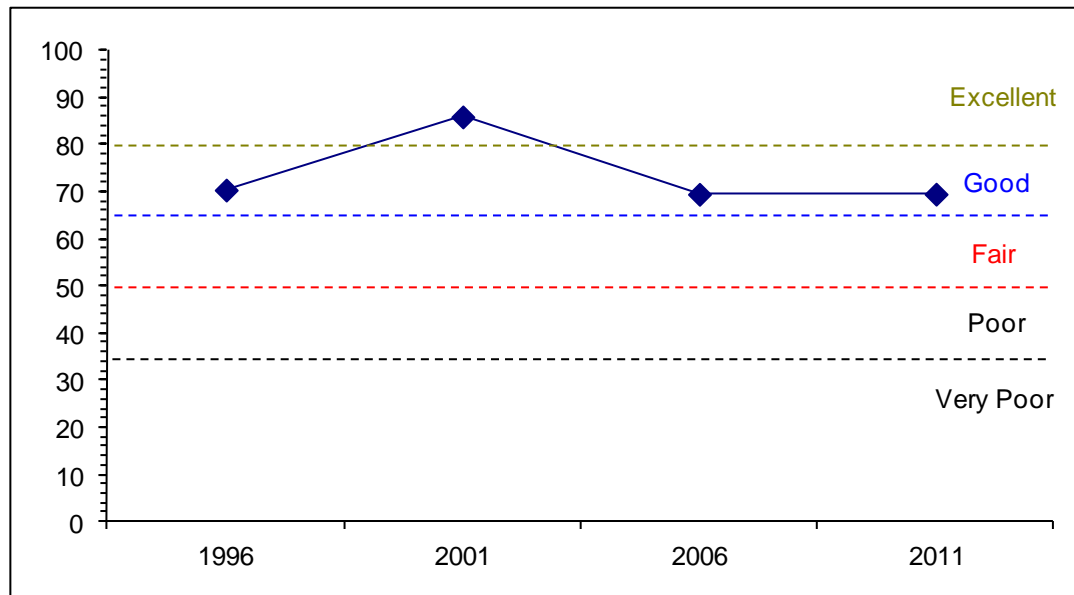
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	29.4	13.7	6.2	11.2	-0.1	10.0	0.0	70.4	Good
01	30.0	12.3	4.7	29.0	-0.1	10.0	0.0	85.9	Excellent
06	30.0	11.0	4.9	13.6	0.0	10.0	0.0	69.5	Good
11	30.0	12.8	4.6	12.8	0.0	9.4	0.0	69.5	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 16



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 16



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

T y p e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	ab140	b186	ab181	a116	.88	3.29	1.18	.99
G	Agropyron spicatum	141	123	104	117	2.15	5.65	2.59	3.23
G	Bromus tectorum (a)	b47	a11	a2	a-	.16	.19	.00	-
G	Carex sp.	-	-	2	3	-	-	.03	.15
G	Elymus cinereus	10	-	3	1	.04	.15	.03	.03
G	Koeleria cristata	c27	b10	bc18	a-	.37	.39	.22	-
G	Oryzopsis hymenoides	1	6	12	4	.03	.18	.33	.15
G	Poa fendleriana	b97	a27	a8	a6	1.71	.76	.33	.03
G	Poa pratensis	a-	bc43	b53	b26	-	.81	.44	.17
G	Poa secunda	a21	b123	b97	b79	.40	3.27	1.62	1.62
Total for Annual Grasses		47	11	2	0	0.15	0.18	0.00	0
Total for Perennial Grasses		437	518	478	352	5.61	14.51	6.81	6.39
Total for Grasses		484	529	480	352	5.76	14.70	6.82	6.39
F	Achillea millefolium	-	6	-	3	-	.06	-	.03
F	Agoseris glauca	b68	a5	b46	b62	.15	.02	.34	.44
F	Antennaria rosea	-	-	4	-	-	-	.01	-
F	Arabis sp.	5	-	8	-	.01	-	.02	-
F	Aster sp.	a17	b38	a12	ab22	.10	.44	.02	.07
F	Astragalus beckwithii	4	3	4	-	.00	.06	.00	-
F	Astragalus newberryi	6	-	-	-	.01	-	-	-
F	Astragalus utahensis	3	-	2	2	.03	-	.00	.00
F	Calochortus nuttallii	3	-	4	4	.00	-	.00	.01
F	Castilleja linariaefolia	4	-	-	-	.03	-	-	-
F	Chaenactis douglasii	b22	a8	a1	a1	.06	.01	.00	.00
F	Cirsium sp.	8	10	13	4	.06	.22	.19	.01
F	Collinsia parviflora (a)	c131	b59	a17	c120	.43	.38	.03	.27
F	Collomia linearis (a)	b16	b22	a-	a2	.03	.03	-	.00
F	Comandra pallida	b105	a57	a58	a49	.49	.61	1.00	.19
F	Crepis acuminata	31	17	24	23	.12	.53	.56	.12
F	Cryptantha sp.	c22	b5	ab9	a-	.22	.01	.02	-
F	Delphinium nuttallianum	a9	a2	a-	b44	.04	.00	-	.18
F	Descurainia pinnata (a)	b16	a-	a-	a2	.05	-	-	.01
F	Epilobium brachycarpum (a)	-	-	2	3	-	-	.00	.00
F	Erigeron pumilus	1	-	-	-	.00	-	-	-
F	Eriogonum cernuum (a)	10	-	-	-	.02	-	-	-
F	Eriogonum umbellatum	46	27	37	43	1.25	.87	1.27	.77
F	Erysimum asperum	3	-	9	-	.01	-	.04	-
F	Hackelia patens	c69	a15	bc58	ab40	.91	.17	2.07	.54
F	Haplopappus acaulis	b16	ab12	ab17	a5	.37	.18	.14	.03
F	Ipomopsis congesta	b21	a-	b20	a-	.09	-	.18	-
F	Lesquerella sp.	5	-	-	3	.01	-	-	.00
F	Linum lewisii	-	-	3	-	-	-	.04	-
F	Lithospermum ruderales	25	20	21	12	.41	.69	1.04	.20

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Lomatium sp.	21	16	13	20	.41	.40	.46	.89
F	Microsteris gracilis (a)	a ⁻	b ²⁶	a ⁻	a ²	-	.05	-	.00
F	Penstemon sp.	-	-	4	-	-	-	.03	-
F	Phlox austromontana	b ⁴⁴	ab ³³	b ³³	a ¹⁵	.30	.61	.36	.16
F	Phlox longifolia	b ⁸⁶	a ³¹	a ¹⁸	a ¹⁵	.18	.07	.04	.03
F	Polygonum douglasii (a)	7	2	2	-	.01	.00	.00	-
F	Ranunculus testiculatus (a)	-	1	-	4	-	.00	-	.01
F	Senecio integerrimus	ab ²⁰	a ⁸	a ⁹	b ²⁷	.40	.36	.07	.50
F	Senecio multilobatus	b ⁵⁹	a ¹⁹	b ⁵³	a ¹¹	.29	.22	.71	.08
F	Stellaria sp.	-	-	3	-	-	-	.01	-
F	Taraxacum officinale	5	4	3	9	.00	.03	.03	.07
F	Unknown forb-annual (a)	b ⁸	a ⁻	a ⁻	a ⁻	.02	-	-	-
F	Viola sp.	ab ²¹	a ⁶	bc ²⁹	c ³⁷	.07	.02	.19	.29
F	Zigadenus paniculatus	-	2	-	-	-	.03	-	-
Total for Annual Forbs		188	110	21	133	0.56	0.47	0.04	0.30
Total for Perennial Forbs		749	344	515	451	6.09	5.67	8.94	4.68
Total for Forbs		937	454	536	584	6.65	6.14	8.98	4.99

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	'11	'96	'01	'06	'11
B	Amelanchier utahensis	32	28	24	23	3.92	7.59	5.63	6.23
B	Artemisia nova	12	6	5	3	.01	.03	.15	1.07
B	Artemisia tridentata vaseyana	41	45	45	50	4.09	6.84	7.25	4.99
B	Chrysothamnus nauseosus consimilis	5	3	4	3	.00	.38	.41	.21
B	Chrysothamnus viscidiflorus lanceolatus	45	36	39	19	1.56	1.24	1.77	.16
B	Eriogonum microthecum	23	15	15	11	.32	.24	.49	.06
B	Gutierrezia sarothrae	11	4	3	0	.12	.15	-	-
B	Juniperus osteosperma	4	2	5	5	.71	.71	1.41	2.59
B	Mahonia repens	5	4	5	1	.04	.04	.18	.00
B	Opuntia sp.	3	1	3	4	.03	-	-	.03
B	Prunus virginiana	2	0	2	1	-	-	-	-
B	Purshia tridentata	48	46	44	54	11.98	16.20	12.44	11.69
B	Ribes cereum cereum	0	0	1	1	-	-	-	-
B	Rosa woodsii	2	3	2	3	-	.30	.33	.03
B	Symphoricarpos oreophilus	72	69	70	71	13.26	16.46	12.03	9.60
B	Tetradymia canescens	34	33	26	17	.67	.60	.53	.03
Total for Browse		339	295	293	266	36.76	50.82	42.65	36.72

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 16

Species	Percent Cover		
	'01	'06	'11
Amelanchier utahensis	-	6.23	7.40
Artemisia nova	-	.03	.05
Artemisia tridentata vaseyana	-	9.19	7.21
Chrysothamnus nauseosus consimilis	-	.76	1.03
Chrysothamnus viscidiflorus lanceolatus	-	2.46	-
Juniperus osteosperma	3.40	4.11	4.53
Pinus edulis	-	-	.71
Pinus monophylla	.40	.53	-
Purshia tridentata	-	18.08	17.48
Rosa woodsii	-	.05	.10
Symphoricarpos oreophilus	-	18.51	16.83
Tetradymia canescens	-	.63	.56

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 16

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier utahensis	1.0	1.6	0.5
Artemisia tridentata vaseyana	1.5	1.4	0.8
Purshia tridentata	1.0	2.9	0.2

POINT-QUARTER TREE DATA--

Management unit 01, Study no: 16

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	46	49	84	86	3.6	6.3	10.1	6.2
Pinus monophylla	20	78	21	25	7.9	8.5	11.7	10.6

BASIC COVER--

Management unit 01, Study no: 16

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	43.29	62.09	53.11	46.44
Rock	2.98	1.24	1.80	3.09
Pavement	3.84	6.13	13.86	5.53
Litter	45.58	47.65	41.45	50.30
Cryptogams	.13	.03	.09	.13
Bare Ground	12.81	13.35	12.71	12.73

SOIL ANALYSIS DATA --

Management unit 01, Study no: 16, Study Name: Nut Pine Hills

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
19.1	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	'11
Rabbit	2	3	20	5
Elk	-	-	-	-
Deer	22	9	18	18
Cattle	6	2	4	3

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	-	8 (20)
38 (94)	78 (193)	41 (101)
4 (9)	8 (20)	3 (7)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 16

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier utahensis									
96	860	26	65	9	-	40	14	0	36/42
01	660	18	64	18	20	12	24	6	38/42
06	680	26	47	26	40	9	6	3	44/46
11	620	16	81	3	-	32	6	0	47/51
Artemisia nova									
96	320	19	38	44	-	38	38	13	7/13
01	220	18	73	9	-	0	0	0	7/12
06	160	0	75	25	-	0	0	0	5/11
11	120	17	83	0	-	0	0	0	7/17
Artemisia tridentata vaseyana									
96	1140	12	84	4	20	19	4	0	19/29
01	1480	5	88	7	20	8	0	1	24/29
06	1640	5	84	11	20	16	0	6	23/34
11	1600	9	69	23	-	5	0	10	19/28
Cercocarpus ledifolius									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	46/45
Chrysothamnus nauseosus consimilis									
96	120	17	33	50	-	0	0	33	26/33
01	60	0	0	100	-	0	0	67	29/49
06	120	17	50	33	-	0	0	33	31/37
11	60	0	67	33	-	0	0	33	25/32
Chrysothamnus viscidiflorus lanceolatus									
96	1480	18	78	4	80	3	0	1	16/20
01	1160	2	95	3	-	0	0	3	14/18
06	1200	3	93	3	-	0	0	2	14/22
11	460	17	57	26	-	0	4	17	13/16

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Eriogonum microthecum</i>									
96	660	15	85	0	20	0	0	0	5/8
01	440	14	77	9	-	0	0	0	5/9
06	340	0	76	24	-	6	0	6	6/11
11	400	10	90	0	-	0	0	0	4/8
<i>Gutierrezia sarothrae</i>									
96	1180	34	64	2	180	0	0	0	4/4
01	380	42	58	0	-	0	0	0	3/5
06	80	0	75	25	-	0	0	25	6/10
11	0	0	0	0	-	0	0	0	-/-
<i>Juniperus osteosperma</i>									
96	140	57	43	-	-	0	0	0	-/-
01	40	50	50	-	20	0	0	0	-/-
06	100	40	60	-	20	0	0	0	-/-
11	100	40	60	-	20	0	0	0	-/-
<i>Mahonia repens</i>									
96	440	100	0	-	-	0	0	0	3/3
01	180	44	56	-	-	0	0	0	2/2
06	260	0	100	-	-	0	0	0	2/4
11	20	0	100	-	-	0	0	0	-/-
<i>Opuntia sp.</i>									
96	100	0	80	20	-	0	0	0	5/16
01	20	0	100	0	-	0	0	0	4/10
06	60	0	100	0	-	0	0	0	4/15
11	80	0	100	0	-	0	0	0	4/11
<i>Prunus virginiana</i>									
96	40	100	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	60	0	33	67	-	0	0	0	-/-
11	20	0	100	0	-	0	0	0	39/20
<i>Purshia tridentata</i>									
96	1480	8	89	3	100	39	55	1	23/49
01	1440	7	88	6	40	21	35	4	25/48
06	1320	6	85	9	80	44	20	6	29/58
11	1960	5	91	4	60	33	27	4	26/45
<i>Ribes cereum cereum</i>									
96	0	0	0	-	-	0	0	0	4/62
01	0	0	0	-	-	0	0	0	-/-
06	20	0	100	-	-	0	0	0	55/61
11	20	0	100	-	-	0	0	0	43/69

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Rosa woodsii</i>										
96	60	33	67	-	20	0	100	0	10/4	
01	80	25	75	-	-	0	0	0	17/18	
06	80	0	100	-	-	0	0	0	29/10	
11	60	0	100	-	-	0	33	0	22/7	
<i>Symphoricarpos oreophilus</i>										
96	4840	23	77	0	80	7	0	0	18/29	
01	3980	16	82	2	-	0	0	0	19/32	
06	5700	24	73	3	-	0	3	2	19/29	
11	4540	11	89	0	-	0	0	.44	13/21	
<i>Tetradymia canescens</i>										
96	1040	27	67	6	20	0	0	0	8/11	
01	1020	8	90	2	-	0	0	0	9/10	
06	720	14	47	39	-	0	0	11	11/16	
11	460	17	70	13	-	35	9	13	9/14	

CLARK'S BASIN - TREND STUDY NO. 1-17-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Summer (Fawning habitat)

NRCS Ecological Site Description: [Upland Shallow Loam \(Black Sagebrush\), R025XY316UT](#)

Land Ownership: USFS

Elevation: 6,860 ft. (2,091 m)

Aspect: South

Slope: 3-5%

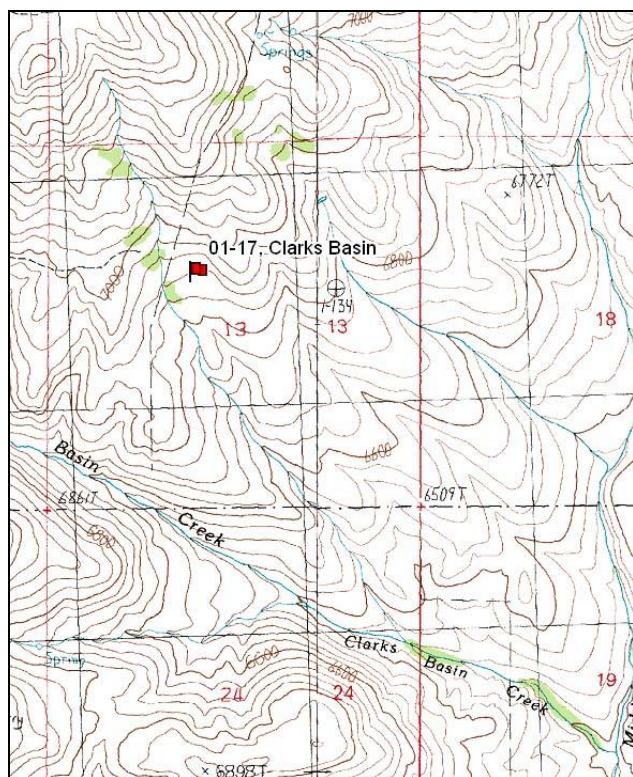
Transect bearing: 100° magnetic

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

Directions:

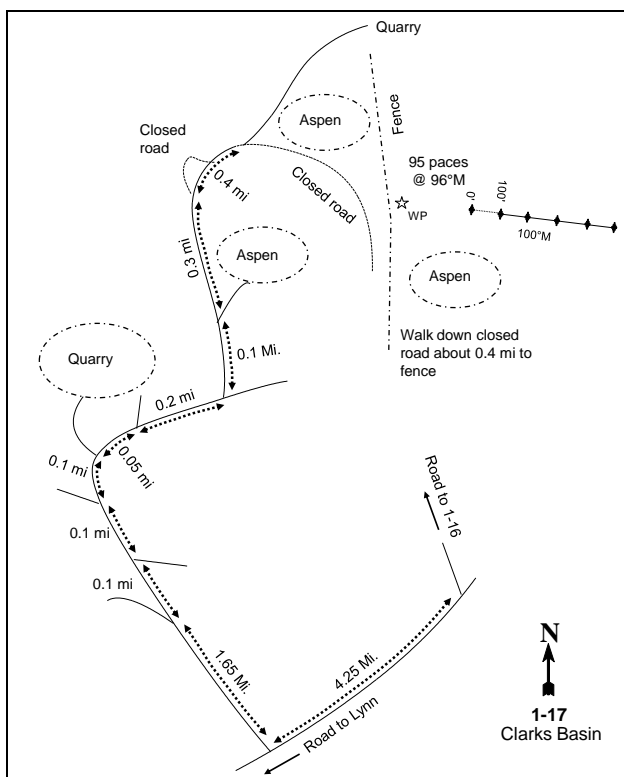
From U-30, travel up the road towards Lynn to Clark's Basin for 13.05 miles. Take a right and drive 1.65 miles to a fork in the road. Stay right and continue for another 0.35 on the main road to a quarry. Stay right (far right) and continue for 0.2 miles. Take a left turn and proceed 0.4 miles to a wet meadow and a spring where the road has 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:



GPS: NAD 83, UTM 12S 281472 E 4636746 N

CLARK'S BASIN - TREND STUDY NO. 1-17

Site Information

Site Description: The study samples a mixed mountain brush community near an aspen clone in the Clark's Basin area. The study is located on a bench between a ridge to the north and Clark's Basin Creek to the south. The area is considered important fawning habitat for deer. This area is administered by the Sawtooth National Forest as part of the Rosette allotment. The fence just to the west of the site divides this allotment from the Clark's Basin allotment. Water is readily available in nearby springs and livestock water developments. There was standing water on parts of the study in 2011 due to the late, wet, and cold spring. This area of the study is characterized as a wet meadow, and is dominated by herbaceous species. Deer pellet groups were sampled in moderate abundance in 2001 and 2006, but low abundance in 2011. Presence by other wildlife species appears to be minimal. Sampled cattle and sheep sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The site is a mixed mountain brush community with a good grass and forb understory. Several preferred browse species occupy the site including Utah serviceberry (*Amelanchier utahensis*), black sagebrush (*Artemisia nova*), mountain big sagebrush (*A. tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and Woods rose (*Rosa woodsii*). The dominant browse is mountain big sagebrush, which provides the majority of browse cover (Table - Browse Trends). Mountain big sagebrush has a moderately dense population of mostly lightly used plants. Decadence and poor vigor have increased throughout the study, and both were moderate in 2011. The moderately dense population of serviceberry displays moderate to heavy use. The small population of antelope bitterbrush has steadily increased in density over the course of the study. Utilization of these shrubs has been moderate to heavy. Decadence and poor vigor of serviceberry and bitterbrush have decreased, and both were low in 2011. Some black sagebrush occurs in patches along sampling belts 3 and 4 at moderate density, and displays mostly light use. Less preferred browse species sampled include rubber rabbitbrush (*Chrysothamnus nauseosus*), mountain low rabbitbrush (*C. viscidiflorus* spp. *lanceolatus*), Oregon grape (*Mahonia repens*), mountain snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is diverse and abundant. Grass composition is comprised of native perennial species, including several wet meadow species. The dominant species include thickspike wheatgrass (*Agropyron dasystachyum*), Kentucky bluegrass (*Poa pratensis*), and Sandberg bluegrass (*P. secunda*). Forbs are very diverse and abundant. Several useful species occur including Wyoming painted-cup (*Castilleja linariaefolia*), silvery lupine (*Lupinus argenteus*), lambstongue groundsel (*Senecio integerrimus*), sulfur eriogonum (*Eriogonum umbellatum*), and low penstemon (*Penstemon humilus*) (Table - Herbaceous Trends).

Soil: The soil is in the Bullump-Sonlet-Rodrof association, likely as part of the Bullump component. These soils occur on drainage ways, with parent material consisting of colluvium and alluvium derived from quartzite and mica schist (Soil Survey Staff 2011). Soil texture is a clay loam with a neutral reaction (pH 6.8) (Table - Soil Analysis Data). There is abundant vegetation and litter cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2006, but was slight in 2011.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** There was a high number of dead sagebrush in 1996, along the first 200 feet of the baseline, which appear to have died several years prior to study establishment. Density of sagebrush decreased 9% from 3,500 plants/acre to 3,180 plants/acre, but cover increased from 17% to 20%. Black sagebrush increased 41% from 1,560 plants/acre to 2,200 plants/acre, but cover remained similar at 4%. Decadence of serviceberry decreased from 41% to 7%, and poor vigor decreased from

18% to 0%. Decadence of bitterbrush decreased from 33% to 18%, and poor vigor decreased from 14% to 5%.

- **2001 to 2006 - stable (0):** Density and cover of preferred browse species remained similar. Decadence of black sagebrush increased from 7% to 23%, and decadence of mountain big sagebrush increased from 8% to 19%.
- **2006 to 2011 - stable (0):** Mountain big sagebrush increased 21% in density from 3,180 plants/acre to 3,840 plants/acre, but cover decreased from 20% to 14%. Decadence of mountain big sagebrush increased to 25%, and poor vigor increased from 10% to 23%. Other preferred browse species had similar densities and covers. Many of the browse species were just coming out of dormancy due to the late, wet, and cold spring.

Grass:

- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased from 14% to 21%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 12%, and cover decreased to 10%.
- **2006 to 2011 - stable (0):** There was a slight decrease in the sum of nested frequency of perennial grasses, but cover increased to 19%.

Forb:

- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 15%, though cover increased from 8% to 13%.
- **2001 to 2006 - slightly up (+1):** The perennial forb sum of nested frequency increased by 11%, but cover remained similar at 13%.
- **2006 to 2011 - slightly up (+1):** There was a 10% increase in the sum of nested frequency of perennial forbs, but cover decreased to 8%.

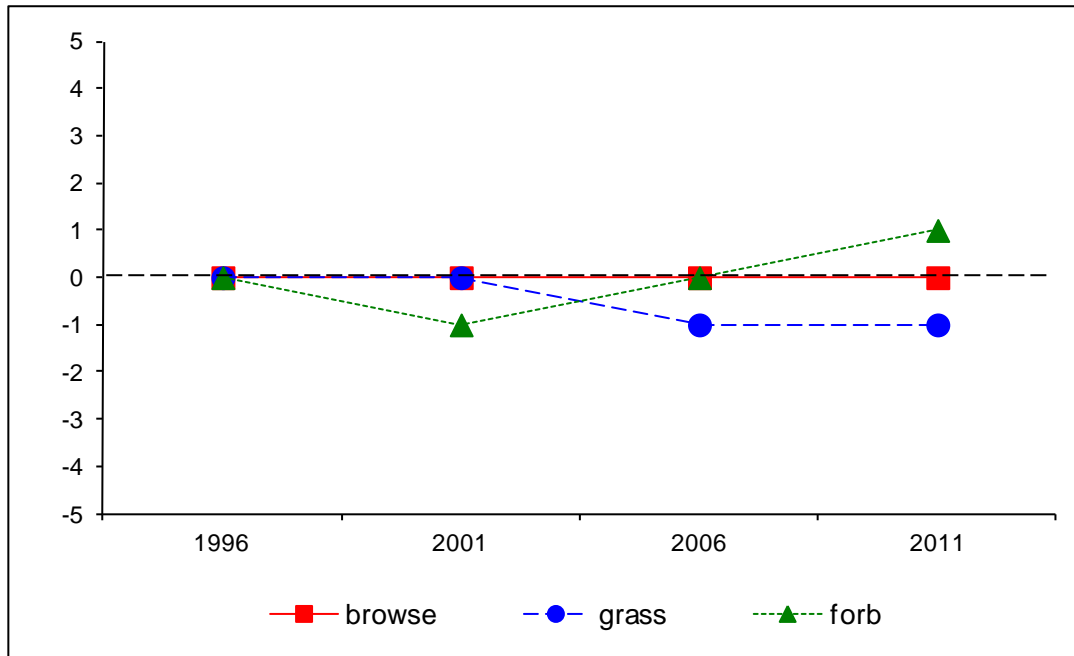
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 1, study no: 17

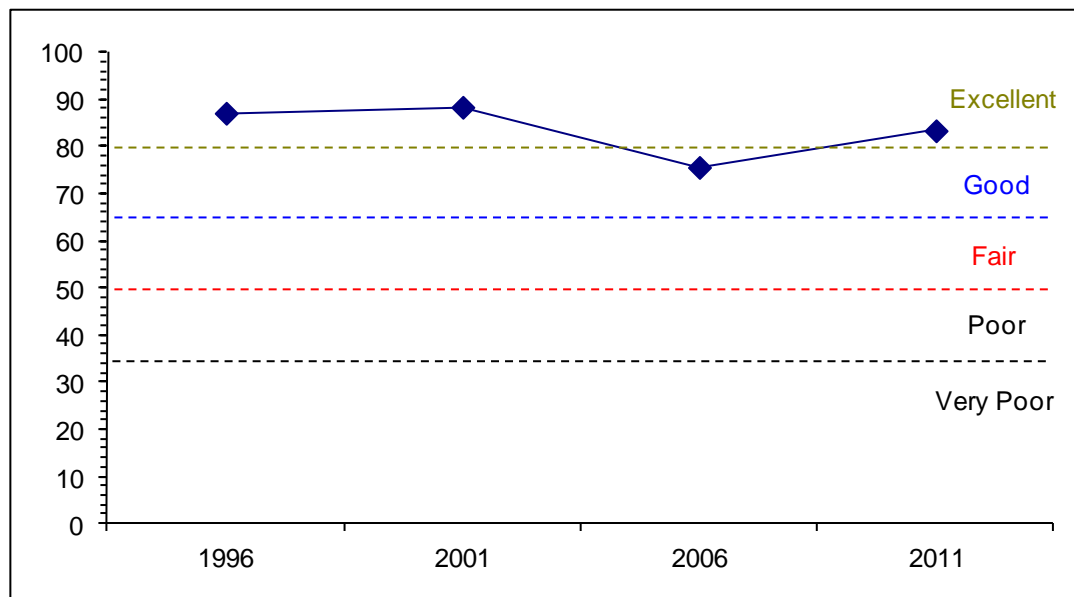
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	13.2	5.2	28.7	0.0	10.0	0.0	87.1	Excellent
01	30.0	12.6	5.8	30.0	0.0	10.0	0.0	88.4	Excellent
06	30.0	10.3	5.6	19.7	0.0	10.0	0.0	75.6	Good
11	29.1	10.3	4.1	30.0	0.0	10.0	0.0	83.4	Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 17



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 17



HERBACEOUS TRENDS--
Management unit 01, Study no: 17

T y p e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	bc279	c299	ab233	a202	6.03	7.03	2.67	3.15
G	Agropyron spicatum	46	24	22	29	1.37	1.22	.60	1.08
G	Bromus tectorum (a)	17	25	17	4	.06	.06	.03	.01
G	Carex douglasii	c52	b25	bc28	a-	1.12	1.00	.18	-
G	Carex sp.	-	8	3	3	-	.18	.18	.15
G	Elymus cinereus	-	4	2	7	-	.98	.38	.78
G	Juncus balticus	a-	a-	b24	b23	-	-	.62	.42
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	a49	b159	b150	b172	1.04	5.79	3.45	6.01
G	Poa secunda	b216	a148	a116	a126	4.51	3.81	1.31	7.42
Total for Annual Grasses		17	25	17	4	0.06	0.06	0.03	0.00
Total for Perennial Grasses		656	697	613	562	14.36	20.69	9.86	19.02
Total for Grasses		673	722	630	566	14.42	20.75	9.89	19.03
F	Achillea millefolium	a62	a53	b78	a55	.57	.79	1.31	.49
F	Agoseris glauca	ab112	a48	b87	b125	.69	.40	.61	1.00
F	Allium sp.	a22	bc92	b79	c132	.06	.42	.19	.55
F	Antennaria rosea	-	1	6	10	-	.03	.06	.04
F	Arabis sp.	8	-	6	1	.02	-	.02	.00
F	Aster sp.	a178	b192	a166	a66	2.19	5.29	3.84	.66
F	Astragalus beckwithii	1	3	-	-	.03	.04	.00	-
F	Astragalus cibarius	8	18	6	8	.39	.08	.07	.04
F	Astragalus convallarius	-	2	8	-	-	.15	.07	-
F	Astragalus sp.	5	-	3	-	.06	-	.03	-
F	Balsamorhiza sagittata	-	-	-	-	-	-	.03	-
F	Calochortus nuttallii	4	-	-	4	.01	-	-	.01
F	Castilleja linariaefolia	1	6	-	-	.03	.30	-	-
F	Cirsium sp.	a3	ab11	b25	ab9	.07	.31	.19	.08
F	Collinsia parviflora (a)	c287	b228	a121	b206	2.28	2.41	.39	1.28
F	Collomia linearis (a)	c85	ab24	bc49	a13	.20	.06	.12	.03
F	Comandra pallida	a15	b50	ab23	a18	.06	.66	.20	.04
F	Crepis acuminata	3	8	12	6	.00	.07	.56	.16
F	Crepis intermedia	b10	a-	a-	a-	.05	-	-	-
F	Cryptantha sp.	7	-	15	3	.01	-	.03	.01
F	Cymopterus sp.	12	-	3	3	.04	-	.03	.00
F	Cynoglossum officinale	1	-	-	-	.03	-	-	-
F	Delphinium nuttallianum	a7	a17	a9	b71	.02	.06	.02	.42
F	Delphinium occidentale	ab2	a1	bc18	c21	.03	.00	.14	.05
F	Epilobium brachycarpum (a)	a-	a-	c122	b6	-	-	2.23	.02
F	Equisetum sp.	4	3	4	-	.01	.00	.01	-
F	Eriogonum umbellatum	16	12	1	10	.12	.39	.15	.08

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Galium bifolium (a)	a-	a-	a11	b29	-	-	.07	.38
F	Gayophytum ramosissimum(a)	a-	b23	a-	a1	-	.04	-	.00
F	Geranium sp.	a1	a1	a2	b20	.01	.03	.00	.22
F	Gilia sp. (a)	-	1	-	-	-	.00	-	-
F	Hackelia patens	10	2	4	13	.04	.03	.33	.22
F	Hydrophyllum capitatum	a-	a-	b45	b57	-	-	.66	.85
F	Hymenoxys acaulis	b41	b35	a-	a-	.39	.93	-	-
F	Iva axillaris	a-	a-	b13	a-	-	-	.49	-
F	Lithophragma parviflora	-	-	4	4	-	-	.00	.01
F	Lithospermum ruderales	-	-	4	2	-	-	.19	.03
F	Lomatium triternatum	2	16	-	10	.01	.30	-	.04
F	Lupinus argenteus	a4	ab6	b21	ab16	.19	.40	.62	.06
F	Lupinus sp.	-	-	-	7	-	-	-	.01
F	Machaeranthera spp	b53	a3	a-	a-	.10	.00	-	-
F	Microsteris gracilis (a)	a-	d87	b9	c35	-	.18	.02	.10
F	Nemophila breviflora (a)	a-	a-	b28	b32	-	-	.32	.36
F	Penstemon humilis	ab7	a6	ab12	b25	.01	.16	.12	.39
F	Phlox longifolia	68	75	68	42	.36	.27	.26	.22
F	Polygonum douglasii (a)	a9	a10	b110	a13	.02	.02	.33	.05
F	Ranunculus inamoenus	a-	a-	a-	b9	-	-	-	.08
F	Schoenocrambe linifolia	-	1	-	-	-	.03	-	-
F	Sedum lanceolatum	-	-	3	-	-	-	.00	-
F	Senecio integerrimus	ab77	a40	b79	b93	1.19	.62	1.73	1.09
F	Senecio multilobatus	-	2	-	-	-	.00	-	-
F	Taraxacum officinale	bc30	c43	ab14	a4	.16	.21	.05	.01
F	Tragopogon dubius (a)	3	2	-	10	.01	.18	-	.05
F	Trifolium sp.	-	4	-	-	-	.00	-	-
F	Unknown forb-annual (a)	3	-	-	-	.15	-	-	-
F	Unknown forb-perennial	b32	a-	a-	a-	.22	-	-	-
F	Veronica biloba (a)	a3	ab29	c148	b47	.03	.13	.93	.18
F	Viguiera multiflora	b70	a3	a-	a-	.14	.03	-	-
F	Viola sp.	ab15	a6	b33	c93	.35	.01	.18	.56
F	Wyethia amplexicaulis	4	3	1	-	.18	.18	.00	-
F	Zigadenus paniculatus	14	12	11	14	.12	.23	.32	.07
Total for Annual Forbs		390	404	598	392	2.71	3.03	4.42	2.48
Total for Perennial Forbs		909	775	863	951	8.02	12.49	12.59	7.56
Total for Forbs		1299	1179	1461	1343	10.73	15.53	17.01	10.05

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	'11	'96	'01	'06	'11
B	Amelanchier utahensis	16	15	15	13	1.56	2.82	2.72	3.04
B	Artemisia nova	16	21	26	27	3.40	4.13	2.21	3.00
B	Artemisia tridentata vaseyana	76	73	73	76	17.25	20.02	20.17	13.65
B	Chrysothamnus nauseosus	2	3	1	0	-	.03	.03	-
B	Chrysothamnus viscidiflorus lanceolatus	38	39	40	19	1.82	1.41	2.70	.18
B	Mahonia repens	3	8	15	10	.01	.87	.96	.19
B	Purshia tridentata	18	19	26	27	1.07	1.78	2.07	2.10
B	Rosa woodsii	10	12	11	10	.51	.87	.60	.43
B	Symphoricarpos oreophilus	58	56	64	66	6.44	4.87	5.77	6.23
B	Tetradymia canescens	3	3	2	3	-	.38	-	.03
Total for Browse		132	140	159	135	32.10	37.22	37.26	28.87

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 17

Species	Percent Cover	
	'06	'11
Amelanchier utahensis	3.25	3.59
Artemisia nova	4.59	3.45
Artemisia tridentata vaseyana	25.10	18.61
Chrysothamnus nauseosus	.15	-
Chrysothamnus viscidiflorus lanceolatus	2.00	.10
Mahonia repens	.45	.23
Purshia tridentata	5.15	7.33
Rosa woodsii	.33	.63
Symphoricarpos oreophilus	8.55	12.26
Tetradymia canescens	-	.20

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 17

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier utahensis	2.1	2.1	0.6
Artemisia tridentata vaseyana	2.0	1.5	1.9
Purshia tridentata	2.9	0.8	0.2

BASIC COVER--

Management unit 01, Study no: 17

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	55.89	68.40	56.25	52.43
Rock	2.41	2.63	2.47	1.87
Pavement	2.48	2.58	2.78	2.54
Litter	52.18	51.50	40.47	45.13
Cryptogams	.31	.22	.10	.06
Bare Ground	9.58	7.31	14.65	16.46

SOIL ANALYSIS DATA --

Management unit 01, Study no: 17, Study Name: Clark's Basin

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
20.5	6.8	31.7	35.0	33.3	3.3	24.2	553.6	0.5

PELLET GROUP DATA--

Management unit 01, Study no: 17

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	2	1	9	-	-	-	-
Elk	-	-	1	-	-	-	1 (3)
Deer	4	10	13	8	34 (84)	31 (76)	10 (25)
Cattle	6	2	4	2	2 (5)	11 (27)	12 (30)
Sheep	-	-	-	-	-	6 (15)	9 (23)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 17

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier utahensis									
96	340	24	35	41	-	65	18	18	27/32
01	300	27	67	7	-	27	27	0	34/39
06	300	20	80	0	280	33	20	0	37/42
11	300	0	100	0	-	33	20	0	43/48
Artemisia nova									
96	1560	5	92	3	-	72	14	3	9/19
01	2200	5	87	7	240	0	0	4	8/18
06	2160	25	52	23	2140	8	.92	10	10/19
11	2440	32	65	3	200	2	0	3	10/20
Artemisia tridentata vaseyana									
96	3500	9	89	2	100	26	.57	.57	20/30
01	3180	9	82	8	300	.62	.62	3	22/33
06	3180	9	72	19	780	8	4	10	23/35
11	3840	6	69	25	40	4	2	23	21/33

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Chrysothamnus nauseosus									
96	40	0	50	50	-	50	50	0	15/19
01	80	25	75	0	-	0	25	0	20/21
06	40	0	0	100	-	0	0	100	-/-
11	0	0	0	0	-	0	0	0	-/-
Chrysothamnus viscidiflorus lanceolatus									
96	1600	9	85	6	40	19	0	0	13/18
01	1520	7	83	11	20	0	0	0	12/15
06	1440	7	86	7	-	0	0	3	13/20
11	480	0	79	21	-	8	17	8	11/15
Eriogonum microthecum									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	6/17
11	0	0	0	-	-	0	0	0	-/-
Mahonia repens									
96	100	0	100	-	-	0	0	0	3/4
01	1820	20	80	-	-	0	0	0	6/7
06	2620	0	100	-	-	0	0	0	5/5
11	600	0	100	-	-	27	0	0	5/6
Opuntia sp.									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	5/17
Purshia tridentata									
96	420	5	62	33	-	38	48	14	17/28
01	440	18	64	18	-	36	45	5	19/40
06	640	0	100	0	60	28	66	0	19/43
11	720	0	100	0	-	25	31	3	21/40
Ribes sp.									
96	0	0	0	-	-	0	0	0	11/26
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	42/42
Rosa woodsii									
96	780	67	33	0	-	0	0	0	19/17
01	1020	47	53	0	-	0	0	0	15/13
06	640	34	63	3	-	3	0	0	22/21
11	1300	5	95	0	-	0	0	0	16/16

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Symphoricarpos oreophilus</i>										
96	2920	25	72	3	200	17	1	.68	16/27	
01	2060	15	76	10	40	.97	0	6	14/26	
06	3660	30	69	2	-	0	0	.54	14/26	
11	3500	5	95	0	-	2	0	0	15/26	
<i>Tetradymia canescens</i>										
96	100	0	100	0	-	60	0	0	15/18	
01	140	29	43	29	-	0	0	14	10/12	
06	60	0	67	33	120	0	0	0	13/19	
11	60	0	67	33	-	0	67	33	15/27	

BEDKE SPRING - TREND STUDY NO. 1-18-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Substantial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Semidesert Shallow Hardpan \(8-10 Ppt\), R028AY231UT](#)

Land Ownership: BLM

Elevation: 5,500 ft. (1,676 m)

Aspect: West

Slope: 5%

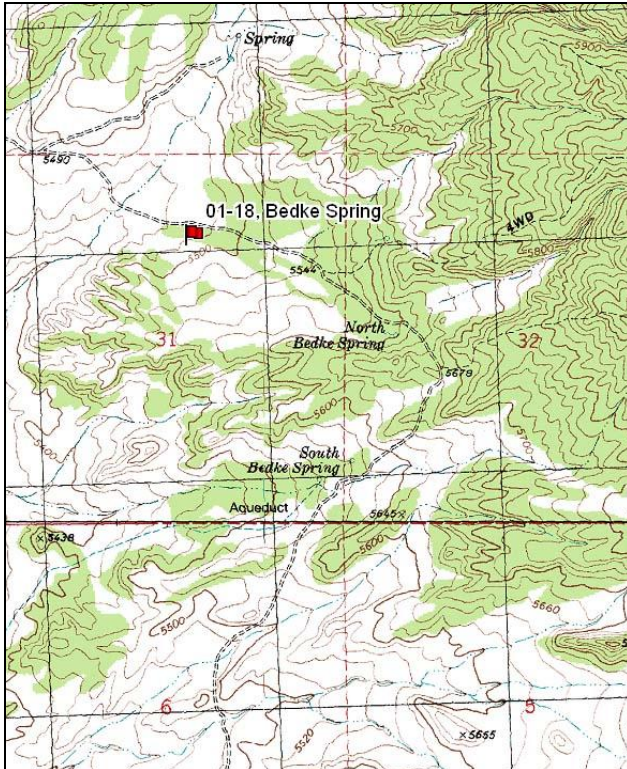
Transect bearing: 110° magnetic

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

Directions:

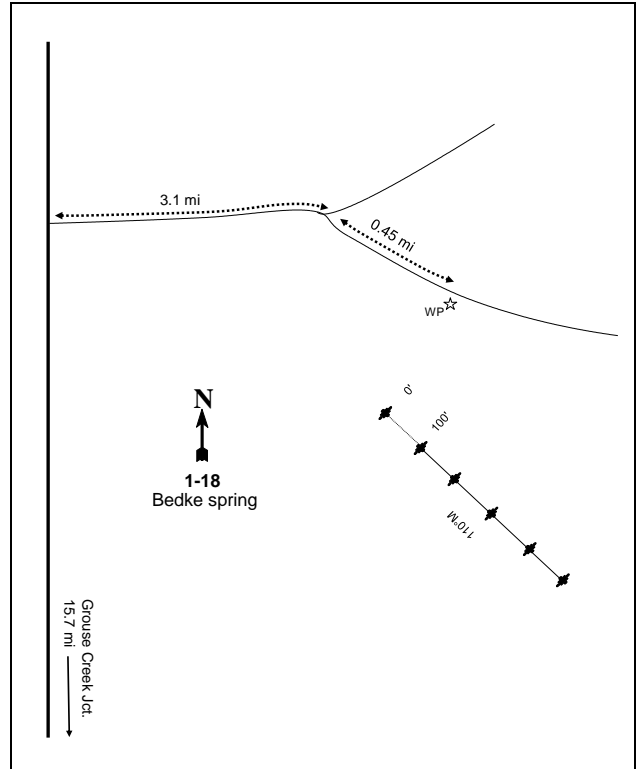
From the Grouse Creek Junction on U-30 travel north for 15.7 miles. Turn right and travel east for 3.1 miles. Stay right and continue 0.45 miles to a witness post on the right hand side of the road. The baseline is approximately 300 feet in a southerly direction on a small bench. The baseline runs 110 degrees magnetic.

Map Name: Ingham Canyon



Township: 11N Range: 17W Section: 31

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 263597 E 4613230 N

Site Information

Site Description: The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) flat surrounded by Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) located just west of North Bedke Spring. The area is managed by the Bureau of Land Management (BLM) as part of the Red Butte allotment. Deer pellet groups have been sampled in low abundance since 2001. Sampled cattle sign has been minimal since 2001. Quadrat frequency of rabbit pellets was high in 2006 (Table - Pellet Group Data).

Browse: Wyoming big sagebrush is the dominant browse species, but has been in a state of decline since 1996. Wyoming big sagebrush has steadily decreased in both cover (Table - Browse Trends) and density since the outset of the study. Decadence is moderate within the sagebrush population, but has been high at times. Poor vigor is moderately high, and recruitment has been poor in most sample years. The increaser species narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) is nearly as dominant as sagebrush, but has also decreased over the course of the study. Other shrubs contributing additional forage include shadscale (*Atriplex confertifolia*), black sagebrush (*Artemisia nova*), and a few scattered spiny hopsage (*Grayia spinosa*). Utilization of these shrubs is light with the exception of a few heavily hedged spiny hopsage. Black greasewood (*Sarcobatus vermiculatus*) and threadleaf rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *consimilis*) are increaser species that also occur on the site, but are not abundant (Table - Browse Characteristics).

Herbaceous Understory: For a Wyoming big sagebrush community, perennial grasses are fairly diverse and abundant. The most abundant perennial species consist of Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Agropyron spicatum*), western wheatgrass (*A. smithii*), crested wheatgrass (*A. cristatum*), and bottlebrush squirreltail (*Sitanion hystrix*). Since the establishment of the study, western wheatgrass and crested wheatgrass abundance has increased, and bottlebrush squirreltail abundance has decreased. The annual species cheatgrass (*Bromus tectorum*) is prevalent on the site, and has at times been the dominant species in cover. The forb composition is also diverse and abundant, though nearly all of the forb cover is provided by the low growing species Hoods phlox (*Phlox hoodii*) (Table - Herbaceous Trends).

Soil: The soil is in the Puett-Plegomir gravelly loams, likely as part of the Plegomir component. These soils occur on hillslopes, with parent material consisting of alluvium derived from limestone and quartzite (Soil Survey Staff 2011). Soil texture is a clay loam with a slightly alkaline soil reaction (pH 7.7). Phosphorus may have limited availability for plant growth and development at 5.4 ppm (Tiedemann and Lopez 2004). The soil is light colored in the interspaces with little organic matter buildup in the surface horizon (Table - Soil Analysis Data). There are large areas of unprotected bare soil in the interspaces. However, vegetation litter has steadily increased over the course of the study (Table - Basic Cover). Water movement is evident on the surface and soil is pedestalled underneath shrubs. The soil erosion condition was classified as slight to moderate in 2001, slight in 2006, and stable in 2011.

Trend Assessments

Browse:

- **1996 to 2001 - slightly down (-1):** The density of Wyoming big sagebrush decreased 24% from 3,360 plants/acre to 2,540 plants/acre, and cover decreased from 8% to 7%. Decadence increased from 26% to 35%, and poor vigor increased from 5% to 14%. Shadscale increased 74% from 1,160 plants/acre to 2,020 plants/acre. The increaser species narrowleaf rabbitbrush decreased 42% in density from 6,600 plants/acre to 3,820 plants/acre, and cover decreased from 7% to 3%.
- **2001 to 2006 - down (-2):** The density of Wyoming big sagebrush decreased 19% to 2,060 plants/acre, and cover decreased to 5%. Decadence of sagebrush increased to 41%, and poor vigor

increased to 25%. Shadscale density decreased 20% to 1,620 plants/acre, though cover increased to 3%.

- **2006 to 2011 - down (-2):** Wyoming big sagebrush density decreased by 42% to 1,200 plants/acre, though cover remained similar. Decadence decreased to 22%, but poor vigor remained similar at 25%. Shadscale decreased 52% in density to 780 plants/acre, but cover remained similar at 2%. Decadence of shadscale increased from 12% to 26%, and poor vigor increased from 10% to 26%.

Grass:

- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 10%, but cover increased from 6% to 7%. Cheatgrass increased significantly in nested frequency, and cover increased from less than 1% to 4%.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased to 9%. Cheatgrass remained similar in frequency, but cover increased to 7%.
- **2006 to 2011 - slightly up (+1):** The perennial grass sum of nested frequency increased 15%, and cover increased to 12%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 4%.

Forb:

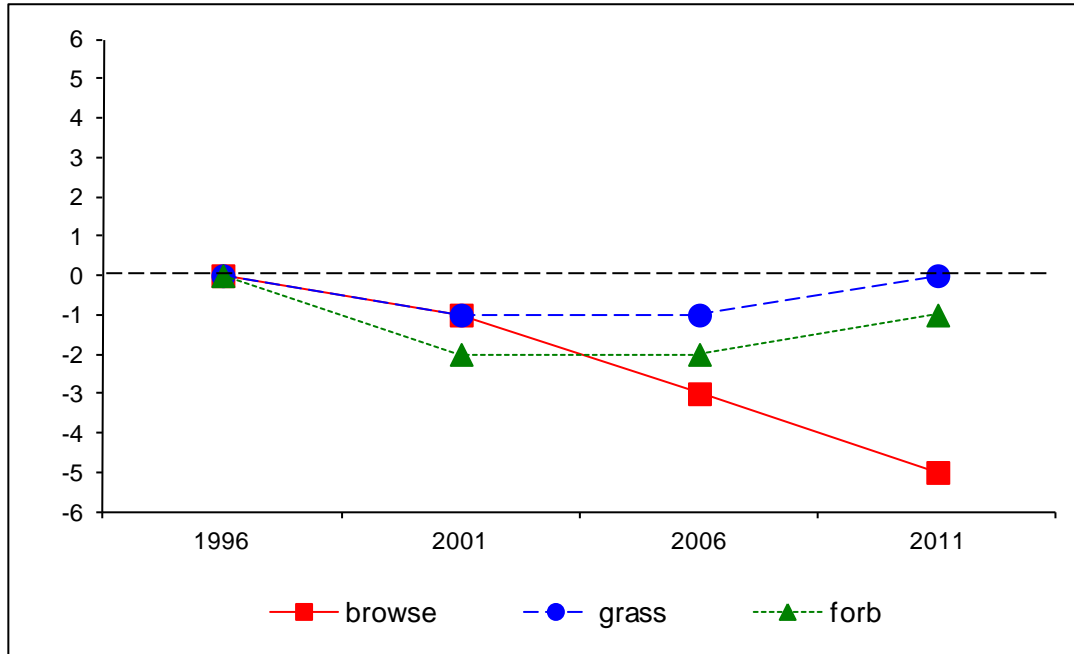
- **1996 to 2001 - down (-2):** The perennial forb sum of nested frequency decreased by 20%, but cover increased slightly from 8% to 10%. There was also a substantial increase in the sum of nested frequency and cover of annual forbs.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 14%, but cover decreased slightly to 9%. The sum of nested frequency of annual forbs and cover increased substantially.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 1, study no: 18

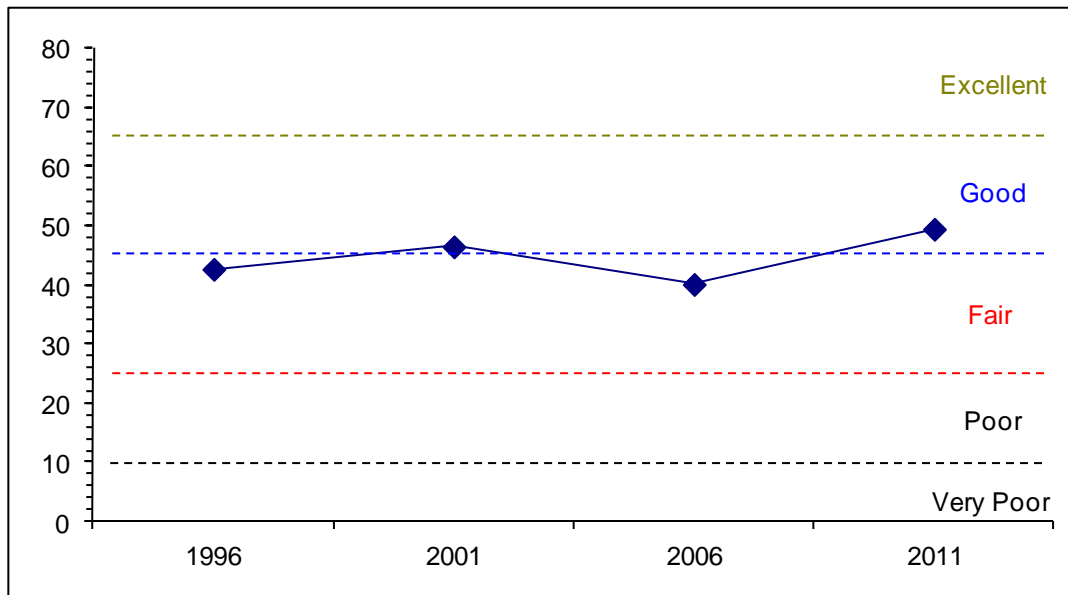
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	11.0	6.9	4.0	11.0	-0.2	10.0	0.0	42.7	Fair
01	9.9	6.0	10.1	13.1	-2.6	10.0	0.0	46.5	Fair-Good
06	8.6	5.6	4.2	17.1	-5.4	10.0	0.0	40.1	Fair
11	8.1	8.2	3.2	23.2	-3.2	10.0	0.0	49.4	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 18



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 18



HERBACEOUS TRENDS--
Management unit 01, Study no: 18

T y p e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a7	a11	a14	b53	.30	.10	.72	1.25
G	Agropyron smithii	ab30	a21	c85	bc63	.19	.12	.82	.83
G	Agropyron spicatum	ab51	c89	a22	bc80	.72	1.11	.73	2.37
G	Bromus tectorum (a)	a115	c310	c351	b190	.30	3.50	7.17	4.24
G	Elymus sp.	10	-	-	-	.12	-	-	-
G	Festuca sp.	2	-	-	3	.03	-	-	.01
G	Oryzopsis hymenoides	-	-	-	3	-	-	-	.03
G	Poa fendleriana	2	-	-	-	.03	-	-	-
G	Poa secunda	216	218	247	248	2.92	4.32	5.17	6.80
G	Sitanion hystrix	c135	b71	ab55	a35	1.19	.89	1.11	.28
Total for Annual Grasses		115	310	351	190	0.30	3.50	7.17	4.24
Total for Perennial Grasses		453	410	423	485	5.51	6.55	8.56	11.58
Total for Grasses		568	720	774	675	5.82	10.05	15.73	15.82
F	Agoseris glauca	-	-	3	3	-	-	.03	.00
F	Allium acuminatum	1	13	11	15	.00	.03	.02	.03
F	Alyssum alyssoides (a)	-	-	6	-	-	-	.01	-
F	Antennaria rosea	a-	a-	b12	c34	-	-	.25	1.02
F	Arabis sp.	5	1	-	2	.04	.03	-	.00
F	Aster scopulorum	-	-	1	8	-	-	.00	.18
F	Astragalus beckwithii	ab21	b43	b33	c3	.12	.59	.65	.03
F	Astragalus cibarius	ab35	a7	b41	b41	.20	.05	1.43	.96
F	Astragalus purshii	bc13	a5	c19	ab3	.14	.00	.16	.01
F	Camelina microcarpa (a)	a-	a3	b66	a-	-	.01	.34	-
F	Carex microptera	a-	a-	a-	b88	-	-	-	.63
F	Castilleja angustifolia	2	-	3	-	.03	-	.03	-
F	Chaenactis douglasii	b23	a3	a7	a6	.05	.00	.04	.01
F	Chorisporea tenella (a)	-	-	-	4	-	-	-	.01
F	Collinsia parviflora (a)	a32	a10	a19	b108	.10	.02	.06	.52
F	Collomia linearis (a)	4	-	-	-	.01	-	-	-
F	Cordylanthus ramosus (a)	2	-	3	-	.00	-	.00	-
F	Crepis acuminata	-	1	-	4	-	.00	-	.03
F	Cryptantha sp.	b12	a-	a1	a3	.06	-	.00	.03
F	Delphinium nuttallianum	-	4	3	12	-	.01	.00	.05
F	Descurainia pinnata (a)	a11	c122	a5	b46	.01	.42	.01	.12
F	Erigeron pumilus	b50	a10	a5	a-	.34	.02	.01	-
F	Erigeron sp.	a-	a6	b14	a1	-	.18	.11	.00
F	Eriogonum ovalifolium	1	3	-	2	.00	.00	-	.03
F	Eriogonum umbellatum	-	1	2	-	-	.00	.03	-
F	Gilia sp. (a)	a2	b29	a3	a-	.01	.10	.00	-
F	Hackelia patens	-	-	-	5	-	-	-	.03
F	Lappula occidentalis (a)	ab22	c77	bc48	a12	.06	.13	.16	.04
F	Lathyrus brachycalyx	-	1	-	-	-	.00	-	-
F	Lomatium sp.	-	-	-	-	-	-	.01	-

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Microsteris gracilis</i> (a)	a-	b33	c114	a5	-	.08	.79	.01
F	<i>Penstemon cyananthus</i>	b24	a-	a4	a1	.25	-	.04	.15
F	<i>Phlox hoodii</i>	240	240	217	204	6.65	8.27	6.41	5.41
F	<i>Phlox longifolia</i>	b67	ab52	a32	a29	.32	.45	.31	.36
F	<i>Ranunculus testiculatus</i> (a)	a11	b196	b183	c338	.01	1.57	1.25	5.88
F	<i>Tragopogon dubius</i> (a)	-	-	1	-	-	-	.03	-
F	Unknown forb-annual (a)	4	-	-	-	.03	-	-	-
F	Unknown forb-perennial	-	4	-	-	-	.01	-	-
F	<i>Veronica biloba</i> (a)	a-	a-	a3	b15	-	-	.01	.03
Total for Annual Forbs		88	470	451	528	0.26	2.34	2.68	6.63
Total for Perennial Forbs		494	394	408	464	8.22	9.67	9.57	9.02
Total for Forbs		582	864	859	992	8.48	12.01	12.25	15.65

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	'11	'96	'01	'06	'11
B	<i>Artemisia nova</i>	1	3	0	2	.76	.03	-	.15
B	<i>Artemisia tridentata wyomingensis</i>	76	70	60	48	7.83	6.91	4.90	4.59
B	<i>Atriplex confertifolia</i>	23	33	35	21	.31	1.22	2.46	2.14
B	<i>Chrysothamnus nauseosus consimilis</i>	2	1	1	11	-	.03	.38	.06
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	86	70	74	68	7.31	3.35	2.33	3.96
B	<i>Grayia spinosa</i>	0	1	0	2	.30	-	-	.86
B	<i>Opuntia</i> sp.	7	14	15	2	.15	.06	.09	-
B	<i>Sarcobatus vermiculatus</i>	2	2	3	1	.38	.78	1.00	1.23
Total for Browse		197	194	188	155	17.04	12.40	11.19	13.01

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 18

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata wyomingensis</i>	6.06	6.30
<i>Atriplex confertifolia</i>	2.90	2.96
<i>Chrysothamnus nauseosus consimilis</i>	.75	1.20
<i>Chrysothamnus viscidiflorus stenophyllus</i>	3.65	3.31
<i>Opuntia</i> sp.	.15	-
<i>Sarcobatus vermiculatus</i>	.46	.45

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 18

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.3	0.8	1.1

BASIC COVER--

Management unit 01, Study no: 18

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	29.98	34.56	38.54	44.67
Rock	2.48	.67	.64	.21
Pavement	6.25	10.18	7.13	7.75
Litter	28.97	22.69	24.74	17.82
Cryptogams	7.75	12.10	7.60	8.72
Bare Ground	27.96	31.32	38.42	26.92

SOIL ANALYSIS DATA --

Management unit 01, Study no: 18, Study Name: Bedke Spring

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
18.0	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	7	2	49	5	-	-	-
Elk	3	-	-	-	-	5 (12)	-
Deer	6	1	10	1	2 (5)	6 (15)	1 (3)
Cattle	1	3	3	5	11 (27)	15 (36)	7 (16)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 18

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Artemisia nova									
96	40	0	50	50	-	100	0	0	10/26
01	60	0	67	33	-	0	0	0	13/24
06	0	0	0	0	-	0	0	0	-/-
11	40	0	100	0	-	0	0	0	8/15
Artemisia tridentata wyomingensis									
96	3360	6	68	26	20	13	0	5	22/31
01	2540	17	49	35	40	5	0	14	22/28
06	2060	8	51	41	-	8	0	25	21/25
11	1200	5	73	22	-	13	0	25	24/31

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Atriplex confertifolia</i>									
96	1160	76	24	0	200	2	0	0	8/10
01	2020	39	59	2	20	0	0	0	8/15
06	1620	9	79	12	-	0	0	10	12/22
11	780	10	64	26	-	0	0	26	14/20
<i>Chrysothamnus nauseosus consimilis</i>									
96	40	50	50	-	-	0	0	0	21/31
01	20	0	100	-	-	0	0	0	24/49
06	20	0	100	-	-	0	0	0	28/50
11	400	10	90	-	-	15	0	0	11/16
<i>Chrysothamnus viscidiflorus stenophyllus</i>									
96	6600	3	94	2	20	.60	0	.30	11/15
01	3820	6	51	43	340	0	0	14	9/13
06	3840	5	89	6	360	9	2	.52	9/13
11	3600	21	75	4	440	3	0	2	9/14
<i>Grayia spinosa</i>									
96	0	0	0	-	-	0	0	0	18/40
01	20	100	0	-	-	0	0	0	15/25
06	0	0	0	-	-	0	0	0	17/40
11	40	0	100	-	-	0	0	0	10/15
<i>Opuntia sp.</i>									
96	140	29	71	0	-	0	0	0	5/9
01	300	13	87	0	40	0	0	0	4/7
06	320	6	88	6	20	0	0	6	5/13
11	40	0	50	50	-	0	0	100	4/10
<i>Sarcobatus vermiculatus</i>									
96	80	100	0	-	-	0	0	0	26/33
01	60	67	33	-	-	0	0	0	38/57
06	80	50	50	-	-	0	0	0	21/32
11	20	0	100	-	20	0	0	0	36/53
<i>Symphoricarpos oreophilus</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	31/62

BALLY MOUNTAIN - TREND STUDY NO. 1-19-11

Vegetation Type: Black Sagebrush

Range Type: Substantial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Upland Stony Loam \(Pinyon-Utah Juniper\), R028AY338UT](#)

Land Ownership: USFS

Elevation: 7,040 ft. (2,146 m)

Aspect: Southwest

Slope: 15%

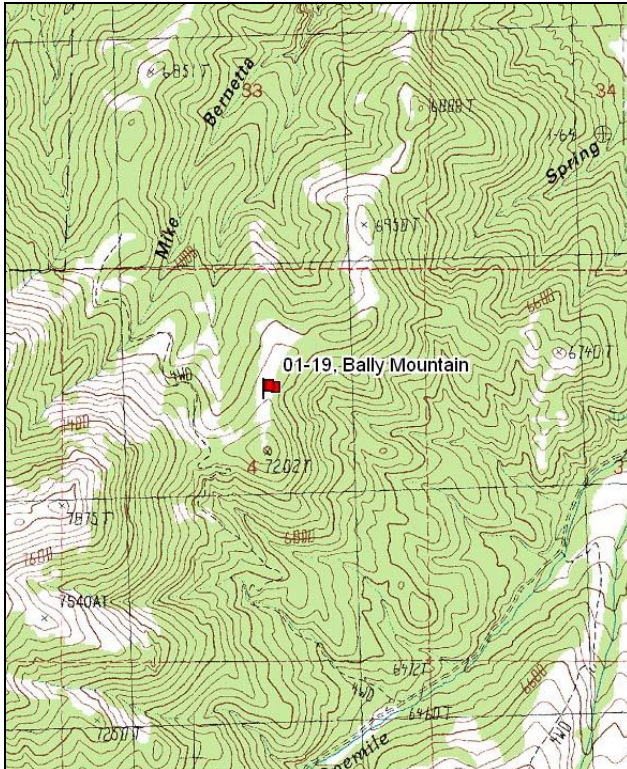
Transect bearing: 0° magnetic

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

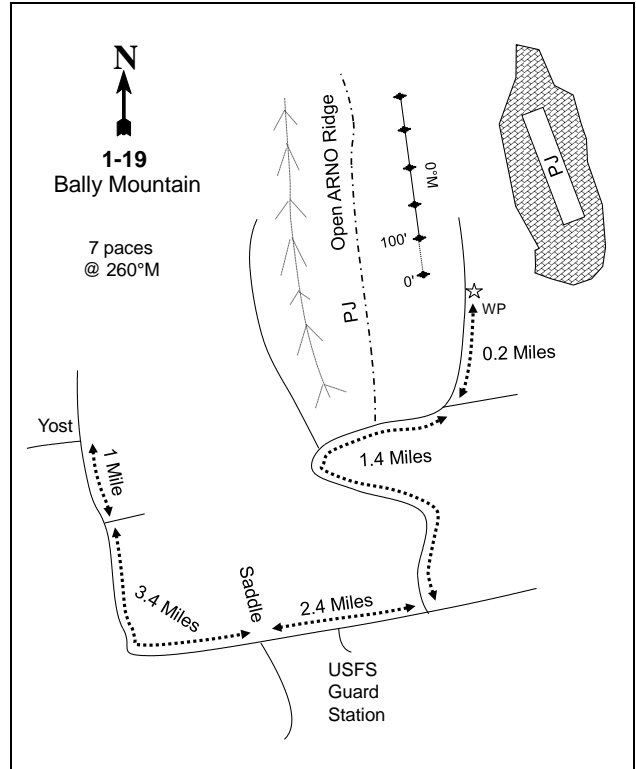
Directions:

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

GPS: NAD 83, UTM 12S 296543 E 4649612 N

BALLY MOUNTAIN - TREND STUDY NO. 1-19

Site Information

Site Description: The study samples an open west facing ridge on Bally Mountain. The open ridge top where the study is located was dominated by black sagebrush (*Artemisia nova*), but was surrounded by singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), and curleaf mountain mahogany (*Cercocarpus ledifolius*). 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 fire burned across the ridge and the surrounding forested areas, but a few patches of trees survived. The area is managed by the Raft River Division of the Sawtooth National Forest as part of the One Mile/Bally pasture in the Clear Creek allotment. The burned area was rested from grazing from 2004 to 2006. Deer pellet groups have been sampled in low abundance since 2001. Cattle sign was sampled in low abundance in 2001, but moderate abundance in 2011 (Table - Pellet Group Data).

Browse: Prior to the fire, the open ridge was dominated by a dense population of low growing black sagebrush. The prescribed fire burned quite evenly across the open ridge and reduced black sagebrush density substantially. Utilization of black sagebrush has been light to moderate over the course of the study. Decadence and poor vigor have been low in most studies, but was moderate in 2011. Prior to the fire, the weedy species broom snakeweed (*Gutierrezia sarothrae*) was also prevalent, but has been reduced substantially following the fire. Other browse species are rare on the site (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is diverse and abundant. Perennial grasses are dominated by three species bluebunch wheatgrass (*Agropyron spicatum*), prairie junegrass (*Koeleria cristata*), and Sandberg bluegrass (*Poa secunda*). Prairie junegrass nested frequency significantly increased after the burn. Forbs are diverse and abundant, but many of the common forbs are low growing species. These include Fendler sandwort (*Arenaria fendleri*), Torrey milkvetch (*Astragalus calycosus*), stemless goldenweed (*Haplopappus acaulis*), desert phlox (*Phlox austromontana*), and dandelion (*Taraxacum officinale*) (Table - Herbaceous Trends).

Soil: The soil is in the Clavicon-Rock outcrop complex, which occurs on hillslopes. Parent material consists of colluvium and residuum derived from limestone, chert, and dolomite (Soil Survey Staff 2011). The soil texture is a clay loam with a soil reaction that is slightly alkaline (pH 7.7). Phosphorus may have limited availability for plant growth and development at 6.0 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). The soil profile is rocky throughout with mostly gravel and some cobble size rocks. There is abundant vegetation and litter cover. Bare ground cover has increased since the fire, but is still moderately low (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** There was little change in the density of black sagebrush. Recruitment of young black sagebrush plants decreased from 19% to 7%.
- **2001 to 2006 - down (-2):** The prescribed fire reduced the very dense population of black sagebrush by 88% from 24,880 plants/acre to 2,920 plants/acre. Cover of black sagebrush decreased from 18% to 2%.
- **2006 to 2011 - down (-2):** Density of black sagebrush decreased 43% to 1,660 plants/acre, but cover remained similar at 2%. Decadence of black sagebrush increased from 6% to 34%, and poor vigor increased from 1% to 28%. However, recruitment of young black sagebrush plants increased to 27% of the population.

Grass:

- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover increased from 12% to 23%.
- **2001 to 2006 - slightly up (+1):** Following the fire, the sum of nested frequency increased 15%, and cover increased to 40%. Bluebunch wheatgrass cover was nearly 26%, but nested frequency remained similar. There was a significant increase in the nested frequency of prairie junegrass.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 9%, and cover decreased to 20%. There was a significant decrease in the sum of nested frequency of bluebunch wheatgrass.

Forb:

- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 37%, and cover decreased from 12% to 7%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 14%, and cover increased to 10%.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, but cover decreased to 7%.

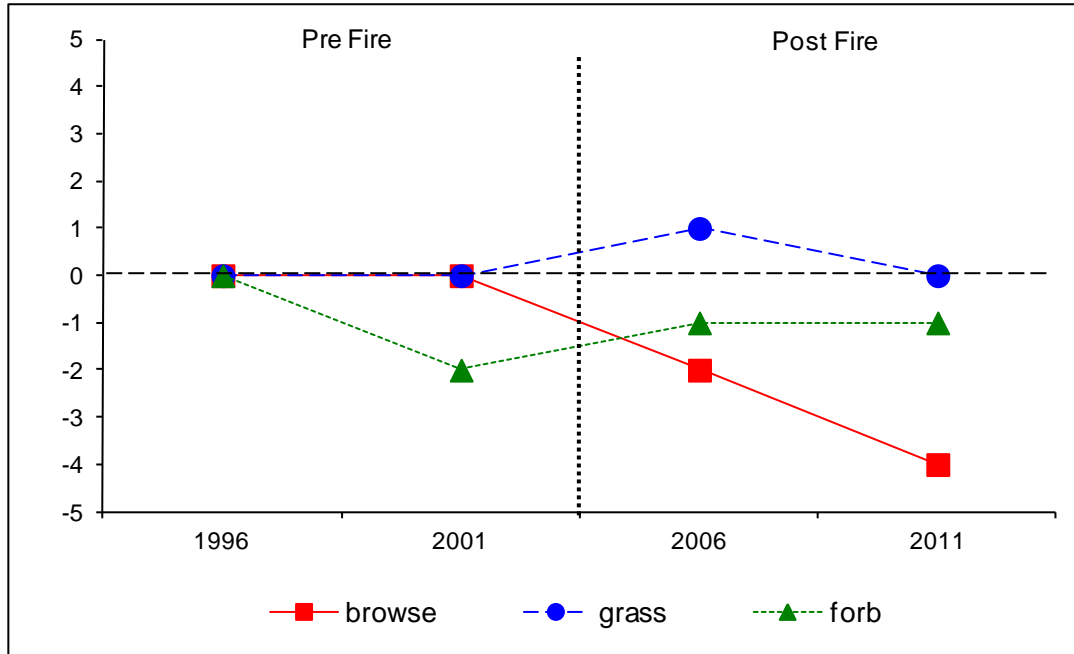
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 1, study no: 19

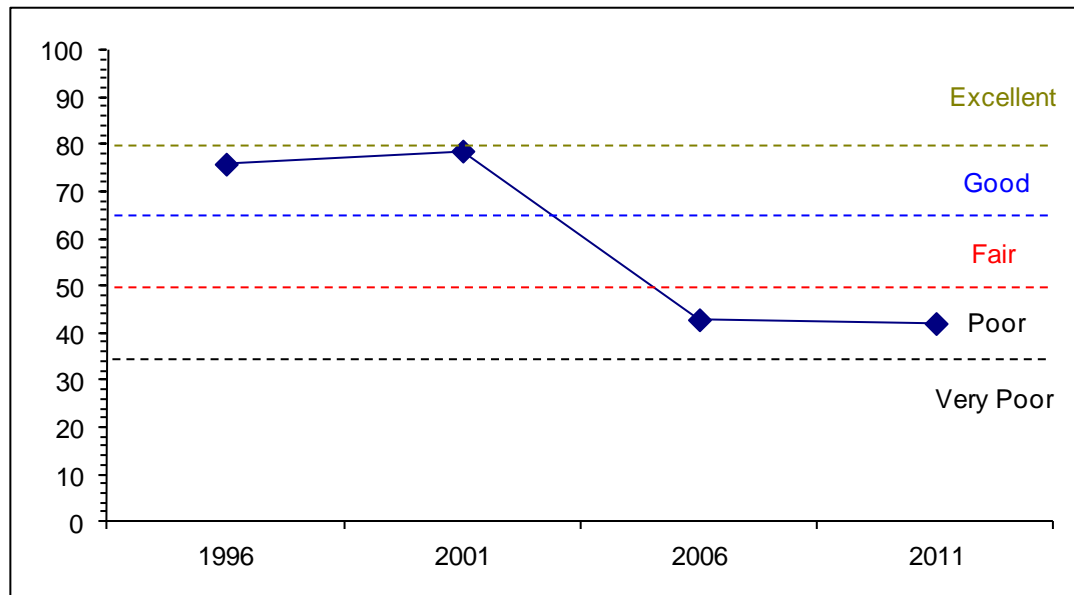
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	18.0	13.8	9.5	24.6	0.0	10.0	0.0	75.9	Good
01	22.2	12.9	3.5	30.0	0.0	10.0	0.0	78.6	Good-Excellent
06	2.9	0.0	0.0	30.0	0.0	10.0	0.0	42.9	Poor
11	2.1	0.0	0.0	30.0	0.0	10.0	0.0	42.1	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1, Study no: 19



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 19



HERBACEOUS TRENDS--
Management unit 01, Study no: 19

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron dasystachyum</i>	-	-	6	7	-	-	.18	.15
G	<i>Agropyron spicatum</i>	ab334	c367	bc359	a319	6.34	16.36	25.72	9.68
G	<i>Bromus tectorum</i> (a)	3	8	3	-	.00	.01	.00	-
G	<i>Festuca</i> sp.	-	-	-	2	-	-	-	.06
G	<i>Koeleria cristata</i>	a64	a100	b188	b190	1.12	2.23	7.99	4.76
G	<i>Oryzopsis hymenoides</i>	b14	a-	a3	a-	.25	-	.03	-
G	<i>Poa secunda</i>	b301	ab259	ab277	a240	4.57	4.67	5.64	5.45
G	<i>Sitanion hystrix</i>	2	-	-	-	.00	-	-	-
Total for Annual Grasses		3	8	3	0	0.00	0.00	0.00	0
Total for Perennial Grasses		715	726	833	758	12.30	23.27	39.57	20.11
Total for Grasses		718	734	836	758	12.31	23.28	39.57	20.11
F	<i>Achillea millefolium</i>	4	4	7	9	.03	.15	.06	.04
F	<i>Agoseris glauca</i>	2	8	3	6	.00	.04	.03	.02
F	<i>Alyssum alyssoides</i> (a)	-	-	1	-	-	-	.00	-
F	<i>Antennaria rosea</i>	a6	a10	a12	b50	.06	.05	.28	.46
F	<i>Arabis</i> sp.	37	10	10	30	.08	.03	.06	.13
F	<i>Arenaria fendleri</i>	c160	b84	c161	a54	.97	.38	2.21	.22
F	<i>Aster</i> sp.	24	6	6	18	.06	.15	.38	.22
F	<i>Astragalus calycosus</i>	b117	a51	b84	a24	1.52	.27	.33	.05
F	<i>Calochortus nuttallii</i>	-	-	5	6	-	-	.01	.01
F	<i>Castilleja angustifolia</i>	11	17	5	12	.02	.33	.04	.07
F	<i>Castilleja linariaefolia</i>	36	55	-	1	.17	.51	-	.00
F	<i>Chenopodium fremontii</i> (a)	-	3	10	-	-	.00	.04	-
F	<i>Cirsium</i> sp.	3	4	6	4	.01	.01	.16	.01
F	<i>Collinsia parviflora</i> (a)	b275	b293	a117	a149	1.78	2.56	.22	.36
F	<i>Comandra pallida</i>	2	6	3	4	.00	.01	.04	.01
F	<i>Cordylanthus ramosus</i> (a)	7	-	-	-	.01	-	-	-
F	<i>Crepis intermedia</i>	2	-	-	7	.00	-	-	.01
F	<i>Cryptantha</i> sp.	b21	a-	a2	a4	.13	-	.01	.04
F	<i>Cymopterus</i> sp.	4	-	7	11	.00	-	.05	.03
F	<i>Descurainia pinnata</i> (a)	-	-	1	5	-	-	.00	.00
F	<i>Draba</i> sp. (a)	-	-	1	-	-	-	.00	-
F	<i>Erigeron pumilus</i>	b54	a24	a14	a29	.26	.07	.26	.07
F	<i>Hackelia patens</i>	-	-	-	5	-	-	-	.06
F	<i>Haplopappus acaulis</i>	b88	a50	a33	a35	2.61	.75	.78	.27
F	<i>Lactuca serriola</i> (a)	a-	a-	b27	a1	-	-	.05	.00
F	<i>Lappula occidentalis</i> (a)	b30	a1	c76	ab14	.20	.00	.33	.05
F	<i>Lesquerella</i> sp.	a4	ab11	a1	b13	.00	.02	.00	.06
F	<i>Linum lewisii</i>	b55	a6	b46	c92	.26	.04	.51	1.02
F	<i>Lithospermum ruderae</i>	-	-	1	2	-	-	.00	.00
F	<i>Lomatium</i> sp.	5	7	-	1	.03	.02	-	.00
F	<i>Machaeranthera canescens</i>	4	-	1	-	.00	-	.00	-
F	<i>Microsteris gracilis</i> (a)	a-	a4	a6	b29	-	.00	.01	.07

T y P e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Penstemon sp.	2	-	-	-	.00	-	-	-
F	Phlox austromontana	c238	b183	a149	ab174	5.08	3.70	2.54	3.25
F	Phlox hoodii	-	-	-	1	-	-	-	.00
F	Phlox longifolia	a-	a6	ab11	b17	-	.01	.07	.13
F	Ranunculus testiculatus (a)	a13	a19	b71	c175	.16	.19	.27	1.41
F	Sanguisorba minor	-	-	-	4	-	-	-	.00
F	Senecio multilobatus	bc48	a25	ab38	c69	.28	.14	.45	.39
F	Taraxacum officinale	ab92	a69	b119	a66	.50	.64	1.24	.29
F	Tragopogon dubius (a)	ab18	a6	a3	b18	.06	.03	.03	.15
F	Viola sp.	-	3	3	1	-	.00	.00	.00
Total for Annual Forbs		343	326	313	391	2.22	2.80	1.00	2.05
Total for Perennial Forbs		1019	639	727	749	12.16	7.38	9.59	6.95
Total for Forbs		1362	965	1040	1140	14.39	10.18	10.59	9.00

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

BROWSE TRENDS--

Management unit 01, Study no: 19

T y P e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Artemisia nova	100	100	26	25	14.38	17.74	2.26	1.61
B	Artemisia tridentata vaseyana	1	2	1	1	-	-	-	-
B	Cercocarpus ledifolius	1	1	0	0	-	-	-	-
B	Chrysothamnus nauseosus consimilis	24	24	9	15	.82	1.19	.51	.67
B	Chrysothamnus viscidiflorus stenophyllus	1	1	2	15	-	-	.01	.51
B	Eriogonum microthecum	15	21	9	11	.01	.04	.03	.04
B	Gutierrezia sarothrae	98	86	12	12	3.24	1.33	.30	.13
B	Pediocactus simpsonii	4	0	2	0	.01	-	-	-
B	Pinus monophylla	2	1	1	1	-	-	-	-
B	Tetradymia canescens	1	1	3	2	-	-	-	-
Total for Browse		247	237	65	82	18.48	20.31	3.13	2.96

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 19

Species	Percent Cover	
	'06	'11
Artemisia nova	2.18	3.88
Artemisia tridentata vaseyana	.40	1.39
Chrysothamnus nauseosus consimilis	.50	1.41
Chrysothamnus viscidiflorus stenophyllus	-	.21
Eriogonum microthecum	.13	-
Gutierrezia sarothrae	.06	-
Tetradymia canescens	-	.06

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 19

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	0.7	-	0.3

BASIC COVER--

Management unit 01, Study no: 19

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	44.50	63.04	50.23	37.70
Rock	6.55	1.45	5.07	4.80
Pavement	11.31	11.48	17.12	18.10
Litter	29.17	23.38	18.61	17.33
Cryptogams	2.90	2.75	.96	1.71
Bare Ground	5.23	9.27	19.50	18.72

SOIL ANALYSIS DATA --

Management unit 01, Study no: 19, Study Name: Bally Mountain

Effective rooting depth (in)	pH	Clay-Loam			% OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
13.4	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	2	1	4	-	-	-	-
Deer	13	2	3	1	6 (15)	5 (12)	1 (3)
Cattle	3	2	-	15	10 (25)	-	30 (73)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 19

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>									
96	26540	19	77	4	380	76	3	.82	5/15
01	24880	7	86	7	180	3	0	1	6/12
06	2920	5	88	6	-	34	5	1	5/12
11	1660	27	40	34	20	52	0	28	6/15
<i>Artemisia tridentata vaseyana</i>									
96	20	100	0	-	-	0	0	0	8/19
01	40	0	100	-	-	0	0	0	9/19
06	20	0	100	-	-	0	100	0	23/43
11	40	0	100	-	-	100	0	0	26/37
<i>Cercocarpus ledifolius</i>									
96	20	100	0	-	-	0	100	0	-/-
01	20	100	0	-	-	100	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus nauseosus consimilis</i>									
96	620	23	61	16	-	32	13	6	17/24
01	720	33	28	39	-	0	0	19	19/23
06	220	9	91	0	-	18	0	0	14/19
11	360	11	72	17	-	11	6	6	19/26
<i>Chrysothamnus viscidiflorus stenophyllus</i>									
96	20	0	100	0	-	0	0	0	6/10
01	20	0	0	100	20	0	0	0	-/-
06	60	0	100	0	-	0	0	0	8/10
11	380	42	47	11	40	5	0	11	4/5
<i>Eriogonum microthecum</i>									
96	500	32	68	0	-	20	0	0	6/10
01	980	20	80	0	-	0	0	0	6/10
06	240	25	75	0	-	0	0	0	4/7
11	260	0	85	15	-	31	0	62	3/7
<i>Gutierrezia sarothrae</i>									
96	19520	28	69	2	1160	0	0	.51	3/4
01	11080	12	85	3	340	0	0	2	3/5
06	380	0	89	11	100	0	0	11	4/7
11	460	22	61	17	80	0	17	0	3/5
<i>Pediocactus simpsonii</i>									
96	80	0	100	-	-	0	0	0	1/2
01	0	0	0	-	-	0	0	0	-/-
06	40	0	100	-	-	0	0	0	1/2
11	0	0	0	-	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Pinus monophylla</i>										
96	40	100	0	-	20	0	0	0	-/-	
01	20	100	0	-	40	0	0	0	-/-	
06	20	100	0	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	0	24/19	
<i>Symphoricarpos oreophilus</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	17/33	
11	0	0	0	-	-	0	0	0	23/31	
<i>Tetradymia canescens</i>										
96	20	0	100	-	-	0	0	0	11/17	
01	20	0	100	-	-	0	0	0	14/20	
06	60	67	33	-	-	0	0	0	9/10	
11	40	0	100	-	-	50	0	0	7/13	

DAKE PASS - TREND STUDY NO. 1-22-11

Vegetation Type: Black Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Year-long

NRCS Ecological Site Description: [Semidesert Stony Loam \(Black Sagebrush\), R028AY252UT](#)

Land Ownership: BLM

Elevation: 5,300 ft. (1,615 m)

Aspect: South

Slope: 4%

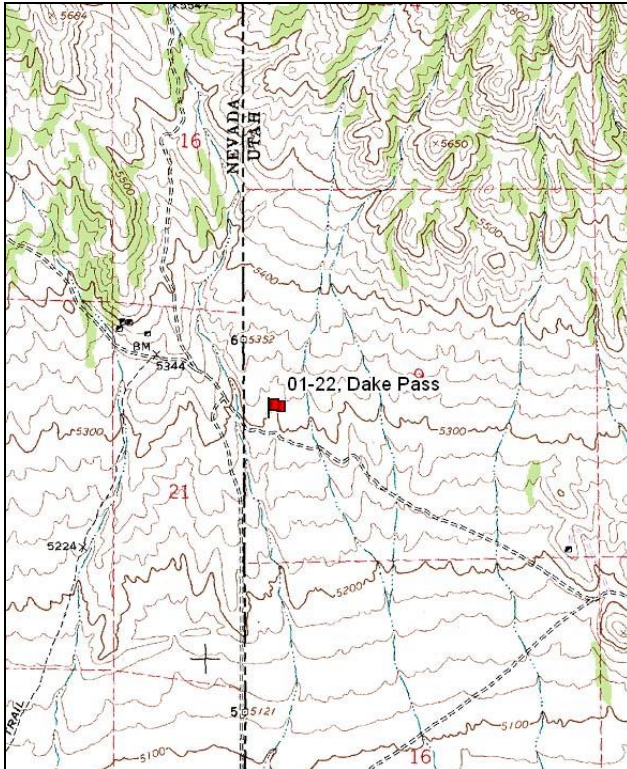
Transect bearing: 0° magnetic

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

Directions:

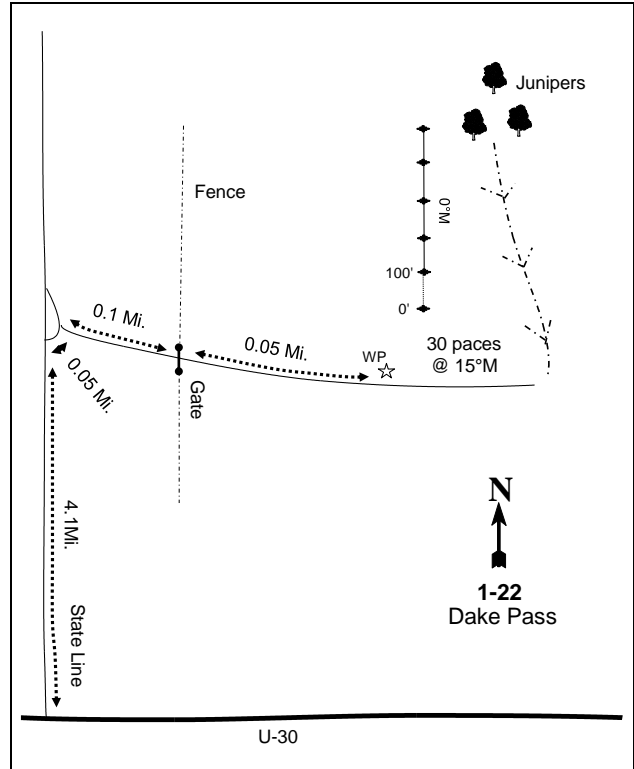
From U-30 at the Utah/Nevada state line, near mile marker 0, turn right and travel 4.1 miles to an intersection. Take a right at the intersection and travel 0.15 to a gate. From the gate drive 0.05 miles to a witness post on the left hand side of the road. From the witness post walk 30 paces at 15 degrees magnetic to the 0-foot baseline stake. The baseline runs 0 degrees magnetic.

Map Name: Jackson Spring



Township: 8N Range: 19W Section: 9

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 246040 E 4590512 N

DAKE PASS - TREND STUDY NO. 1-22

Site Information

Site Description: The study 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 (*Artemisia nova*) and shallow drainage depressions with deeper soils. The area is managed by the Bureau of Land Management (BLM) as part of the U & I allotment. 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. Pellet groups have been sampled in low to lightly moderate abundance for elk and low abundance for deer since 2001. Most of the wildlife presence appears to be concentrated in the drainage areas on the site. Sampled cattle sign has been low in abundance since 2001 (Table - Pellet Group Data).

Browse: Black sagebrush is the most abundant species, but there are several other palatable browse species including bud sagebrush (*Artemisia spinescens*), shadscale (*Atriplex confertifolia*), winterfat (*Ceratoides lanata*), Nevada ephedra (*Ephedra nevadensis*), and spiny hopsage (*Grayia spinosa*). All of these species provide additional forage for wintering big game. Black sagebrush has provided over 50% of the browse cover on the site since 1996 (Table - Browse Trends). The black sagebrush population is comprised of a dense stand of low growing plants. Utilization of black sagebrush was moderate to heavy in 1996 and 2011, but was light in 2001 and 2006. Decadence and poor vigor of black sagebrush have been moderate over the course of the study. Recruitment of young black sagebrush plants has been mostly good, with an abundance of seedlings sampled in 2006. The other preferred browse species occur at much lower densities. Winterfat and ephedra have displayed heavy use throughout the sample years. The other browse species have had mostly light use with some moderate use. Other less desirable shrubs include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) and Nuttall horsebrush (*Tetradymia nuttallii*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is not particularly abundant. There are only three perennial grass species that have been sampled, which are Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and bottlebrush squirreltail (*Sitanion hystrix*). The annual grass cheatgrass (*Bromus tectorum*) is found on the site, and dominated the herbaceous understory in 2006. However, cheatgrass has been rare in the other sample years. Forbs are not abundant on the site, but are somewhat diverse. Most forb species have low forage value (Table - Herbaceous Trends).

Soil: The soil is in the Tosser-Plegomir complex, likely as part of the Tosser component. These soils occur on fan remnants, with parent material consisting of alluvium derived from limestone and rhyolite (Soil Survey Staff 2011). The soil texture is a clay loam with a moderately alkaline soil reaction (pH 8.2) (Table - Soil Analysis Data). The soil is light colored, with considerable surface rock and pavement cover. There are large open areas between individual shrubs, but little bare soil is exposed due to the abundance of pavement-rock cover (Table - Basic Cover). Aside from the gradual movement of soil from the low ridges, there is no accelerated erosion occurring and the soil erosion condition was classified as stable in 2001 and 2011, but was slight in 2006.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density of black sagebrush increased 10% from 7,580 plants/acre to 8,360 plants/acre, though cover remained similar at 14%. Decadence decreased from 33% to 27%, but poor vigor increased from 7% to 12%. Recruitment of young black sagebrush plants increased from 11% of the population to 15%.
- **2001 to 2006 - slightly down (-1):** The black sagebrush density decreased by 17% to 6,920 plants/acre, and cover decreased to 12%. Decadence remained the same at 27%, but poor vigor

increased slightly to 16%. Recruitment of young black sagebrush plants decreased to 8%, but there was an abundance of seedlings.

- **2006 to 2011 - slightly down (-1):** There was a 12% decrease in the density of black sagebrush to 6,100 plants/acre, and cover decreased to 10%. Decadence decreased slightly to 22%, and poor vigor decreased to 14%. Recruitment of young black sagebrush plants increased to 12%.

Grass:

- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover increased from 6% to 9%.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial grasses decreased by 15%, and cover decreased to 6%. Cheatgrass increased significantly in nested frequency, and cover increased from less than 1% to 13%. Bottlebrush squirreltail decreased significantly in nested frequency.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses decreased 15%, but cover increased slightly to 7%. There was a significant decrease in the nested frequency of cheatgrass, and cover decreased to less than 1%.

Forb:

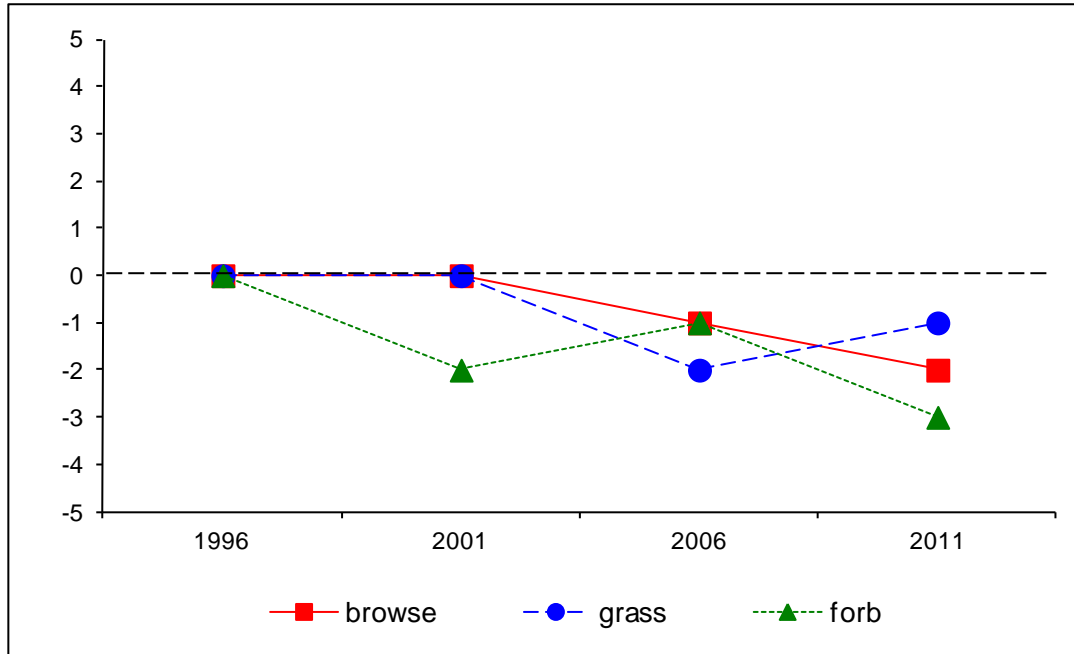
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 49%, and cover decreased from 4% to less than 1%.
- **2001 to 2006 - slightly up (+1):** Perennial forb sum of nested frequency increased markedly, but cover remained similar at around 1%. Perennial forbs remained rare on the site.
- **2006 to 2011 - down (-2):** There was a substantial decrease in the sum of nested frequency of perennial forbs, and cover remained around 1%. The sum of nested frequency of annual forbs and cover increased substantially, and several annual species dominated the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 1, study no: 22

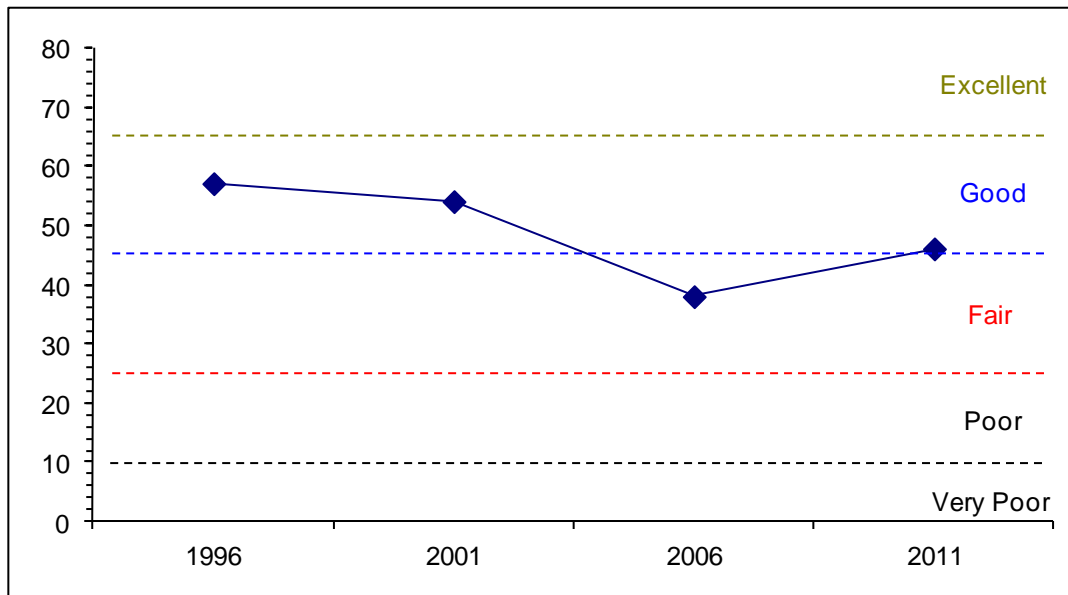
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	23.6	7.0	7.5	12.0	0.0	7.1	0.0	57.2	Good
01	20.4	7.5	7.8	17.0	-0.2	1.6	0.0	54.1	Good
06	19.8	8.1	4.7	12.8	-9.6	2.3	0.0	38.0	Fair
11	16.8	9.1	6.2	13.4	-0.7	1.3	0.0	46.1	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 22



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 1, Study no: 22



HERBACEOUS TRENDS--

Management unit 01, Study no: 22

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Bromus tectorum (a)	a27	ab51	c406	b62	.04	.20	12.83	.87
G	Oryzopsis hymenoides	49	63	57	72	.64	2.33	1.38	2.41
G	Poa secunda	136	118	133	104	2.87	2.54	3.89	2.87
G	Sitanion hystrix	b129	b126	a71	a45	2.46	3.64	1.14	1.41
Total for Annual Grasses		27	51	406	62	0.04	0.20	12.83	0.87
Total for Perennial Grasses		314	307	261	221	5.98	8.52	6.42	6.70
Total for Grasses		341	358	667	283	6.02	8.72	19.26	7.57
F	Agoseris glauca	3	-	-	-	.00	-	-	-
F	Arabis sp.	b10	a-	a-	a-	.02	-	-	-
F	Astragalus sp.	-	-	1	-	-	-	.00	-
F	Astragalus utahensis	12	-	4	2	.03	-	.06	.06
F	Caulanthus crassicaulis	4	-	1	-	.38	-	.00	-
F	Collinsia parviflora (a)	14	-	5	-	.02	-	.01	-
F	Cryptantha sp.	b33	a-	b27	a2	.42	-	.09	.01
F	Cymopterus sp.	-	1	-	2	-	.00	-	.06
F	Delphinium sp.	-	-	-	2	-	-	-	.00
F	Descurainia pinnata (a)	a2	ab15	b33	c104	.00	.04	.08	1.88
F	Erigeron pumilus	2	-	-	-	.00	-	-	-
F	Erigeron sp.	-	-	1	5	-	-	.00	.15
F	Eriogonum ovalifolium	1	-	-	-	.00	-	-	-
F	Gilia sp. (a)	a5	a3	a21	b268	.01	.00	.05	4.84
F	Halogeton glomeratus (a)	1	-	-	-	.00	-	-	-
F	Lappula occidentalis (a)	ab15	a4	a13	b28	.05	.01	.02	.28
F	Mentzelia albicaulis (a)	6	-	1	-	.03	-	.00	-
F	Navarretia intertexta (a)	7	-	3	2	.01	-	.00	.00
F	Phlox hoodii	b107	a50	a49	a38	2.47	.55	.62	.23
F	Phlox longifolia	a27	ab51	b57	a23	.15	.22	.34	.10
F	Sphaeralcea grossulariifolia	1	1	-	-	.03	.00	-	-
F	Townsendia sp.	3	-	-	-	.01	-	-	-
Total for Annual Forbs		50	22	76	402	0.14	0.05	0.17	7.02
Total for Perennial Forbs		203	103	140	74	3.55	0.78	1.13	0.63
Total for Forbs		253	125	216	476	3.70	0.84	1.31	7.65

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	'11	'96	'01	'06	'11
B	Artemisia nova	87	92	88	81	14.13	13.55	12.41	10.03
B	Artemisia spinescens	19	15	8	5	.55	.19	.45	-
B	Atriplex confertifolia	56	53	51	45	4.50	2.28	2.72	2.80
B	Ceratoides lanata	3	13	16	12	.03	.27	.65	.33
B	Chrysothamnus viscidiflorus stenophyllus	35	39	36	35	1.76	1.27	2.41	2.79
B	Ephedra nevadensis	9	8	10	8	.21	.64	.63	.85
B	Grayia spinosa	10	9	9	9	2.70	2.33	2.45	2.40
B	Kochia americana	17	0	0	0	.75	-	-	-
B	Opuntia sp.	0	0	0	2	-	-	-	.00
B	Pediocactus simpsonii	3	2	3	3	.00	.00	-	-
B	Tetradymia nuttallii	5	2	1	6	.30	.06	-	-
Total for Browse		244	233	222	206	24.95	20.63	21.74	19.23

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 22

Species	Percent Cover	
	'06	'11
Artemisia nova	12.31	14.58
Artemisia spinescens	.06	.43
Atriplex confertifolia	4.03	3.09
Ceratoides lanata	.40	.15
Chrysothamnus viscidiflorus stenophyllus	2.18	1.71
Ephedra nevadensis	.56	.46
Grayia spinosa	2.18	1.86
Opuntia sp.	-	.05
Tetradymia nuttallii	.30	.21

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 22

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	0.6	1.1	0.7
Ceratoides lanata	-	3.2	2.3

BASIC COVER--

Management unit 01, Study no: 22

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	33.97	32.38	38.72	30.60
Rock	5.53	2.96	3.77	5.94
Pavement	27.12	30.03	27.08	34.12
Litter	33.09	17.84	28.57	22.25
Cryptogams	2.29	3.89	1.95	1.53
Bare Ground	4.20	17.40	13.35	10.21

SOIL ANALYSIS DATA --

Management unit 01, Study no: 22, Study Name: Dake Pass

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.2	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	13	-	-	-	-
Elk	1	9	12	12	19 (46)	12 (30)	27 (66)
Deer	1	-	1	-	-	-	1 (2)
Cattle	-	-	1	1	-	9 (23)	5 (13)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 22

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia nova									
96	7580	11	57	33	5660	55	21	7	11/23
01	8360	15	57	27	360	2	.95	12	9/18
06	6920	8	65	27	113560	5	0	16	10/19
11	6100	12	66	22	780	33	25	14	9/20
Artemisia spinescens									
96	1080	24	50	26	20	11	24	22	5/13
01	780	8	62	31	-	13	18	18	6/8
06	400	0	95	5	20	35	5	0	5/8
11	220	9	91	0	20	0	0	0	7/12
Artemisia tridentata wyomingensis									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	30/43
11	0	0	0	-	-	0	0	0	-/-

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Atriplex confertifolia</i>									
96	4800	29	59	12	1660	7	8	3	9/15
01	3480	23	60	17	20	0	0	5	7/12
06	3200	14	78	8	100	1	0	3	9/16
11	2320	14	78	8	40	13	4	8	9/18
<i>Ceratoides lanata</i>									
96	60	33	67	0	-	0	67	0	7/12
01	680	26	74	0	20	3	0	0	5/8
06	1000	16	80	4	40	30	60	0	7/10
11	560	43	57	0	-	54	36	0	6/12
<i>Chrysothamnus viscidiflorus stenophyllus</i>									
96	1120	4	89	7	400	7	0	2	10/16
01	1240	13	73	15	40	0	0	8	9/16
06	1440	3	89	8	780	3	3	1	10/15
11	1580	10	82	8	40	11	0	5	9/15
<i>Ephedra nevadensis</i>									
96	280	21	79	0	-	29	36	0	18/29
01	160	0	75	25	-	50	50	0	15/25
06	260	8	62	31	-	0	69	31	15/23
11	200	10	50	40	-	40	60	50	16/27
<i>Grayia spinosa</i>									
96	260	0	77	23	-	15	8	31	23/34
01	380	0	74	26	-	0	0	0	16/25
06	320	0	81	19	-	13	0	13	20/29
11	300	0	100	0	-	27	0	7	19/37
<i>Kochia americana</i>									
96	1360	4	94	1	40	13	0	1	6/11
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	0	0	0	0	-	0	0	0	-/-
<i>Leptodactylon pungens</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	7/14
11	0	0	0	-	-	0	0	0	-/-
<i>Opuntia sp.</i>									
96	0	0	0	-	-	0	0	0	4/13
01	0	0	0	-	-	0	0	0	5/10
06	0	0	0	-	-	0	0	0	5/16
11	40	0	100	-	-	0	0	0	4/7

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Pediocactus simpsonii</i>										
96	60	0	100	-	-	0	0	0	0/2	
01	40	0	100	-	-	0	0	0	1/2	
06	60	67	33	-	-	0	0	0	1/2	
11	60	33	67	-	-	0	0	0	1/4	
<i>Tetradymia nuttallii</i>										
96	140	29	43	29	-	0	0	14	13/18	
01	40	0	0	100	-	0	0	100	11/12	
06	20	0	100	0	-	0	0	0	14/20	
11	180	0	89	11	-	0	0	11	12/21	

PATTERSON PASS - TREND STUDY NO. 1-23-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Summer

NRCS Ecological Site Description: Not Available

Land Ownership: BLM

Elevation: 8,200 ft. (2,499 m)

Aspect: Southwest

Slope: 15-25%

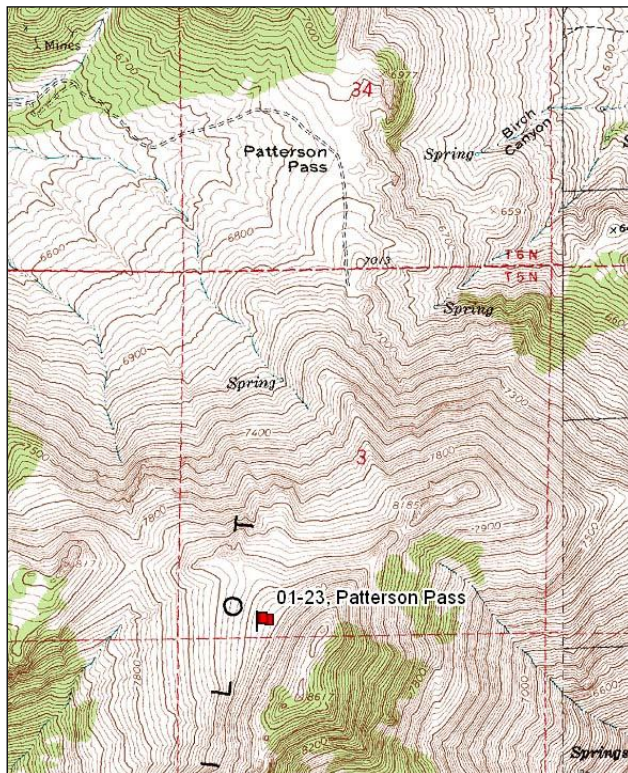
Transect bearing: 225° magnetic

Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft). Rebar: belt 1 on 1ft., belt 2 on 15 ft., belt 3 on 0 ft., belt 4 on 1ft., belt 5 on 0 ft.

Directions:

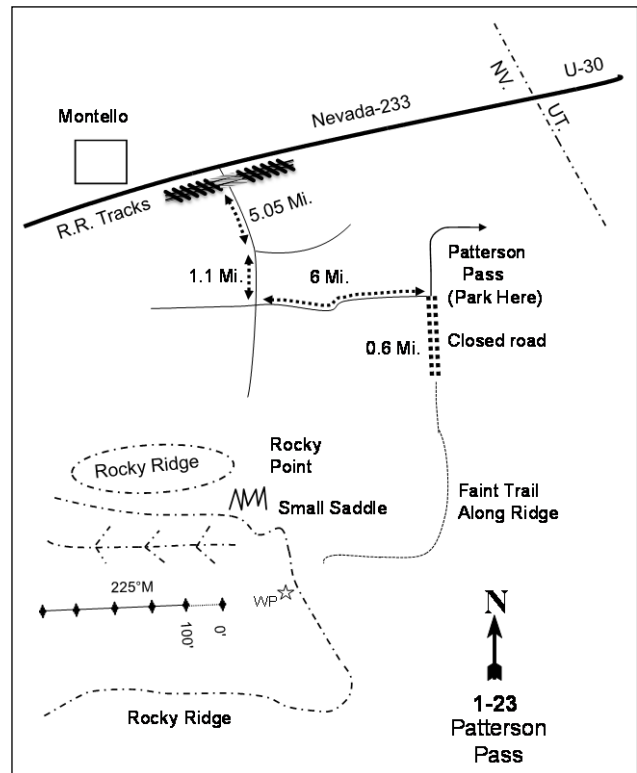
Drive 0.5 miles past mile marker 25 on Nevada State Road 233. Turn left to cross the railroad tracks and continue straight for 5.05 miles. At this point there will be a road going to the left. Stay right and continue 1.1 miles to a four way intersection. Take a left turn and drive 6 miles to Patterson Pass. Park here at Patterson Pass. 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



Township: 5N Range: 19W Section: 3

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 246926 E 4562319 N

PATTERSON PASS - TREND STUDY NO. 1-23

Site Information

Site Description: The study 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 in a remote area accessible only by foot. The area is managed by the Bureau of Land Management as part of the Lucin-Pilot allotment. This area receives concentrated occupancy by elk. Elk pellet groups have been sampled in moderately high abundance since 2001. Two cow elk were seen in the area when the site was read in early summers of 2001 and 2006. It appears that elk occupy the area throughout the spring and summer. Bedding areas were also noted, and it appeared that some sagebrush plants were used as antler rubs. Small numbers of deer pellet groups have also been sampled. Livestock do not appear to utilize the steeper slopes where the study is located (Table - Pellet Group Data). Chuckers were heard on the nearby rocky slopes in 1996.

Browse: The site is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). It has accounted for more than half of the browse cover since the study was established. Black sagebrush is also abundant, and has increased in cover since 1996 (Table - Browse Trends). It appears that there is some hybridization occurring between these two species, which may cause some confusion in identification. The two species combined have a dense population. Utilization of sagebrush has been light to moderate over the course of the study. Decadence and poor vigor of mountain big sagebrush have been moderate. Decadence and poor vigor of black sagebrush have been low. Recruitment of young plants for both sagebrush species was good at the outset of the study, but has decreased and was considered to be poor in 2011. Additional forage is provided by a small population of slenderbush eriogonum (*Eriogonum microthecum*) and a few scattered wax current (*Ribes cereum* ssp. *cereum*). The increaser species mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) is fairly abundant, but density has steadily decreased since 1996 (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant and diverse. Sheep fescue (*Festuca ovina*) is the most abundant grass species, providing over 60% of the grass cover since 1996. Spike fescue (*Leucopoa kingii*), mutton bluegrass (*Poa fendleriana*), and Sandberg bluegrass (*P. secunda*) are also common. Several useful forb species are abundant including silvery lupine (*Lupinus argenteus*), bluebell (*Mertensia oblongifolia*), lambstongue groundsel (*Senecio integerrimus*), and Hooker balsamroot (*Balsamorhiza hookeri*) (Table - Herbaceous Trends).

Soil: The soil is in the Lundy-Sonlet-Lodar very gravelly loams, likely as part of the Lundy component. These soils occur on hillslopes, with parent material consisting of colluvium derived from chert and/or limestone (Soil Survey Staff 2011). 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. The soil texture is loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). It is extremely rocky with numerous large rocks and boulders on the surface and throughout the profile. Protective ground cover, in the form of vegetation and litter cover, is abundant and well dispersed (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** Combined density of mountain big sagebrush and black sagebrush increased by 10% from 7,160 plants/acre to 7,900 plants/acre, but cover remained similar at 25%. Recruitment of young black sagebrush plants decreased from 12% to 3%, and recruitment of young mountain big sagebrush decreased from 17% to 10%. Mountain low rabbitbrush decreased 20% from 4,100 plants/acre to 3,280 plants/acre, and cover decreased from 5% to 4%.

- **2001 to 2006 - stable (0):** Combined mountain big sagebrush and black sagebrush density remained similar at 7,820 plants/acre, but cover increased to 29%. Decadence of mountain big sagebrush increased from 15% to 27%, and poor vigor increased from 9% to 13%. Recruitment of mountain big sagebrush decreased to 2%, but black sagebrush recruitment increased to 9%.
- **2006 to 2011 - stable (0):** The combined density of mountain big sagebrush and black sagebrush decreased 7% to 7,300 plants/acre, and cover decreased to 25%. Decadence and poor vigor of mountain big sagebrush remained similar at 23% and 19%, respectively. Recruitment remained poor for both species.

Grass:

- **1996 to 2001 - slightly down (-1):** The perennial grass sum of nested frequency decreased by 12%, but cover increased from 18% to 26%.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover decreased to 20%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 19%, and cover decreased to 14%.

Forb:

- **1996 to 2001 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 18%, and cover increased from 10% to 14%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 13%, but cover increased to 20%.
- **2006 to 2011 - up (+2):** There was a 20% increase in the sum of nested frequency of perennial forbs, though cover decreased to 15%. Sum of nested frequency and cover of annual forbs also increased markedly.

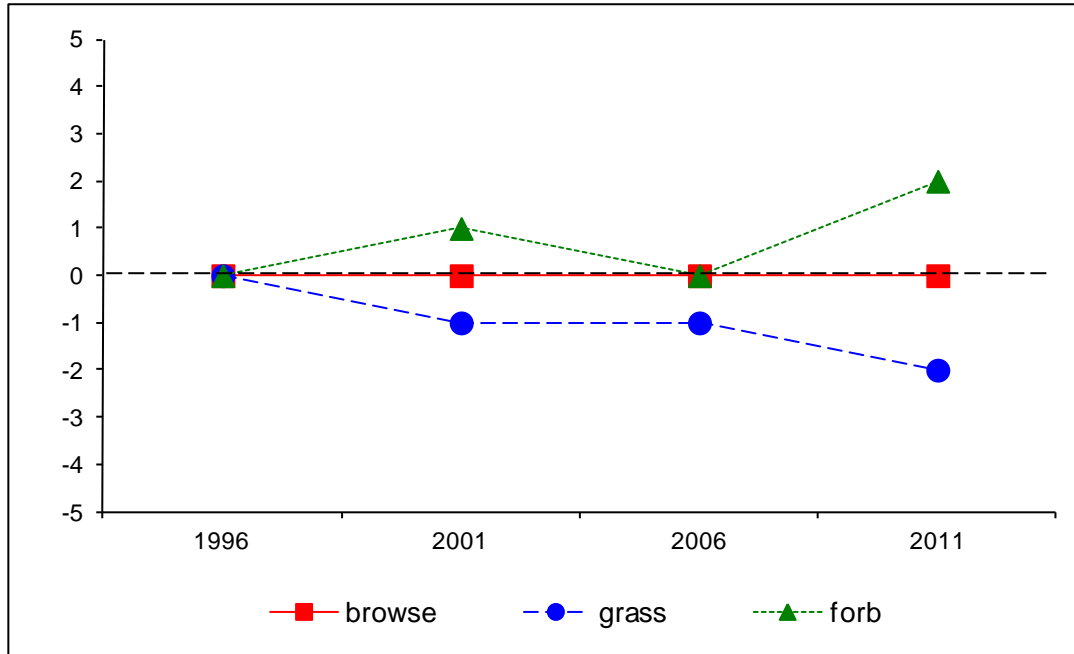
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 1, study no: 23

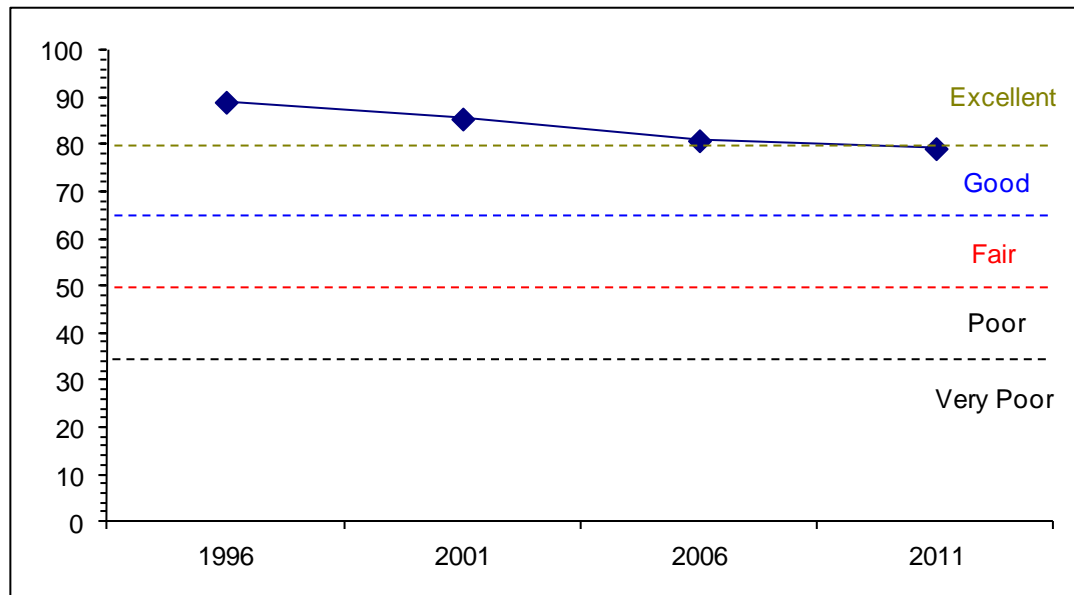
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	11.2	7.8	30.0	0.0	10.0	0.0	89.0	Excellent
01	30.0	11.2	4.2	30.0	0.0	10.0	0.0	85.4	Excellent
06	30.0	8.9	1.9	30.0	0.0	10.0	0.0	80.8	Good-Excellent
11	30.0	9.8	2.0	27.3	0.0	10.0	0.0	79.2	Good-Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 23



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 23



HERBACEOUS TRENDS--
Management unit 01, Study no: 23

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	b43	b24	a6	a10	.32	.78	.18	.10
G	Elymus cinereus	a5	a5	a5	b32	.63	.85	.63	.47
G	Festuca ovina	a292	a287	a281	b246	12.97	15.92	12.14	9.93
G	Koeleria cristata	-	2	-	-	-	.30	-	-
G	Leucopoa kingii	b110	ab84	b98	a53	2.50	4.80	3.96	2.11
G	Melica bulbosa	-	-	1	-	-	-	.15	-
G	Poa fendleriana	b47	b63	b49	a14	.77	1.99	1.08	.12
G	Poa pratensis	1	-	-	-	.03	-	-	-
G	Poa secunda	b95	a35	b67	ab62	1.07	.29	1.22	.88
G	Sitanion hystrix	3	-	-	-	.00	-	-	-
G	Stipa columbiana	-	5	-	-	-	.03	-	-
G	Stipa lettermani	ab11	b28	ab14	a7	.08	.63	.39	.04
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		607	533	521	424	18.40	25.61	19.77	13.66
Total for Grasses		607	533	521	424	18.40	25.61	19.77	13.66
F	Agoseris glauca	ab83	ab106	a69	b107	.60	.93	1.27	1.33
F	Arabis sp.	-	7	3	-	-	.01	.00	-
F	Astragalus beckwithii	-	2	-	-	-	.01	-	-
F	Astragalus utahensis	1	-	-	-	.00	-	-	-
F	Balsamorhiza hookeri	5	5	12	4	.01	.06	.89	.01
F	Castilleja linariaefolia	-	-	-	-	-	.00	-	-
F	Chenopodium fremontii (a)	-	-	-	5	-	-	-	.15
F	Collinsia parviflora (a)	b198	a106	a95	b247	.86	.75	.27	2.14
F	Comandra pallida	7	13	17	11	.07	.18	.54	.04
F	Crepis acuminata	7	4	-	9	.02	.06	-	.21
F	Hackelia patens	33	11	19	4	.44	.39	.75	.06
F	Haplopappus acaulis	a2	a2	a-	b20	.15	.03	-	.10
F	Lithophragma parviflora	a-	a-	c27	b11	-	-	.22	.02
F	Lomatium sp.	-	4	-	5	-	.03	-	.06
F	Lupinus argenteus	b150	ab153	ab126	a99	4.57	5.04	5.90	.88
F	Lygodesmia spinosa	2	-	-	-	.03	-	-	-
F	Mertensia oblongifolia	a71	a70	a88	b151	.77	.72	1.38	2.16
F	Microsteris gracilis (a)	-	1	-	-	-	.00	-	-
F	Penstemon sp.	3	-	-	-	.00	-	-	-
F	Phlox hoodii	-	-	3	2	-	-	.00	.01
F	Phlox longifolia	b188	b155	a66	a78	.81	1.10	.33	.50
F	Polygonum douglasii (a)	6	2	6	3	.04	.00	.01	.01
F	Potentilla pennsylvanica	ab50	b57	ab48	a32	.61	.90	1.85	.14
F	Ranunculus jovis	a-	b134	b107	c197	-	1.41	.82	4.11
F	Senecio integerrimus	a77	a60	b132	a87	1.22	2.09	6.34	3.59
F	Senecio multilobatus	a-	b17	a-	b28	-	.76	-	.93
F	Sisymbrium altissimum (a)	4	-	-	-	.03	-	-	-
F	Taraxacum officinale	31	34	11	28	.35	.28	.11	.40

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
	Total for Annual Forbs	208	109	101	255	0.93	0.76	0.29	2.30
	Total for Perennial Forbs	710	834	728	873	9.69	14.07	20.45	14.59
	Total for Forbs	918	943	829	1128	10.63	14.84	20.74	16.90

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	'11	'96	'01	'06	'11
B	Artemisia nova	34	27	33	46	6.58	3.99	8.43	10.92
B	Artemisia tridentata vaseyana	85	87	78	74	17.79	21.00	20.52	14.08
B	Chrysothamnus viscidiflorus lanceolatus	74	64	67	46	4.60	4.03	3.13	1.17
B	Eriogonum microthecum	38	29	36	16	1.36	.90	1.89	.38
B	Pediocactus simpsonii	3	1	1	1	-	-	.15	-
B	Ribes cereum cereum	0	0	1	1	-	.38	.38	.03
	Total for Browse	234	208	216	184	30.35	30.31	34.51	26.59

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 23

Species	Percent Cover	
	'06	'11
Artemisia nova	13.10	14.16
Artemisia tridentata vaseyana	26.56	18.08
Chrysothamnus viscidiflorus lanceolatus	4.21	1.16
Eriogonum microthecum	1.48	.68
Ribes cereum cereum	.08	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 23

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	-	1.1	0.6
Artemisia tridentata vaseyana	1.3	1.9	1.2

BASIC COVER--

Management unit 01, Study no: 23

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	55.85	64.50	65.55	53.47
Rock	12.85	9.43	11.84	11.08
Pavement	.60	.32	2.00	1.00
Litter	61.70	52.75	34.43	32.95
Cryptogams	.00	.04	.01	.74
Bare Ground	3.30	2.31	4.65	8.93

SOIL ANALYSIS DATA --

Management unit 01, Study no: 23, Study Name: Patterson Pass

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
9.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	14	-	-	-	-
Grouse	-	1	-	-	-	-	-
Elk	58	25	34	29	47 (116)	40 (99)	44 (109)
Deer	4	1	2	3	1 (2)	1 (3)	2 (5)
Cattle	-	-	-	1	-	-	-

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 23

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia nova									
96	2100	12	79	9	180	39	.95	0	11/25
01	1900	3	93	4	-	0	0	1	11/20
06	2980	9	87	4	8540	0	0	.67	11/21
11	3660	3	87	10	100	18	.54	4	13/29
Artemisia tridentata vaseyana									
96	5060	17	68	15	340	27	11	4	19/33
01	6000	10	76	15	60	8	0	9	19/32
06	4840	2	71	27	1940	9	.41	13	20/33
11	3640	5	71	23	-	37	0	19	20/36
Chamaebatiaria millefolium									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	44/81
11	0	0	0	-	-	0	0	0	-/-

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Chrysothamnus nauseosus									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	24/17
11	0	0	0	-	-	0	0	0	-/-
Chrysothamnus viscidiflorus lanceolatus									
96	4100	11	78	11	20	4	0	7	11/16
01	3280	9	76	15	-	.60	0	5	9/16
06	2760	6	89	5	-	0	0	0	9/15
11	1620	0	80	20	-	2	0	19	10/13
Eriogonum microthecum									
96	1320	15	85	0	-	12	0	0	6/12
01	1120	0	100	0	-	0	0	0	6/13
06	1380	1	96	3	-	4	0	0	6/14
11	460	0	91	9	-	0	0	13	7/14
Pediocactus simpsonii									
96	80	0	100	-	-	50	0	0	7/6
01	20	0	100	-	-	0	0	0	3/3
06	20	0	100	-	-	0	0	0	4/5
11	20	0	100	-	-	0	0	0	5/10
Ribes cereum cereum									
96	0	0	0	0	-	0	0	0	3/94
01	0	0	0	0	-	0	0	0	37/103
06	20	0	0	100	-	0	0	100	34/81
11	20	0	0	100	-	0	0	100	37/70

SHEEP RANGE SPRING - TREND STUDY NO. 1-24-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Summer

NRCS Ecological Site Description: Not Available

Land Ownership: BLM

Elevation: 7,200 ft. (2,195 m)

Aspect: Southwest

Slope: 16%

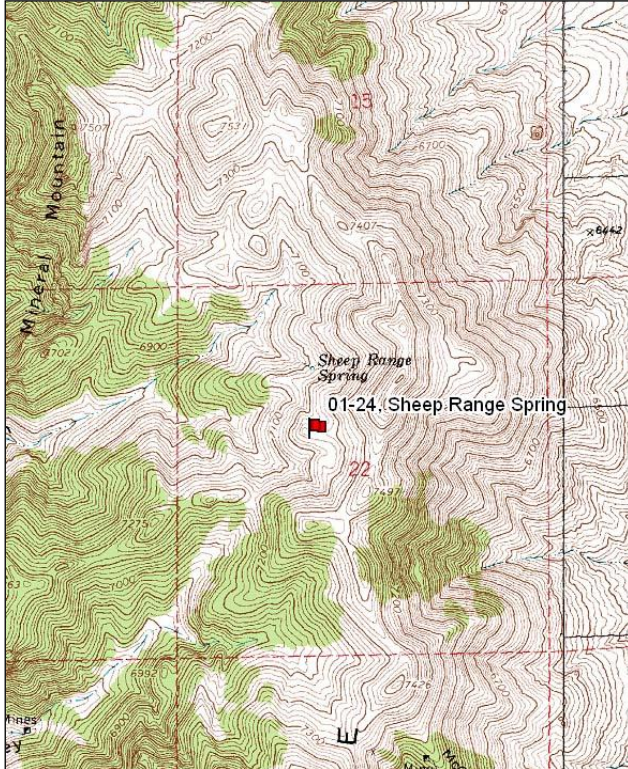
Transect bearing: 84° magnetic

Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft). Rebar: belt 4 on 21ft.

Directions:

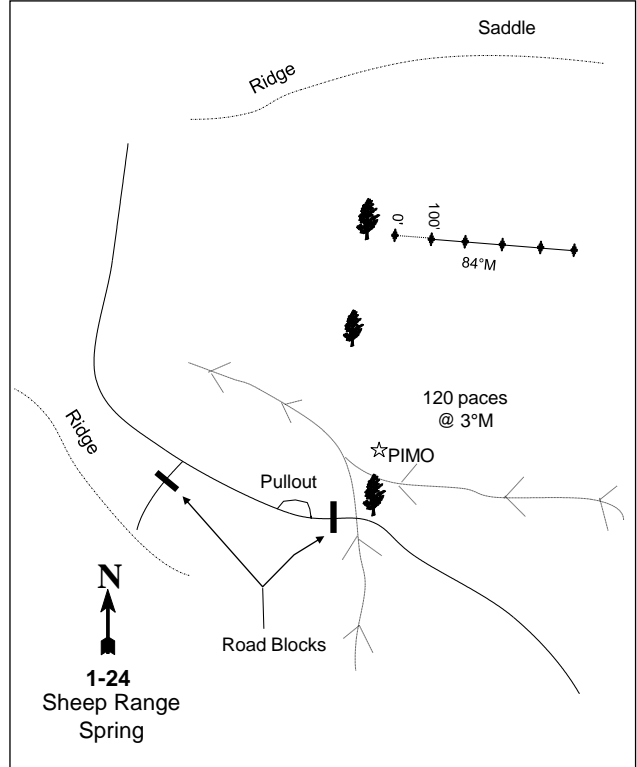
From the U-30 and Pilot Mountain Road junction, travel south on the Pilot Mountain Road for 5.4 miles to the railroad tracks. Continue straight for 0.6 miles to the TL Bar Beefmaster Ranch. Take the left fork and travel 5 miles to a fork in the road. Take a right turn and travel 2.1 miles to a four way 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 downhill 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



Township: 6N Range: 19W Section: 22

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 247361 E 4568102 N

SHEEP RANGE SPRING - TREND STUDY NO. 1-24

Site Information

Site Description: The study was established in 1996 to monitor habitat used by elk in the Pilot Mountains. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass covered ridge that runs east-west. The study area is surrounded by ridges dominated by black sagebrush (*A. nova*). The baseline was placed on a ridge with deeper soils and more grass and forb cover. The area is managed by the Bureau of Land Management (BLM) as part of the Lucin-Pilot allotment. There are many mining claims in the area, but most do not appear active. Pellet groups have been sampled in moderate abundance for elk and low abundance for deer since 2001. Two cow elk were also seen in the area during study establishment in 1996. Deer and elk likely occupy this area during the summer as well as normal winters. There has been limited sage-grouse pellets sampled, but two sage-grouse were seen in 1996. Sampled cattle and sheep sign has been low since 2001 (Table - Pellet Group Data).

Browse: The browse component is dominated by mountain big sagebrush, intermixed with black sagebrush in some of the areas within the more shallow soils. Cover of mountain big sagebrush has steadily increased since 1996 (Table - Browse Trends), though density has remained similar. The average size of sagebrush increased steadily from 1996 to 2006. The mountain big sagebrush population is a moderately dense stand of mostly lightly used plants, though use was moderate in 2011. The black sagebrush population is comprised of a low density stand of lightly utilized plants. Decadence and poor vigor have been low in both sagebrush species, though some decadent and dead mountain big sagebrush plants were found in areas with more shallow soils where black sagebrush is more prevalent. The increaser species mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) has a dense population, but density has steadily decreased since 1996. Utilization of rabbitbrush is light. Other shrubs sampled include threadleaf rubber rabbitbrush (*C. nauseosus* ssp. *consimilis*) and slenderbush eriogonum (*Eriogonum microthecum*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant. The most common perennial grasses are thickspike wheatgrass (*Agropyron dasystachyum*), bluebunch wheatgrass (*A. spicatum*), and Sandberg bluegrass (*Poa secunda*). Cheatgrass was quite common in both 1996 and 2001, but has been rare since 2006. Forbs produce a large proportion of the vegetation cover, and perennial forb species are diverse. The dominant perennial species consist of arrowleaf balsamroot (*Balsamorhiza sagittata*), silvery lupine (*Lupinus argenteus*), longleaf phlox (*Phlox longifolia*), and two milkvetch (*Astragalus spp.*) species. Some of the arrowleaf balsamroot was infested with insects, which caused yellow spots on the leaves in 1996.

Soil: The soil is in the Lundy-Sonlet-Lodar very gravelly loams, which occurs on hillslopes. Parent material consists of colluvium derived from limestone and chert (Soil Survey Staff 2011). The soil texture is a loam to clay loam with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). The soil is extremely rocky under the first few inches of soil, and rock and pavement are abundant on the surface. Bare ground increased to moderate levels and litter cover decreased in 2006 (Table - Basic Cover). Some of this decline may be due to the decrease of cheatgrass. The soil erosion condition was classified as slight in 2001 and 2006, but was stable in 2011.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density of mountain big sagebrush decreased slightly from 2,200 plants/acre to 2,080 plants/acre, but cover increased from 7% to 11%. Recruitment of young plants decreased from 18% to 5% of the population.
- **2001 to 2006 - stable (0):** Mountain big sagebrush density decreased 12% to 1,840 plants/acre, but cover increased to 12%. Decadence increased from 16% to 22%, and poor vigor increased from 5% to

9%. Recruitment of young plants decreased to 2%, but there were numerous seedlings sampled in 2006.

- **2006 to 2011 - up (+2):** There was a 34% increase in the density of mountain big sagebrush to 2,460 plants/acre, and cover increased to 16%. Decadence decreased to 11%, but poor vigor remained similar at 10%. Recruitment of young plants increased to 23% of the population.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased by 11%, and cover increased from 11% to 22%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 6% to 4%.
- **2001 to 2006 - slightly up (+1):** There was little change in the sum of nested frequency of perennial grasses, but cover decreased to 15%. Cheatgrass decreased significantly in nested frequency, and was not sampled on the site.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 25%.

Forb:

- **1996 to 2001 - slightly up (+1):** There was a 14% increase in the sum of nested frequency of perennial forbs, though cover remained similar at 16%.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial forbs decreased by 54%, and cover decreased to 13%.
- **2006 to 2011 - up (+2):** The perennial forb sum of nested frequency increased over two-fold to above 2001 levels. Cover of perennial forbs increased slightly to 14%.

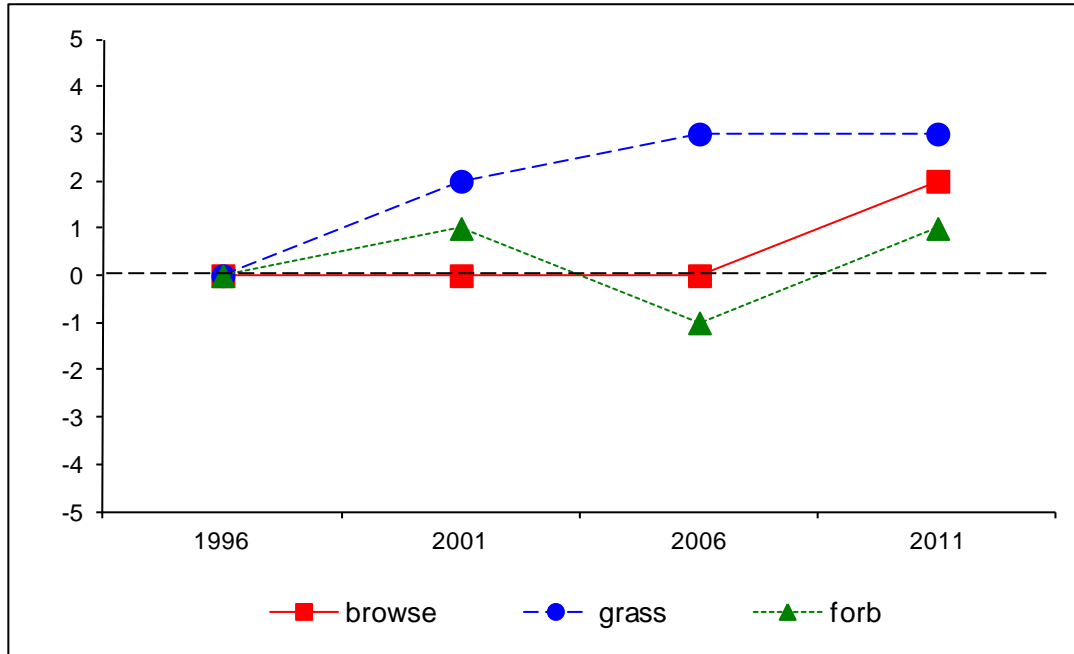
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 1, study no: 24

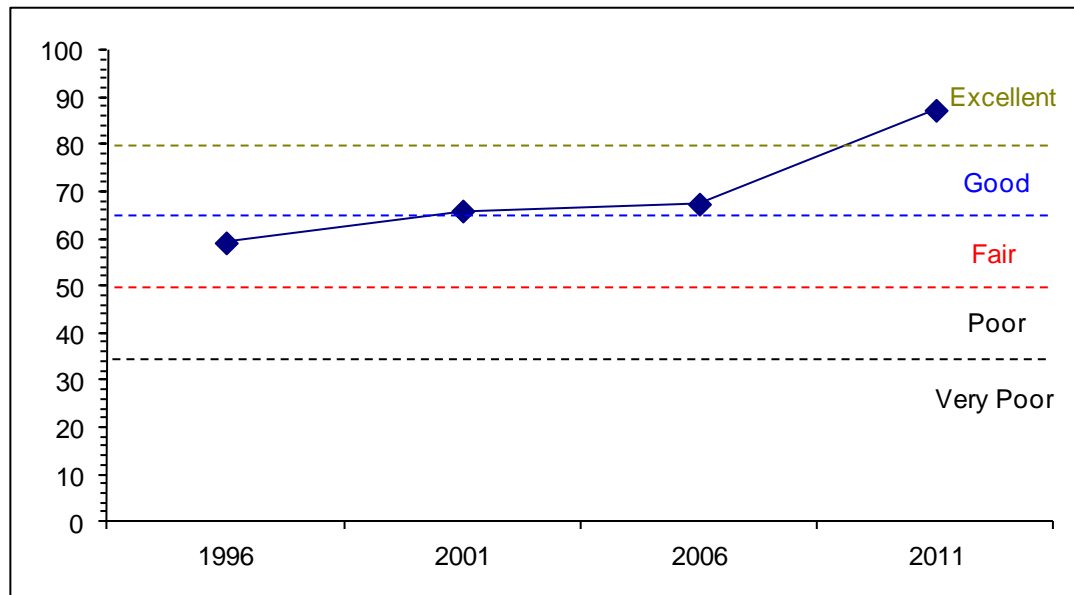
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.4	10.6	7.7	22.6	-4.1	10.0	0.0	59.2	Fair
01	16.2	10.4	2.4	30.0	-3.1	10.0	0.0	65.9	Fair-Good
06	17.5	8.7	1.2	30.0	0.0	10.0	0.0	67.4	Good
11	23.4	11.9	12.6	30.0	-0.6	10.0	0.0	87.3	Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 1 Study no: 24



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 1, Study no: 24



HERBACEOUS TRENDS--

Management unit 01, Study no: 24

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	b122	a42	b165	b149	2.07	.93	2.68	2.19
G	Agropyron spicatum	a106	b192	a112	a87	2.09	8.69	5.00	4.55
G	Bromus tectorum (a)	d307	c263	a-	b37	5.48	4.08	-	.80
G	Poa fendleriana	a1	a3	a4	b23	.00	.00	.03	1.67
G	Poa secunda	a195	ab237	ab225	b258	7.08	12.14	7.38	16.45
G	Stipa lettermani	3	-	-	-	.03	-	-	-
Total for Annual Grasses		307	263	0	37	5.48	4.08	0	0.80
Total for Perennial Grasses		427	474	506	517	11.30	21.78	15.10	24.87
Total for Grasses		734	737	506	554	16.78	25.87	15.10	25.68
F	Agoseris glauca	b50	b94	a13	c155	.17	.36	.03	1.75
F	Allium sp.	a1	b50	a-	c98	.00	.23	-	.50
F	Arabis sp.	-	-	5	-	-	.00	.01	-
F	Aster scopulorum	-	-	11	2	-	-	.09	.03
F	Astragalus beckwithii	b27	a3	a-	b25	.25	.03	-	.75
F	Astragalus cibarius	b62	b60	a3	a8	.46	1.21	.15	.05
F	Balsamorhiza hookeri	21	16	19	14	.23	1.02	.51	.81
F	Balsamorhiza sagittata	b130	b114	a81	a66	12.23	9.21	9.23	3.26
F	Camelina microcarpa (a)	b19	a1	a-	a-	.03	.03	-	-
F	Collinsia parviflora (a)	b160	c295	a-	c321	.62	1.75	-	5.16
F	Collomia linearis (a)	a3	b57	a-	a11	.01	.14	-	.02
F	Comandra pallida	ab18	ab32	b40	a13	.10	.45	.78	.10
F	Crepis acuminata	ab9	b14	a6	a-	.05	.17	.04	-
F	Descurainia pinnata (a)	-	-	-	6	-	-	-	.06
F	Erigeron pumilus	a-	b14	a-	a-	-	.10	-	-
F	Eriogonum villiflorum	a-	b16	a-	a-	-	.42	-	-
F	Hackelia patens	b38	a14	ab25	b42	.71	.11	.97	.67
F	Haplopappus acaulis	2	-	10	4	.03	-	.07	.03
F	Hydrophyllum capitatum	b25	b49	a-	c113	.20	.53	-	3.92
F	Lappula occidentalis (a)	6	-	3	-	.01	-	.03	-
F	Lewisia rediviva	-	-	-	2	-	-	-	.03
F	Lithospermum ruderae	1	1	3	-	.00	.15	.31	-
F	Lomatium sp.	-	11	-	15	-	.16	-	.10
F	Lupinus argenteus	b33	b34	a5	ab18	.92	.86	.09	.39
F	Machaeranthera grindelioides	2	3	-	-	.03	.00	-	-
F	Microsteris gracilis (a)	a-	c217	a-	b66	-	1.17	-	.66
F	Navarretia intertexta (a)	2	-	-	-	.00	-	-	-
F	Phlox hoodii	-	-	-	5	-	-	-	.03
F	Phlox longifolia	b162	b125	a73	a67	.82	1.00	.23	.59
F	Polygonum douglasii (a)	3	-	4	-	.00	-	.01	-
F	Ranunculus testiculatus (a)	-	1	-	-	-	.00	-	-
F	Senecio integerrimus	a4	ab16	a3	b28	.03	.17	.06	.59
F	Viola sp.	a-	a3	a8	b47	-	.00	.04	.30
Total for Annual Forbs		193	571	7	404	0.68	3.10	0.03	5.92

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
	Total for Perennial Forbs	585	669	305	722	16.28	16.23	12.64	13.95
	Total for Forbs	778	1240	312	1126	16.97	19.34	12.68	19.87

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	'11	'96	'01	'06	'11
B	Artemisia nova	24	15	22	21	2.42	1.89	1.78	2.36
B	Artemisia tridentata vaseyana	64	62	58	63	7.43	11.06	12.13	16.36
B	Chrysothamnus nauseosus consimilis	1	1	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus lanceolatus	63	62	65	56	6.23	6.55	4.41	3.67
B	Eriogonum microthecum	3	1	2	0	.03	.00	.06	-
B	Pediocactus simpsonii	0	0	1	1	-	-	-	-
	Total for Browse	155	141	148	141	16.13	19.52	18.39	22.41

CANOPY COVER, LINE INTERCEPT--

Management unit 01, Study no: 24

Species	Percent Cover	
	'06	'11
Artemisia nova	3.16	3.46
Artemisia tridentata vaseyana	16.71	13.83
Chrysothamnus viscidiflorus lanceolatus	6.93	7.91

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 01, Study no: 24

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	-	0.9	0.7
Artemisia tridentata vaseyana	1.8	1.3	1.4

BASIC COVER--

Management unit 01, Study no: 24

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	49.35	61.50	43.90	59.74
Rock	6.65	4.62	5.19	4.11
Pavement	7.63	8.09	14.84	6.74
Litter	53.22	50.44	30.63	19.26
Cryptogams	.04	.04	0	.09
Bare Ground	6.47	7.08	18.91	18.76

SOIL ANALYSIS DATA --

Management unit 01, Study no: 24, Study Name: Sheep Range Spring

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
14.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	1	-	-	-	-
Grouse	-	-	-	1	-	-	-
Elk	40	11	16	14	22 (55)	21 (51)	21 (53)
Deer	9	1	1	3	5 (13)	8 (20)	3 (8)
Cattle	-	-	1	1	-	3 (7)	-
Sheep	-	-	-	-	-	3 (8)	5 (13)

BROWSE CHARACTERISTICS--

Management unit 01, Study no: 24

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Artemisia nova										
96	1020	8	78	14	-	12	0	0	10/26	
01	500	4	84	12	-	0	0	8	10/25	
06	740	5	81	14	340	0	3	11	9/23	
11	860	40	56	5	140	2	0	5	8/24	
Artemisia tridentata vaseyana										
96	2200	18	66	15	20	10	.90	5	20/31	
01	2080	5	79	16	-	3	0	5	24/37	
06	1840	2	76	22	3560	8	0	9	24/39	
11	2460	23	67	11	120	53	0	10	22/39	
Chrysothamnus nauseosus consimilis										
96	20	100	0	-	-	0	0	0	26/29	
01	20	0	100	-	-	0	0	0	27/58	
06	0	0	0	-	-	0	0	0	34/49	
11	0	0	0	-	-	0	0	0	34/66	
Chrysothamnus viscidiflorus lanceolatus										
96	3600	19	73	8	20	.55	0	4	15/25	
01	3340	3	88	9	40	0	0	0	13/20	
06	3160	4	87	9	-	1	0	2	10/20	
11	2500	2	91	6	-	.80	0	6	10/21	
Eriogonum microthecum										
96	180	0	89	11	-	11	0	0	3/10	
01	20	0	100	0	-	0	0	0	3/6	
06	40	0	100	0	-	0	0	0	3/7	
11	0	0	0	0	-	0	0	0	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Pediocactus simpsonii										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	1/2	
11	20	0	100	-	-	0	0	0	2/3	

SUMMARY

WILDLIFE MANAGEMENT UNIT 1 - BOX ELDER

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Nineteen interagency range trend studies were sampled in Unit 1 during the summer of 2011.

Ten of the studies [Chokecherry Springs (1-4), Bovine Exclosure (1-6), Red Butte Exclosure (1-12), Broad Hollow (1-14), Cedar Hills (1-15), Nut Pine Hills (1-16), Clarks Basin (1-17), Bally Mountain (1-19), Patterson Pass (1-23), and Sheep Range Spring (1-24)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush, basin big sagebrush, and black sagebrush communities. Though categorized as deer winter range in this summary, the Nut Pine Hills, Clark's Basin, Patterson Pass, and Sheep Range Spring studies are considered to be crucial deer summer range and fawning habitat. The Bovine Exclosure and Red Butte Exclosure studies are considered to be elk year-long range; the Bally Mountain study is considered to be elk winter range; and the Patterson Pass and Sheep Range Spring studies are considered important elk summer range.

The remaining nine studies [Rosette (1-2), Devils Playground (1-5), South Side Emigrant Pass (1-7), Mud Springs Basin (1-8), Kilgore Basin (1-10), Kimber Ranch (1-11), Raft River Narrows (1-13), Bedke Spring (1-18), and Dake Pass (1-22)] are classified as low potential deer winter range sites, and sample Wyoming big sagebrush or black sagebrush communities. All of the studies except Raft River Narrows and Bedke Spring are also considered to be elk year-long range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of Western Utah (Division 1). Western Utah had a historic annual mean precipitation of 8.69 inches from 1895 to 2011. The mean annual PDSI of Western Utah displays predominance to drought in the division over most of study years. Wetter than normal years in Western Utah included 1983-1984, 2005, and 2011; and drought years included 1989-1992, 1996, 1999-2004 and 2007-2009 (Figure 1 and Figure 2) (Time Series Data 2012).

The 1961-1990 mean annual precipitation was 8-10 in. on the Dake Pass study; 10-12 in. on the Rosette, Devils Playground, South Side Emigrant Pass, Mud Springs Basin, Kilgore Basin, Kimber Ranch, and Bedke Spring studies; 12-14 in. on the Patterson Pass and Sheep Rang Spring studies; 14-16 in. on the Chokecherry Springs, Bovine Exclosure, Raft River Narrows, and Cedar Hills studies; 16-18 in. on the Red Butte Exclosure, Broad Hollow, Nut Pine Hills, and Bally Mountain studies; and 18-20 in. on the Clark's Basin study (PRISM Climate Group 2011).

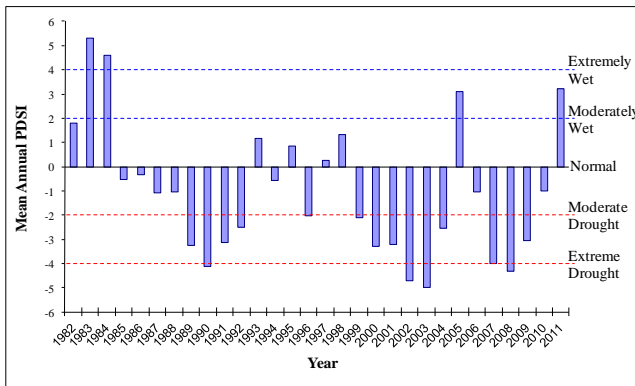


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for Western Utah (Division 1). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

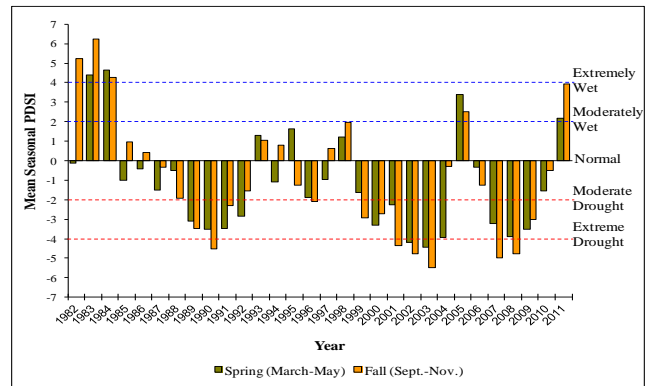


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for Western Utah (Division 1). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

Mountain/Basin Big Sagebrush and Black Sagebrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse has remained similar over the course of the study (Figure 8a). The dominant browse species on the majority of the mid-level potential studies is mountain big sagebrush, though basin big sagebrush is the dominant species on the Bovine Exclosure and Red Butte Exclosure studies. The two big sagebrush species were averaged together in this summary. Wildfires occurred on the Broad Hollow and Cedar Hills studies in 1996 and 2000, respectively. The wildfire on the Broad Hollow study occurred following the sample in 1996, and burned just part of the transect. The wildfire on the Cedar Hills study was larger and burned the entire study area, removing nearly all of the browse species. Decreases in density due to the fires on these sites comprised much of the decrease in the mean density of big sagebrush in 2001. The mean density of big sagebrush decreased significantly from 1996 to 2001, and significantly again from 2001 to 2006. Density of big sagebrush remained similar from 2006 to 2011 (Figure 4a). Despite the changes in density, mean cover of big sagebrush was higher in 2001 and 2006 than in 1996 and 2011 (Figure 4b). The mean decadence of big sagebrush has been moderately high since 1996, with the highest decadence in 2006 (Figure 4c).

Black sagebrush is the dominant browse on the Bally Mountain study, and is also common on the Bovine Exclosure, Nut Pine Hills, Clark's Basin, Patterson Pass, and Sheep Range Spring studies. A prescribed fire in 2003 removed a large portion of the black sagebrush on the Bally Mountain study. Because the prescribed fire had a large influence on the mean trends, the Bally Mountain study was excluded from the summary of black sagebrush. For further information on black sagebrush on the Bally Mountain study, refer to the discussion section. The mean black sagebrush density and cover, excluding Bally Mountain, remained similar from 1996 to 2006, and then increased significantly in 2011 (Figure 4a and Figure 4b). Mean decadence of black sagebrush was moderate in 1996 and 2006, but was low in 2001 and 2011 (Figure 4c).

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit has increased over the course of the study. There was a large increase in 1990, and a slight increase in 2006 (Figure 8a). Grasses within these communities are typically diverse and abundant. Annual grass species, comprised primarily of cheatgrass (*Bromus tectorum*), are common, but are generally less prevalent than perennial species. Mean sum of nested frequency of perennial grasses has remained fairly similar since 1996, but cover increased

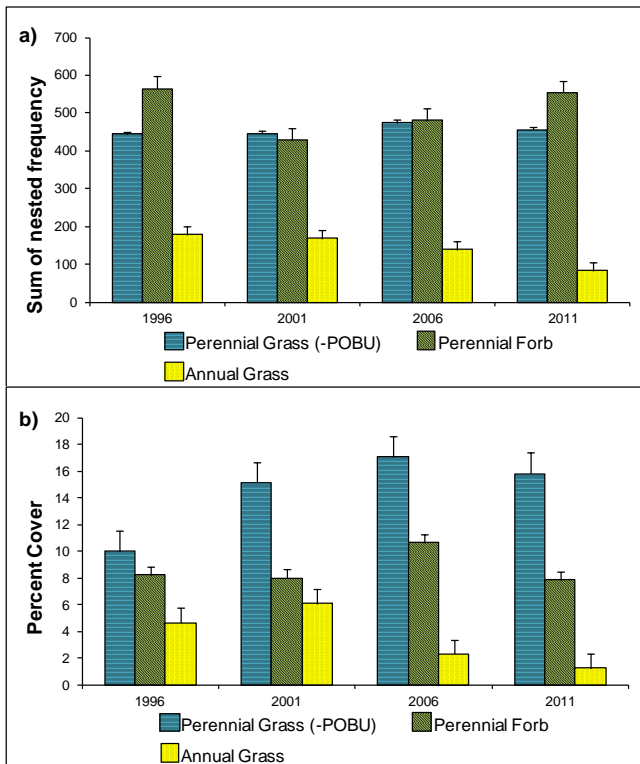


Figure 3. a) Mid-level potential sites mean perennial grass (excluding bulbous bluegrass), perennial forb and annual grass sum of nested frequency by year for WMU 1, Box Elder. b) Mid-level potential sites mean perennial grass (excluding bulbous bluegrass), perennial forb and cheatgrass cover by year for WMU 1.

significantly in 2001 and has remained higher since that time. The mean nested frequency and cover of annual grasses has steadily decreased since 2001 (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend for the unit has increased slightly over the study years. There was a decrease in trend in 2001, but trend increased again in 2006 and increased slightly in 2011 (Figure 8a). Perennial forbs are also diverse and abundant within the sampled communities. The mean sum of nested frequency of perennial forbs was significantly higher in 1996 and 2011 than in 2001 and 2006 (Figure 3a). However, mean cover of perennial forbs was significantly higher in 2006 than the other sample years (Figure 3b).

Browse Utilization & Animal Presence: Big sagebrush plants on all of the mid-level potential studies have primarily displayed light to moderate use over the course of the study years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group data indicates that most of the study areas are predominantly occupied by deer, though several study areas are more highly occupied by elk. The mean abundance of sampled deer pellet groups on the mid-level potential studies in the unit has been moderate since 2001. Pellet groups for deer have been sampled in the highest abundance on the Broad Hollow, Nut Pine Hills, and Clark's Basin studies. Deer pellet group

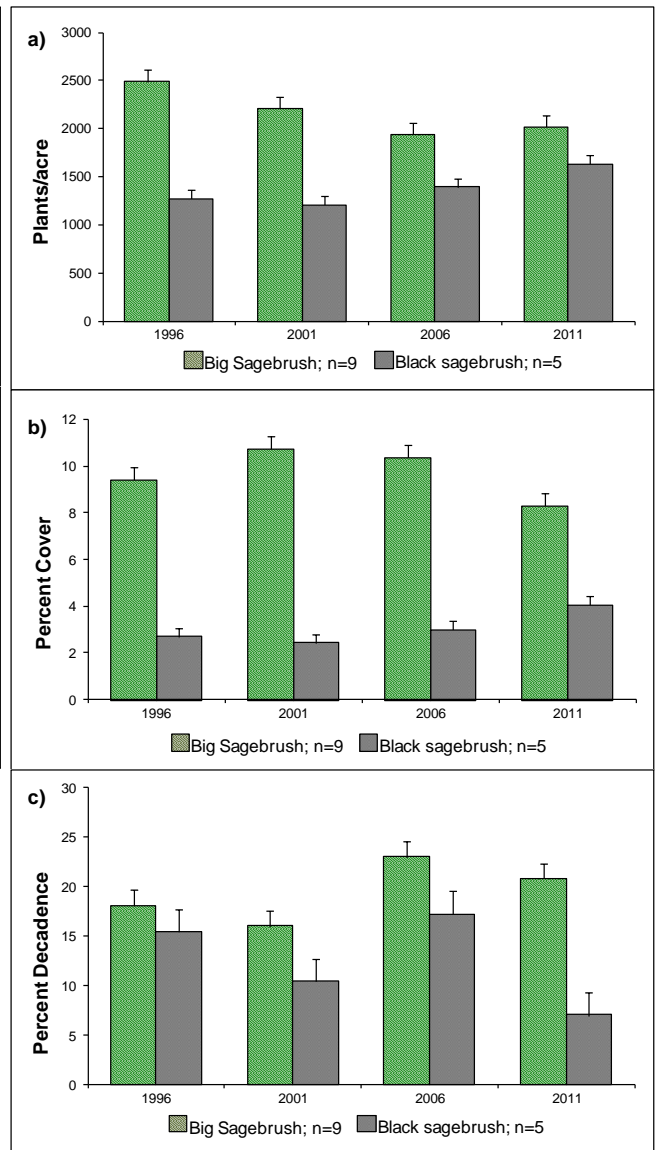


Figure 4. a) Mid-level potential sites mean density of big sagebrush (*Artemisia tridentata*) and black sagebrush (*A. nova*), excluding Bally Mountain, by year for WMU 1, Box Elder. b) Mid-level potential sites mean cover of big sagebrush and black sagebrush, excluding Bally Mountain, by year for WMU 1. c) Mid-level potential sites mean decadence of big sagebrush and black sagebrush, excluding Bally Mountain by year for WMU 1.

abundance has increased on the Broad Hollow study since 2001, but decreased on the Clark's Basin study in 2011. Elk pellet groups are rare on most of the mid-level potential studies, but have been sampled in high and moderate abundance on the Patterson Pass and Sheep Range Spring studies, respectively. Livestock sign from cattle or sheep has been sampled in low abundance on most mid-level potential studies. However, livestock sign was sampled in particularly high abundance on the Red Butte Exclosure and Cedar Hills studies in 2006 and the Bally Mountain study in 2011, but has been low on these studies in other sample years. Livestock sign was sampled in moderate abundance on the Clark's Basin study in 2006 and 2011 (Figure 9a).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has remained fairly stable since 1996, with rankings ranging from fair to fair-good throughout the sample years. Attributes of preferred browse species have decreased slightly since 1996, but perennial grass cover has increased and annual grass cover has decreased (Table 1 and Figure 7).

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.7	10.4	6.3	19.3	-3.1	8.4	0.0	61.0	Fair
01	21.4	9.4	3.9	24.0	-4.1	7.7	0.0	62.3	Fair
06	19.2	7.2	2.3	23.7	-1.6	8.9	0.0	59.6	Fair
11	17.8	8.6	3.9	25.2	-0.8	8.6	0.0	63.3	Fair-Good

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=10) by year for WMU 1, Box Elder. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

Discussion: The decline of big sagebrush populations on these important winter ranges gives reason for concern, but big sagebrush remains prevalent on most of the mid-level potential studies on the unit. The Chokecherry Springs, Bovine Exclosure, Broad Hollow, Cedar Hills, and Patterson Pass studies have driven the pattern of big sagebrush decline for mid-level potential studies on the unit. Wildfires occurred on the Broad Hollow and Cedar Hills studies in 1996 and 2000, respectively. The wildfire on the Broad Hollow study occurred following the sample in 1996, and burned just part of the transect. The wildfire on the Cedar Hills study was larger and burned the entire study area, removing nearly all of the browse species. Decreases in density due to the fires on these sites comprised much of the decrease in the mean density of big sagebrush in 2001, but density of big sagebrush has continued to decrease on the Broad Hollow study and many of the other mid-level potential studies in subsequent sample years.

Causes of sagebrush decline are varied and multiple causes may have compounded effects on the mid-level potential studies in this unit. Drought has been a predominant factor in this area over the course of the study years (Figure 1 and Figure 2), but these mid-level potential studies are at higher elevations and drought was likely not as acute as lower elevation studies. While lack of precipitation may have caused some stress on plants, it does not appear to be the primary cause of the decline on the mid-level potential studies. The abundance of the annual grass species cheatgrass is a more likely primary cause of sagebrush decline. This weedy species can form dense mats of cover that compete with seedling and young sagebrush plants, which thereby limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Cheatgrass can also increase fuel loads and increase the chance of a catastrophic fire event. Cheatgrass has been especially prevalent on the Chokecherry Springs, Bovine Exclosure, Red Butte Exclosure, Broad Hollow, and Sheep Range Spring studies. However, cheatgrass has decreased on each of these studies since 1996. It appears that cheatgrass is having the largest impact on the big sagebrush populations on the Chokecherry Springs, Bovine Exclosure, and Broad Hollow studies.

Wyoming Big Sagebrush and Black Sagebrush Communities (Low Potential)

Browse: The low potential site cumulative median browse trend has remained similar over the course of the study. There was a slight increase in trend in 1996, but a slight decrease again in 2006 (Figure 8b). Wyoming big sagebrush is the dominant browse species on the Rosette, Mud Springs Basin, Raft River Narrows, and Bedke Spring, with less dense populations also occurring on the Devils Playground, Kilgore Basin, and Kimber Ranch studies. Part of the Raft River study was burned in a backfire set in 2000; however, if this site were excluded trends would remain similar for Wyoming big sagebrush. The mean density of Wyoming big sagebrush has steadily decreased since 1996. The largest decrease in 2001 was primarily due to the aforementioned fire on the Raft River study (Figure 6a). Mean cover of Wyoming big sagebrush has remained fairly similar, though cover was significantly lower in 2006 than the other sample years (Figure 6b). Mean decadence of Wyoming big sagebrush has generally been moderately high on the studies, but was significantly lower in 2001 than the other sample years (Figure 6c).

Black sagebrush is the dominant browse species on the Devils Playground, South Side Emigrant Pass, Kilgore Basin, Kimber Ranch, and Dake Pass studies, with less dense populations also occurring on the Mud Springs Basin and Bedke Spring studies. Mean density of black sagebrush was highest in 2001, but decreased significantly in 2006, and remaining at the lower rates in 2011 (Figure 6a).

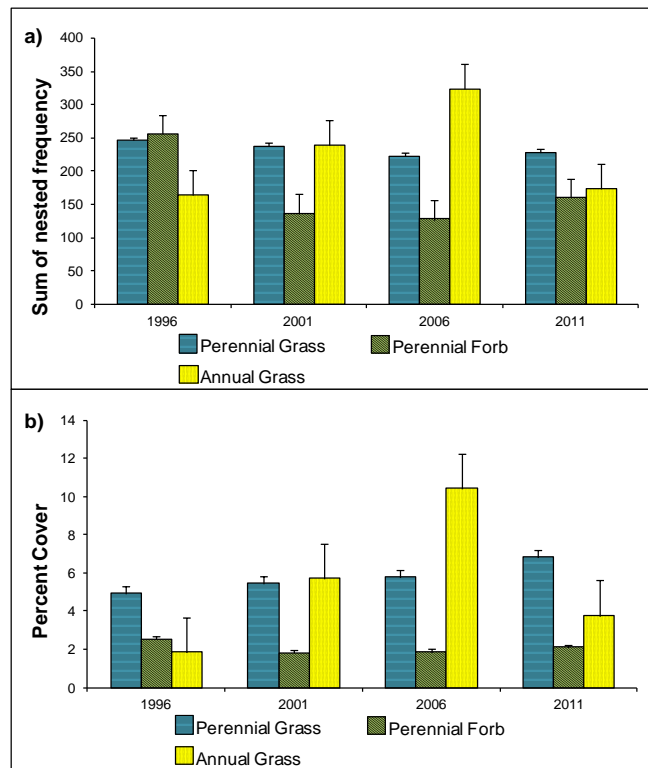


Figure 5. a) Low potential sites mean perennial grass, perennial forb and annual grass sum of nested frequency by year for WMU 1, Box Elder. b) Low potential sites mean perennial grass, perennial forb and cheatgrass cover by year for WMU 1.

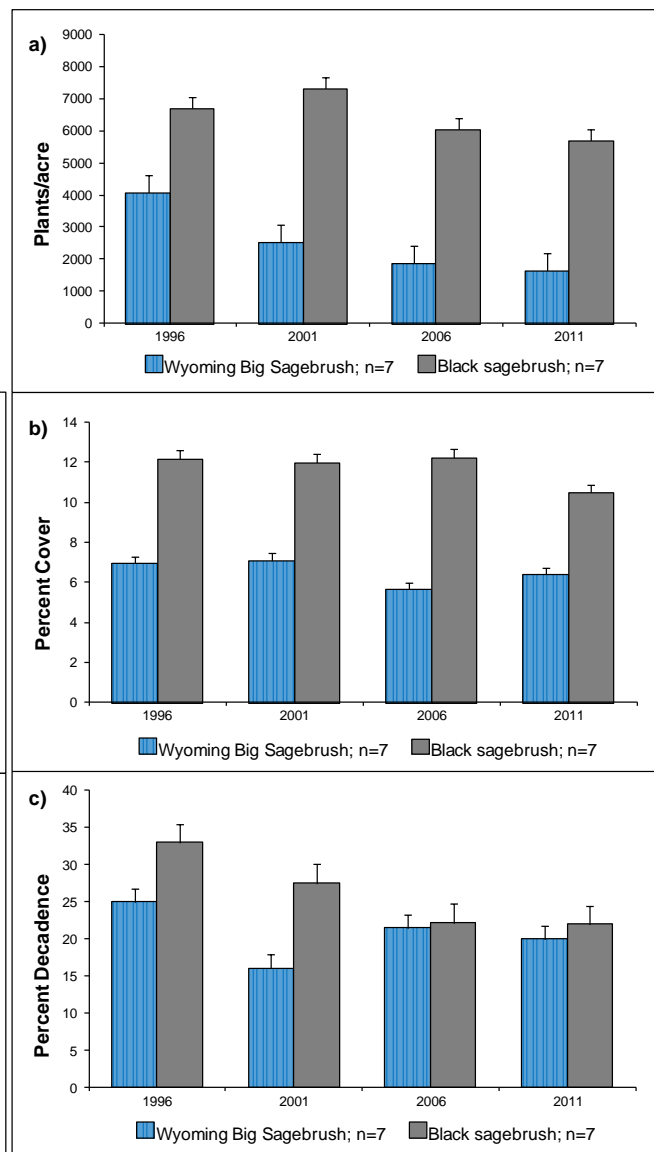


Figure 6. a) Low potential sites mean density of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and black sagebrush (*A. nova*) by year for WMU 1, Box Elder. b) Low potential sites mean cover of Wyoming big sagebrush and black sagebrush by year for WMU 1. c) Low potential sites mean decadence of Wyoming big sagebrush and black sagebrush by year for WMU 1.

Mean cover of black sagebrush remained similar from 1996 to 2006, then decreased significantly in 2011 (Figure 6b). Mean decadence of black sagebrush decreased significantly in 2001, and again in 2006, but remained similar at the lower rate in 2011 (Figure 6c).

Herbaceous Understory: The low potential median cumulative grass trend for the unit has increased slightly over the course of the study. There was a slight increase in the trend in 1990, a slight decrease in 2006, but a slight increase again in 2011 (Figure 8b). Grasses within these communities are moderately diverse and abundant. However, annual grass species, predominantly cheatgrass (*Bromus tectorum*), are common and have been the dominant component on many of the studies during many of the sample years. Mean sum of nested frequency of perennial grasses has remained similar throughout the sample years, but cover has steadily increased and was significantly higher in 2011 than in 1996. The mean nested frequency and cover of annual grasses steadily increased from 1996 to 2006, but both decreased significantly in 2011, returning to 1996 levels (Figure 5a and Figure 5b).

The low potential median cumulative forb trend for the unit has increased slightly over the course of the study. There was a large increase in 1996, but a large decrease in 2001. Trend increased slightly again in 2011 (Figure 8b). Perennial forbs are also moderately diverse, but are not as abundant as perennial grasses within the sampled communities. The mean sum of nested frequency of perennial forbs was similar to that of perennial grasses in 1996, but decreased significantly in 2001 and has remained at decreased levels since that time (Figure 5a). Mean cover of perennial forbs has followed a similar trend as the mean sum of nested frequency, but mean perennial forb cover has been substantially lower than perennial grasses over the course of the study (Figure 5b).

Browse Utilization & Animal Presence: Wyoming big sagebrush and black sagebrush plants on most of the low potential studies displayed moderate to heavy utilization at the outset of the studies in 1984, but have primarily displayed light to moderate utilization in the subsequent sample years. Black sagebrush on the Dake Pass study displayed moderate to heavy utilization in 1996 and 2011, but much lighter use in the other sample years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of Wyoming big sagebrush and black sagebrush is a primary concern for the low potential studies on this unit.

Pellet group transect data indicates that deer predominantly occupy these study areas. The mean abundance of sampled deer pellet groups has increased slightly from lightly moderate to more moderate abundance since 2001. Deer pellet groups have been sampled in the highest abundance on the Rosette, Devils Playground, South Side Emigrant Pass, Mud Springs Basin, Kimber Ranch, and Raft River Narrows studies. The abundance of sampled deer pellet groups has increased on the Kimber Ranch study from moderate abundance in 2001 to high abundance in 2011. The abundance of sampled elk pellet groups was low on all the studies except the South Side Emigrant Pass and Dake Pass studies. The abundance of sampled pellet groups for elk was very high on the South Side Emigrant Pass study in 2001, but has been low in the other sample years. The mean abundance of livestock pellet groups has been low on the study sites since 2001 (Figure 9b).

Deer Desirable Components Index (DCI): The low potential deer DCI steadily decreased from good in 1996 to fair in 2006, but increased again in 2011, returning to 2001 levels. Much of the change in the DCI score is due to fluctuations in annual grass cover, but there has also been a decrease in preferred browse cover and recruitment of young preferred browse plants since 1996. Increases in perennial grass cover has compensated for some of the loss in preferred browse (Table 2 and Figure 7).

Discussion: The decline in density of Wyoming big sagebrush and black sagebrush is a cause of concern for these important deer winter ranges, though cover has remained relatively stable over the course of the study years. The Rosette, Mud Springs Basin, Raft River Narrows, and Bedke Springs studies have driven the pattern of Wyoming big sagebrush decline for low potential studies on the unit. A wildfire occurred on the Raft River Narrows study in 2000. The wildfire burned just part of the study transect, but reduced density on

the study. Decreases in density due to the fire on this site comprised much of the decrease in the mean density of Wyoming big sagebrush in 2001, but density has continued to decrease on the Raft River Narrows study and many of the other low potential studies in subsequent sample years. The Devils Playground, Kimber Ranch, and Dake Pass studies have driven the pattern of decline of black sagebrush for the low potential studies on the unit.

Causes of sagebrush decline are varied and multiple causes may have compounded effects on the low potential studies in this unit. Drought has been a predominant factor in this area over the course of the study years (Figure 1 and Figure 2), and has likely negatively impacted these low elevation studies. The abundance of the annual grass species, especially the weedy species cheatgrass, is also likely a primary cause of sagebrush decline. Cheatgrass has been especially prevalent on the Rosette, Devils Playground, Mud Springs Basin, Kilgore Basin, Kimber Ranch, Raft River Narrows, Bedke Spring, and Dake Pass studies. It appears that cheatgrass is having the largest impact on the sagebrush populations on the Rosette, Mud Springs Basin, Kimber Ranch, Raft River Narrows, Bedke Springs, and Dake Pass studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.5	8.6	8.4	9.8	-1.4	4.3	0.0	49.4	Good
01	19.3	8.5	7.0	10.9	-4.3	2.6	0.0	44.1	Fair-Good
06	18.4	6.6	2.9	11.5	-7.8	2.7	0.0	34.5	Fair
11	17.4	8.6	4.8	13.6	-2.8	3.3	0.0	44.9	Fair-Good

Table 2. Low potential scale mean deer DCI scores and rankings (n=3) by year for WMU 1, Box Elder. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

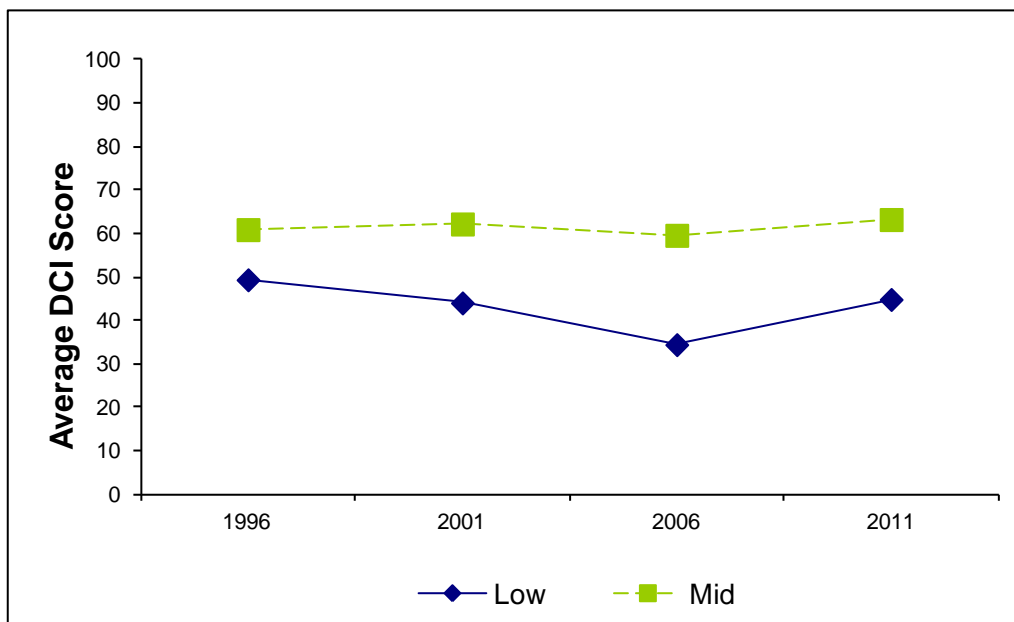


Figure 7. Mean low (n=9) and mid-level (n=10) potential scale deer DCI scores by year for WMU 1, Box Elder. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

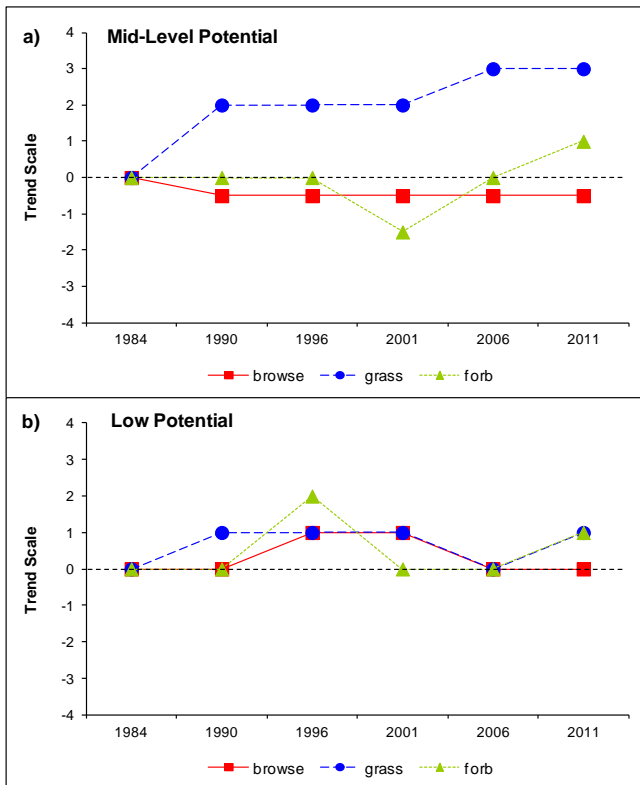


Figure 8. a) Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 1, Box Elder. b) low potential sites cumulative median browse, grass and forb trends by year for WMU 1.

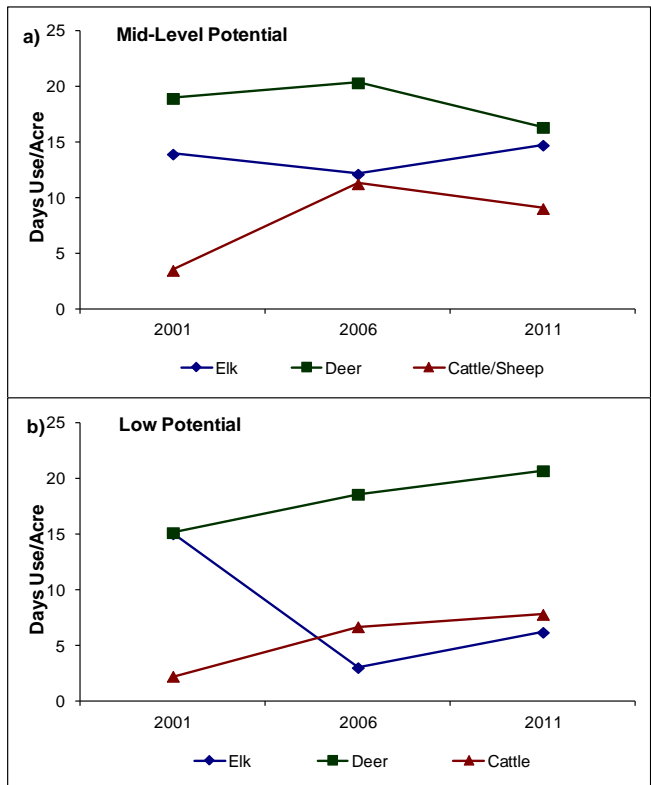
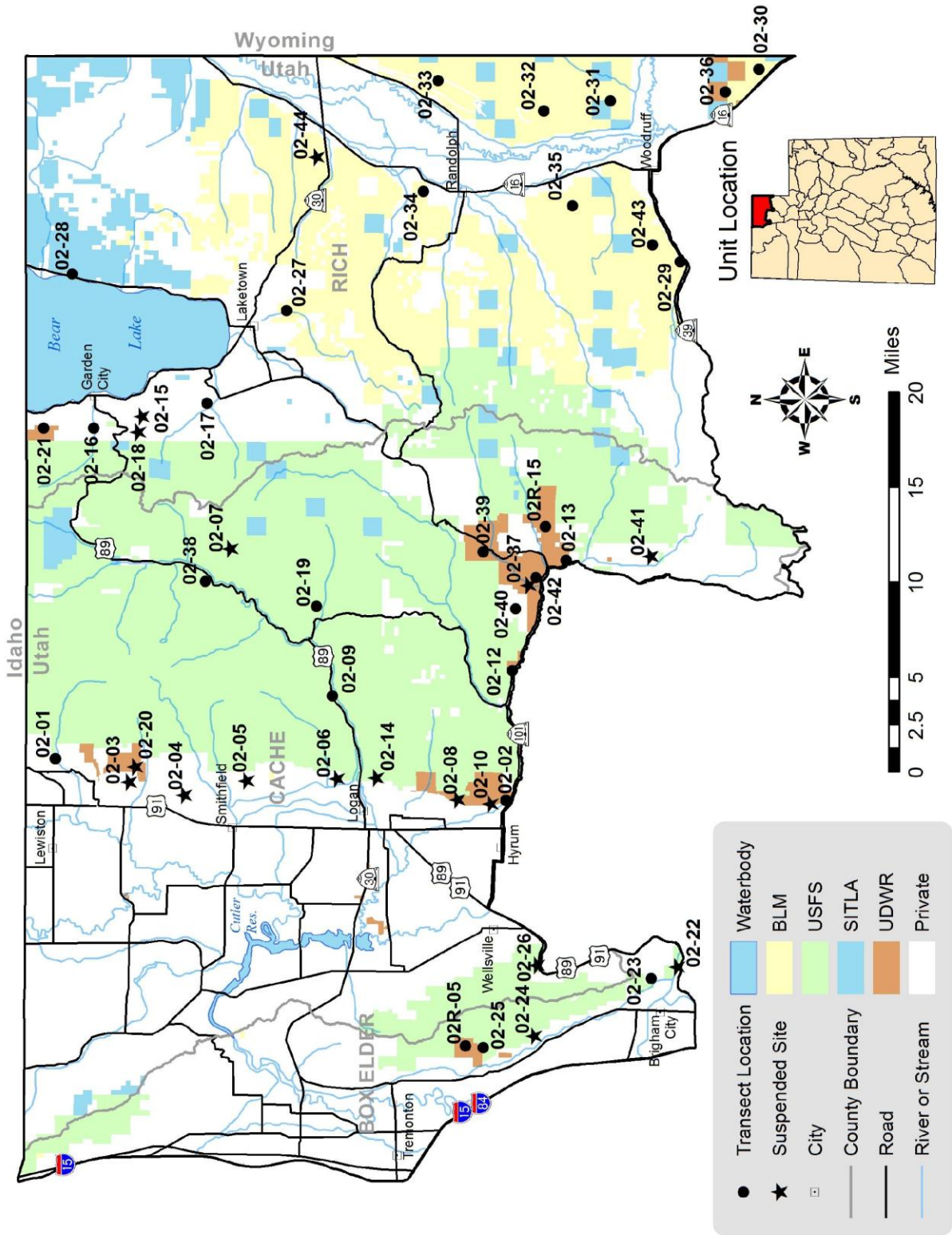


Figure 9. a) Mid-level potential sites mean animals days use/acre (n=10) by year for WMU 1, Box Elder. b) Low potential sites mean animal days use/acre (n=9) by year for WMU 1.

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.

Management Unit Description

The Cache Management Unit 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 and managed as sub-units.

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 of the deer that winter on Clarkston Mountain range, also summer on the Caribou National Forest in Idaho. Land development and associated habitat loss is still a critical problem facing wildlife management in this area.

The majority of the deer range, along with the largest deer herd, is 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 Bureau of Land Management (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 limit of the winter

range begins at about 8,000 feet at the Idaho border and gradually descends to 6,000 feet at Cottonwood Canyon. The lower limit generally follows the 6,000-foot contour.

Range Trend Studies

Twenty-eight interagency range trend studies were sampled in Unit 2 during the summer of 2011. A total of forty-five studies have been established within Unit 2 since 1984. Thirty-one range trend study sites were established in 1984, and of these studies, ten studies [High Creek (2-1), Green Canyon Exclosure (2-6), Millville Canyon (2-8), Broad Hollow Flat (2-10), Second Dam Blacksmith Fork (2-12), Hardware Plateau (2-13), Meadowville (2-17), Flat Bottom Canyon (2-23), Calls Fort Canyon (2-24), and Mouth of Two Jump Canyon (2-25)] sample mountain big sagebrush communities; one study [Mouth of Blacksmith Fork (2-2)] samples a basin big sagebrush community; two studies [Crow Mountain (2-4) and Beirdneau (2-9)] sample antelope bitterbrush communities; two studies [East of Richmond (2-3) and Smithfield Dry Canyon (2-5)] sample perennial grass communities; four studies [Spawn Creek (2-7), Lower Hodges Canyon (2-15), Upper Hodges Canyon (2-18), and Box Elder Canyon (2-22)] sample mountain brush communities; one study [Garden City Canyon (2-16)] samples a curlleaf mountain mahogany community; one study [Laketown Canyon (2-27)] samples a mountain mahogany community; seven studies [North Eden (2-28), Woodruff Creek (2-29), Stateline (2-30), South Crawford Mountains (2-31), Otter Creek (2-34), Higgins Hollow (2-35), and Rich County Landfill (2-44)] sample Wyoming big sagebrush communities; two studies [Wood Pass (2-32) and Dry Canyon (2-14)] sample juniper communities; and one study [Braizer Canyon (2-33)] samples a black sagebrush community. Five studies were established in 1990, and of these studies, two studies [Right Fork Logan Canyon (2-19) and Richmond WMA (2-20)] sample antelope bitterbrush communities; one study [Swan Creek (2-21)] samples a curlleaf mountain mahogany community; one study [Woodruff Co-op (2-36)] samples a Wyoming big sagebrush community; and one study [Wellsville Canyon (2-26)] samples a mountain brush community. Five studies were established in 1996, and of these studies, four studies [Twin Creek (2-38), Pole Hollow Spring (2-39), Warrens Spring (2-40), and Boundary Spring (2-41)] sample mountain brush communities; and one study [Rock Creek Riparian (2-37)] samples a riparian community. One study [Coldwater WMA (2R-5)] was established in 1998, and samples mountain big sagebrush community. One study [Curtis Ridge (2R-15)] was established in 2006, and samples a low sagebrush community. One study [Woodruff Longhill (2-43)] was established in 2009, and samples a Wyoming big sagebrush community. One study [Hardware Gravel Pit (2-42)] was established in 2011, and samples a mountain big sagebrush community.

In 1984, one study (East of Richmond) was suspended. In 1990, one study (Rich County Landfill) was suspended. In 1996, seven studies (Smithfield Dry Canyon, Spawn Creek, Millville Canyon, Broad Hollow Flat, Dry Canyon, Upper Hodges Canyon, and Box Elder Canyon) were suspended. In 2001, six studies (Crow Mountain, Green Canyon Exclosure, Richmond WMA, Calls Fort Canyon, Wellsville Canyon, and Boundary Spring) were suspended. In 2006, two studies (Rock Creek Riparian and Lower Hodges Canyon) were suspended. These sites were suspended for various reasons and if the need arises in the future, these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

HIGH CREEK - TREND STUDY NO. 2-1-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Upland Shallow Loam \(Black Sagebrush\), R047XA316UT](#)

Land Ownership: DWR

Elevation: 5,300 ft (1,615 m)

Aspect: South

Slope: 32%

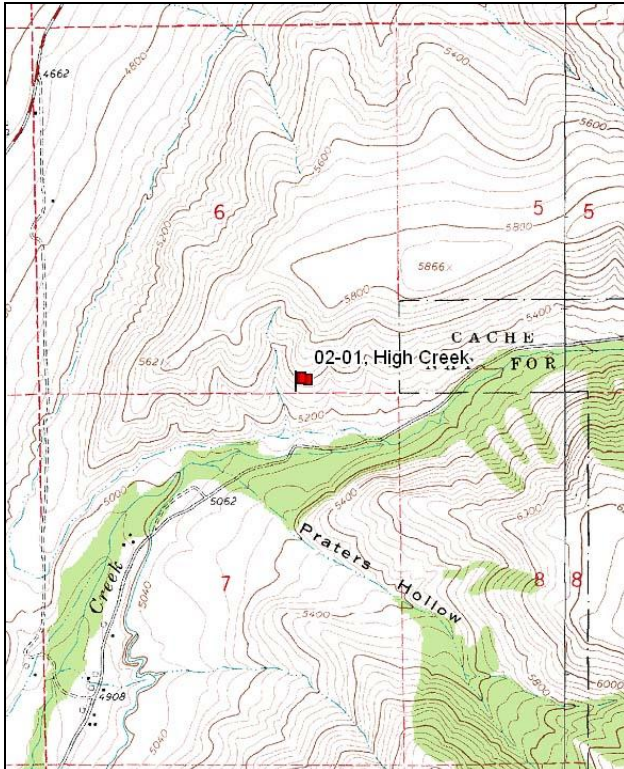
Transect bearing: 165° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 2 on 2ft, belt4 on 2ft, and belt 5 on 2ft.

Directions:

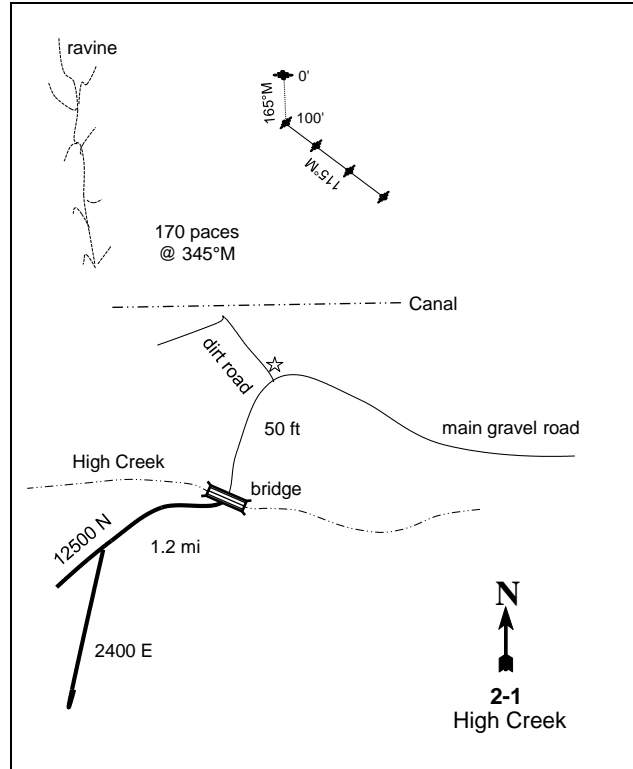
From 12500 North and 2400 East in Richmond, proceed northeast for 1.2 miles and cross High Creek. Just beyond this crossing (north) a dirt road heads off to the northeast. From this intersection, walk 170 paces at a bearing of 345 degrees magnetic to the 100-foot stake of the frequency baseline. Walk 100 feet beyond this stake to the 0-foot stake, marked with browse-tag #9150. 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



Township: 14N Range: 2E Section: 6

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 436617 E 4647445 N

HIGH CREEK - TREND STUDY NO. 2-1

Site Information

Site Description: This study is located on the north side of High Creek and samples crucial winter range on the northernmost part of the herd unit, near the Idaho border. The hillside on which the study is located contains many open areas dominated by cheatgrass (*Bromus tectorum*) and the invasive perennial grass bulbous bluegrass (*Poa bulbosa*). The browse canopy is primarily made up of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Deer and cattle pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The key browse species found on this site are mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*). Sagebrush provided over 80% of the total browse cover in each reading ranging from 6% to 12% cover since 1996 (Table - Browse Trends). Recruitment of young sagebrush plants was good in 1984, 1990, and 2006, but was poor in the other sample years. The rate of decadence increased through the initial sample years, but has remained near 20% since 1996. The utilization of sagebrush has been light and only received heavy use in 1984. Antelope bitterbrush is a small, healthy population on the site, with most plants having a clubbed, prostrate growth form. Bitterbrush was first sampled in 1996, most likely due to the larger sample area, and most of the plants are located higher on the hill. Utilization of bitterbrush has been moderate to heavy since 1996 (Table - Browse Characteristics). Both sagebrush and bitterbrush had better than usual leader growth in 2011, likely due to the wet winter and spring that year (Table - Key Browse Annual Leader Growth).

Herbaceous Understory: The grass component of the study is dominated by cheatgrass and two other annual brome species, Japanese chess (*Bromus japonicus*) and rattlesnake brome (*B. brizaeformis*). In the past, cheatgrass has had high, stable nested frequencies, but frequency decreased significantly in 2011. Bulbous bluegrass has increased substantially since 2001 and is also a co-dominant species on the site. The only other grass species are small populations of bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) (Table - Herbaceous Trends).

The forb understory is made up of annual and weedy species that typically act as invaders or increasers after disturbance. These winter annuals and weeds provide considerable competition to other more desirable species. Dominant species include western ragweed (*Ambrosia psilostachya*), annual willowherb (*Epilobium brachycarpum*), storksbill (*Erodium cicutarium*), common sunflower (*Helianthus annuus*), and yellow salsify (*Tragopogon dubius*). The perennial western ragweed had a high nested frequency in 1984, but decreased significantly in 1990, and since then has steadily increased in frequency and cover. The noxious weeds field bindweed (*Convolvulus arvensis*) and dyers woad (*Isatis tinctoria*) were sampled for the first time in 2006 at low nested frequency (Table - Herbaceous Trends).

Soil: Soil is part of the Richmond soil series, which occur on mountain slopes. Parent material consists of colluvium derived from limestone and/or residuum weathered from limestone. These soils are classified as shallow with excessive drainage (Soil Survey Staff 2011). Rocks are common on the surface and in the profile. Rocks consist of both large limestone cobble and smaller gravel sized rock. The soil is a clay loam with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). Protective ground cover is abundant, but comes largely from weedy plant cover and litter (Table - Basic Cover). No active erosion has been observed on the site, and the soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density of mountain big sagebrush decreased by 11% from 4,131 plants/acre to 3,664 plants/acre, yet the proportion of young plants increased from 19% to 35%.

Sagebrush decadence increased from 4% to 13%. The sagebrush population also showed signs of poor vigor increasing from 2% to 26%.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decadence increased to 18%, but poor vigor decreased to 9%. Recruitment of young sagebrush plants decreased to 2% of the population.
- **1996 to 2001 - down (-2):** The density for sagebrush decreased 29% from 2,400 plants/acre to 1,700 plants/acre, though cover remained similar at 13%. The amount of decadent sagebrush increased to 22%, but plants displaying poor vigor continued to decrease to 5%. Recruitment of young sagebrush remained very low at 1% of the population.
- **2001 to 2006 - slightly down (-1):** The sagebrush density decreased by 7% to 1,580 plants/acre, and cover decreased to 6%. Recruitment of sagebrush plants was excellent at 56% of the population. However, mature sagebrush decreased by 67% from 1,300 mature plants/acre to 400 mature plants/acre. Decadence decreased slightly to 19%, but poor vigor increased slightly to 8%.
- **2006 to 2011 - stable (0):** The sagebrush density remained similar at 1,600 plants/acre, though cover increased to 8%. The amount of decadent sagebrush increased slightly to 23%, and poor vigor increased to 16%. Recruitment decreased markedly with no young sagebrush plants sampled in 2011.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequencies for perennial grasses remained low on the study.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased more than two-fold, but perennial grasses remain rare on the site. Sandberg bluegrass was sampled for the first time at low frequency and cover. Perennial grasses were a minor component of the understory; however, annual grasses were included in the sample for the first time and were very abundant. Cheatgrass had the highest nested frequency and highest average cover for grasses at 23%.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequencies for perennial grasses increased by 97%, and cover increased from 4% to 6%. However, the increase is mostly due to a significant increase in the nested frequency of bulbous bluegrass, with a subsequent increase in cover.
- **2001 to 2006 - slightly down (-1):** The sum nested frequency of perennial grasses increased by 34%, which is attributable to a significant increase in the nested frequency of bulbous bluegrass. Bulbous bluegrass comprised 28% of the total grass cover, increasing from 4% to 8% cover. Cheatgrass maintained a consistent nested frequency; however, cheatgrass decreased in cover from 25% to 18%.
- **2006 to 2011 - stable (0):** The sum nested frequency for perennial grasses increased by 12%. Despite the increase, desired perennial species remain rare on the site. Bulbous bluegrass maintained a similar nested frequency, though cover decreased slightly to 5%. Cheatgrass had a significant decrease in nested frequency, but the other annual brome species increased significantly. Cover of the annual bromes decreased from 19% to 12%.

Forb:

- **1984 to 1990 – slightly up (+1):** The sum of nested frequency for perennial forbs decreased by 73%, however, this is mostly due to the decrease of western ragweed which showed a significant decrease in nested frequency. Because there was a significant decrease in this undesirable species, the overall forb trend moved slightly up.
- **1990 to 1996 - down (-2):** Weedy forbs dominated the study site and provided the majority of the forb cover. Perennial forbs decreased by 71%. The sum of nested frequency of annual forbs increased markedly.
- **1996 to 2001 - slightly up (+1):** Although the forb community has been composed of weedy annual species, the sum of nested frequencies for perennials forbs increased nearly four-fold. The desirable species sego lily (*Calochortus nuttallii*) and silvery lupine (*Lupinus argenteus*) increased significantly in nested frequency.

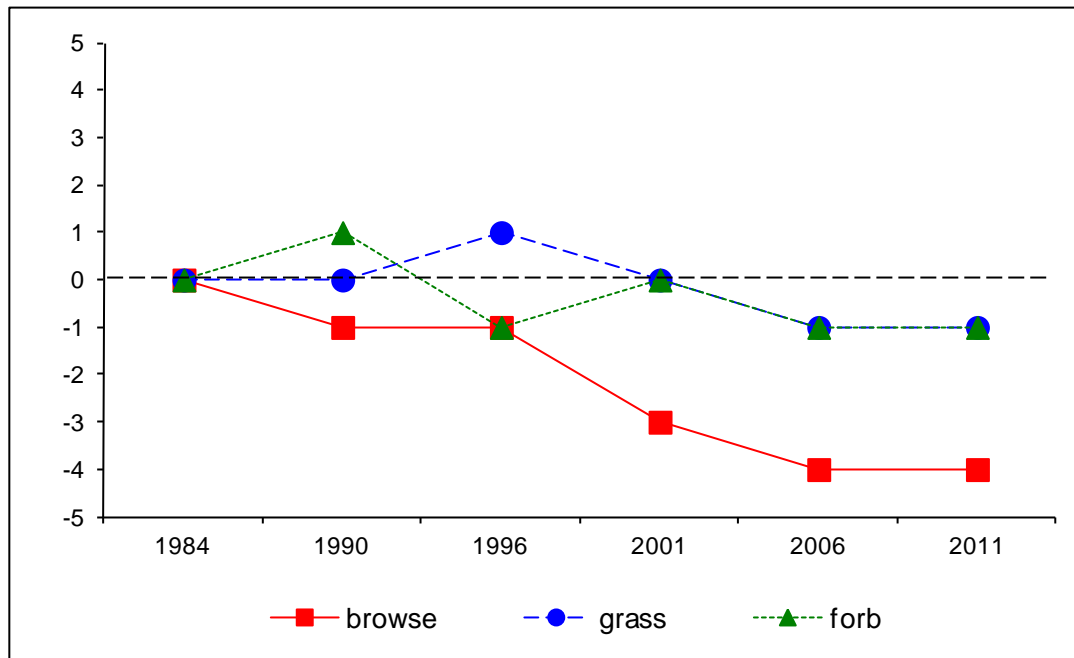
- **2001 to 2006 - slightly down (-1):** Perennial forbs decreased by 14% in nested frequency, though cover increased from 3% to 6%. The noxious weeds field bindweed and dyers woad were sampled at low frequency and cover.
- **2006 to 2011 - stable (0):** The sum of nested frequencies for perennial forbs increased by 88%, but much of that increase is due to a significant increase in the nested frequency of the weedy species western ragweed. The noxious weed, field bindweed, and the desirable species, sego lily, also increased significantly in nested frequency, though both species remained rare on the site. Annual forb species also increased substantially on the site.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 1

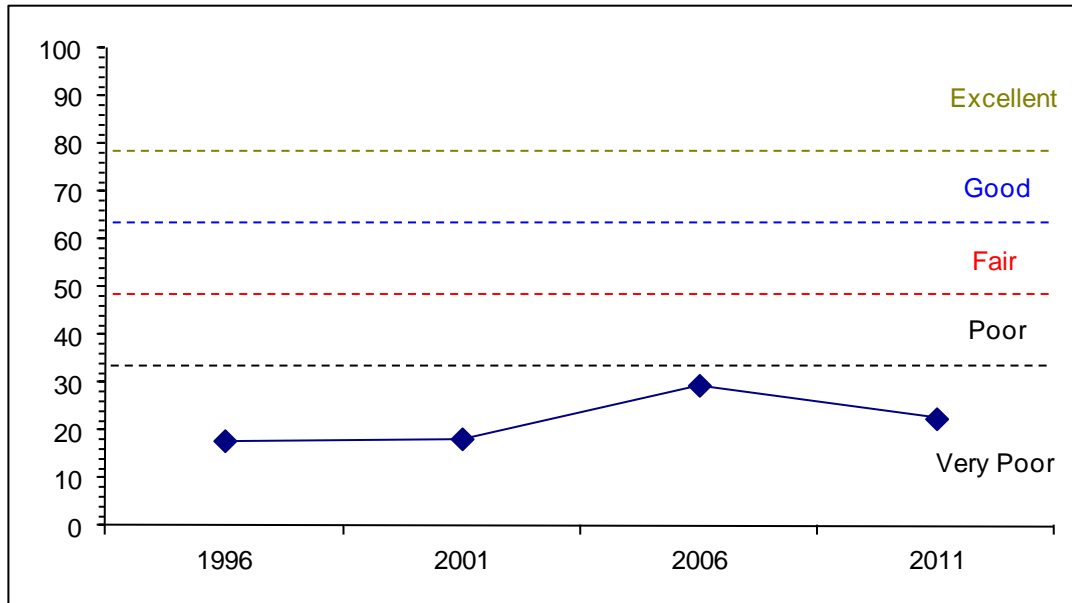
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	18.1	10.3	0.9	5.7	-20.0	2.9	0.0	17.9	Very Poor
01	18.2	9.0	0.5	3.2	-19.3	6.8	0.0	18.3	Very Poor
06	9.8	10.3	15.0	2.4	-14.0	10.0	-4.0	29.5	Very Poor
11	11.7	9.0	0.0	2.6	-8.7	10.0	-2.0	22.5	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 1



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 1



HERBACEOUS TRENDS--
 Management unit 02, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a9	ab25	abc31	bc34	bc37	c58	2.02	1.15	1.12	1.30
G	Bromus brizaeformis (a)	-	-	b85	a38	a10	c146	.77	.12	.05	2.37
G	Bromus japonicus (a)	-	-	b158	a68	b111	c215	4.85	.72	1.04	4.75
G	Bromus tectorum (a)	-	-	b306	b371	b361	a251	23.27	24.90	17.63	4.49
G	Poa bulbosa	a-	a3	a26	b88	c141	c146	.83	4.37	7.85	5.37
G	Poa secunda	a-	a-	b13	b16	ab7	a3	.84	.43	.07	.00
Total for Annual Grasses		0	0	549	477	482	612	28.90	25.74	18.72	11.61
Total for Perennial Grasses		9	28	70	138	185	207	3.69	5.96	9.05	6.68
Total for Grasses		9	28	619	615	667	819	32.60	31.70	27.77	18.30
F	Agoseris glauca	17	16	-	-	4	22	-	-	.06	.31
F	Allium acuminatum	6	-	-	-	-	3	-	-	-	.00
F	Alyssum alyssoides (a)	-	-	a95	b194	a92	b158	.22	1.63	.22	1.06
F	Ambrosia psilostachya	c284	a15	a16	a35	a45	b77	.69	.64	1.48	2.42
F	Artemisia ludoviciana	7	6	4	14	7	9	.15	.74	.47	.62
F	Astragalus sp.	-	4	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	-	-	-	-	-	-	-	.15	.00	-
F	Boraginaceae (a)	-	-	a-	a-	a12	a-	-	-	.03	-
F	Calochortus nuttallii	bc24	a-	a-	bc30	b7	c43	-	.19	.02	.32
F	Camelina microcarpa (a)	-	-	-	-	3	9	-	-	.00	.05
F	Cirsium undulatum	-	4	-	-	-	3	-	-	-	.15
F	Collinsia parviflora (a)	-	-	a-	a1	b56	a-	-	.00	.21	-
F	Convolvulus arvensis	a-	a-	a-	a-	a6	b13	-	-	1.00	.51
F	Crepis acuminata	-	5	7	3	8	5	.27	.04	.21	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Epilobium brachycarpum</i> (a)	-	b127	b119	a63	c179	b148	1.78	.25	4.28	2.02
F	<i>Erodium cicutarium</i> (a)	-	-	a30	bc193	b158	c223	.35	6.77	3.65	6.39
F	<i>Galium aparine</i> (a)	-	-	a6	a7	a3	b28	.18	.04	.00	.61
F	<i>Grindelia squarrosa</i>	a-	a-	a5	ab17	b26	b36	.21	.87	1.82	.82
F	<i>Hackelia patens</i>	a2	a12	a1	a-	a-	a-	.03	-	-	-
F	<i>Helianthus annuus</i> (a)	a-	b30	a-	a6	a6	c124	.00	.06	.18	2.46
F	<i>Holosteum umbellatum</i> (a)	-	-	-	-	7	6	-	-	.04	.01
F	<i>Isatis tinctoria</i>	-	-	-	-	1	-	-	-	.01	-
F	<i>Lactuca serriola</i> (a)	a-	bc7	ab28	a4	c61	d98	.72	.02	.59	1.37
F	<i>Lappula occidentalis</i> (a)	-	-	10	-	-	-	.02	-	-	-
F	<i>Lithospermum arvense</i> (a)	-	-	a-	a-	a-	b98	-	-	-	1.56
F	<i>Lomatium grayi</i>	bc27	c30	ab4	ab6	a-	a3	.04	.03	-	.03
F	<i>Lupinus argenteus</i>	a2	a-	a-	b12	a2	ab4	-	.43	.83	.77
F	<i>Machaeranthera</i> spp	b92	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	a4	b37	a4	-	.01	.12	.01
F	<i>Oenothera caespitosa</i>	b15	b16	a-	a-	a-	a-	.00	-	.00	-
F	<i>Phacelia hastata</i>	a7	b24	a-	a-	a-	a2	-	-	-	.03
F	<i>Phlox longifolia</i>	3	-	-	9	1	-	-	.01	.00	-
F	<i>Polygonum douglasii</i> (a)	-	-	8	20	8	7	.02	.06	.01	.04
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	5	1	1	-	.01	.00	.00
F	<i>Rumex crispus</i>	-	-	-	-	-	-	-	-	.00	-
F	<i>Tragopogon dubius</i> (a)	a16	b58	ab37	a31	a26	c152	.76	.41	.68	1.38
F	<i>Veronica biloba</i> (a)	-	-	a12	c169	b73	a22	.04	1.68	.45	.17
F	<i>Zigadenus paniculatus</i>	a1	a-	a1	b20	b19	ab17	.03	.26	.25	.11
Total for Annual Forbs		16	262	345	697	722	1078	4.11	10.97	10.53	17.17
Total for Perennial Forbs		487	132	38	146	126	237	1.44	3.39	6.18	6.17
Total for Forbs		503	394	383	843	848	1315	5.56	14.36	16.72	23.35

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	'11	'96	'01	'06	'11
B	<i>Artemisia tridentata vaseyana</i>	62	54	40	52	12.29	13.07	6.26	7.99
B	<i>Purshia tridentata</i>	8	6	7	9	1.85	1.24	1.33	1.13
Total for Browse		70	60	47	61	14.14	14.32	7.60	9.13

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 1

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata vaseyana</i>	4.41	10.63
<i>Purshia tridentata</i>	2.58	2.16

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 1

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.5	2.2	3.7
Purshia tridentata	1.1	3.3	5.3

BASIC COVER--

Management unit 02, Study no: 1

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	6.50	56.92	57.89	49.27	49.02
Rock	37.00	49.25	19.50	19.99	22.76	24.64
Pavement	21.00	11.50	6.28	3.97	11.58	10.53
Litter	30.25	21.00	56.94	34.85	29.68	26.14
Cryptogams	1.50	0	.07	.04	.00	.06
Bare Ground	8.00	11.75	.72	3.32	3.17	4.38

SOIL ANALYSIS DATA --

Management unit 02, Study no: 1, High Creek

Effective rooting depth (in)	pH	Clay loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.7	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		
	'01	'06	'11
Rabbit	-	2	1
Deer	2	5	1
Cattle	2	-	-

Days use per acre (ha)		
'01	'06	'11
-	-	-
10 (25)	3 (7)	1 (2)
2 (5)	2 (5)	4 (9)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 1

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>									
84	4131	19	77	4	33	23	76	2	25/30
90	3664	35	52	13	-	4	0	26	24/36
96	2400	2	80	18	40	21	4	9	26/38
01	1700	1	76	22	20	15	5	5	29/44
06	1580	56	25	19	580	3	0	8	28/47
11	1600	0	78	23	200	24	4	16	23/33
<i>Gutierrezia sarothrae</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	11/19
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Purshia tridentata</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	220	0	100	0	-	73	0	0	31/72
01	140	0	100	0	-	29	71	0	26/66
06	220	0	100	0	-	45	55	0	25/43
11	260	0	92	8	-	15	46	8	24/43
<i>Rosa woodsii</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	58/80

MOUTH OF BLACKSMITH FORK - TREND STUDY NO. 2-2-11

Vegetation Type: Basin Big Sagebrush

Range Type: Deer Winter

NRCS Ecological Site Description: Not Available

Land Ownership: DWR

Elevation: 4,800 ft (1,463 m)

Aspect: South

Slope: 20%

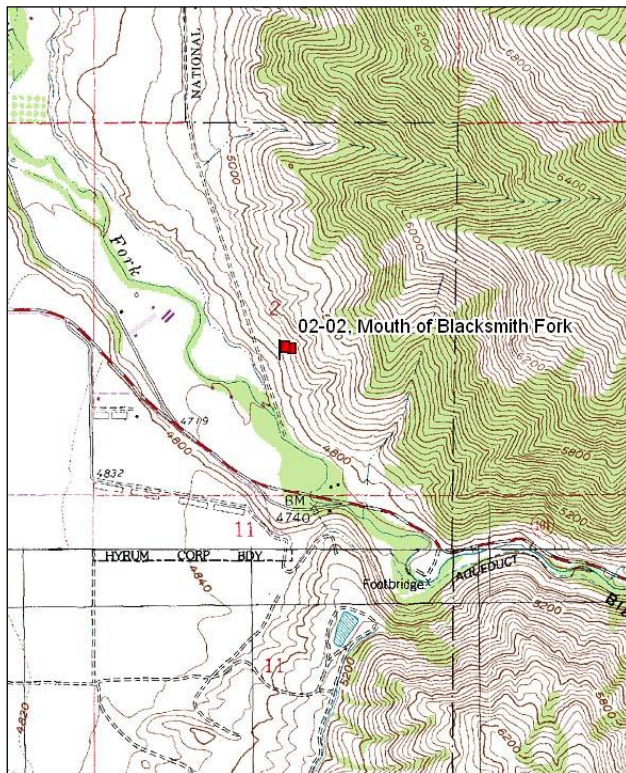
Transect bearing: 159° magnetic

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

Directions:

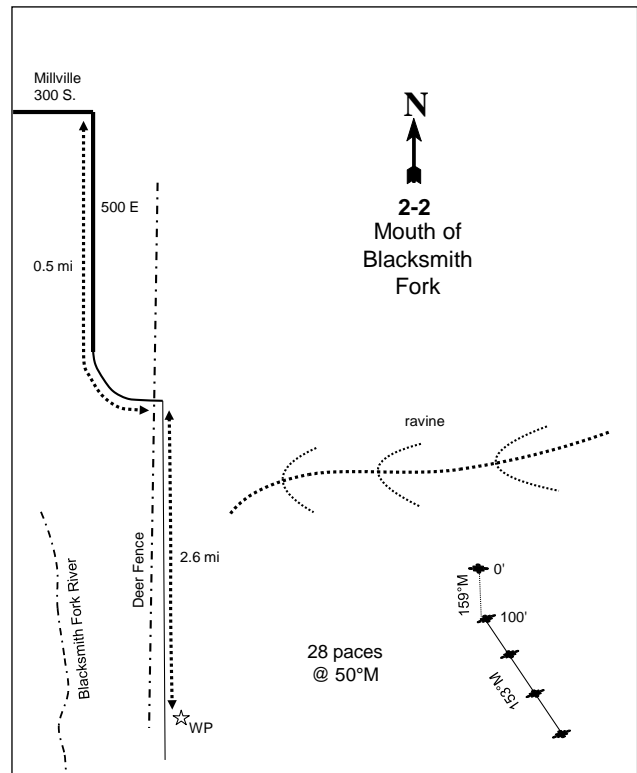
Proceed south 0.5 miles from the intersection of 300 South and 500 East in Millville. At the intersection just east of the deer fence, proceed south for 2.6 miles and stop at a witness post, which is at the top of the hill. From the witness post, walk 100 feet at 50 degrees magnetic to the 0-foot stake 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



Township: 10N Range: 1E Section: 2

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 433072 E 4609266 N

MOUTH OF BLACKSMITH FORK - TREND STUDY NO. 2-2

Site Information

Site Description: This study is located slightly north of where the Blacksmith Fork river enters the Cache Valley. The study sits on a narrow bench about 200 feet above a big game fence, which runs along the east edge of the valley. At the outset of the study, the vegetation type was basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) with a remnant stand of perennial grass, and an abundance of annual grasses, annual forbs, and perennial weeds. The weedy annual grass species jointed goatgrass (*Aegilops cylindrica*) and winter rye (*Secale cereale*) are both found on the site (Table - Herbaceous Trends). The site burned as part of the Sleepy Hollow wild fire in 2007, which burned 900 acres in the area. The fire removed nearly all the browse from the site. The site was part of the Millville WMA Fire Rehabilitation project ([WRI Project #972](#)). The rehabilitation project was accomplished by aerially applying Plateau (Imazapic) herbicide in September of 2007. In December of 2007, 792 acres were aerially seeded (Table - Seed Mix). In the spring of 2008, the treatment area was planted with 4,000 antelope bitterbrush plants (*Purshia tridentata*) to restore browse cover in order to benefit wintering mule deer; however, no bitterbrush plants were observed within the study site. In 2006, deer pellet groups were sampled in moderate abundance; however, deer pellet groups were sampled in low abundance in all other sample years. Elk pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The browse composition once consisted of a fairly dense stand of basin big sagebrush with a few antelope bitterbrush (*Purshia tridentata*); however, the recent fire has removed the browse component. The sagebrush population is sparse and the surviving younger, mature plants are overgrown by surrounding annual grasses. A more mature stand of unburned sagebrush is found just south of the study site. Historically, the sagebrush population consisted of mostly mature plants, with recruitment of young plants being good at the outset of the study and becoming poor over the course of the study. Sagebrush has received mostly light, but occasional moderate use by wildlife over the course of the study. Broom snakeweed (*Gutierrezia sarothrae*) and the seeded species forage kochia (*Kochia prostrata*) make up a minor browse component. Shrubs such as antelope bitterbrush and Utah juniper (*Juniperus osteosperma*) occurred occasionally in the past, but were not sampled following the fire (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant, and is dominated by annual grasses and weedy forbs. Jointed goatgrass and winter rye are the most abundant species found on the site, and have both increased, following the fire. The annual grasses Japanese chess (*Bromus japonicus*), rattlesnake brome (*B. brizaeformis*), and cheatgrass (*B. tectorum*) have all decreased; however, cheatgrass in the past was the dominant annual grass species and was likely the fuel for the recent fire. The weedy perennial grass species bulbous bluegrass (*Poa bulbosa*) has also decreased in abundance. The preferred perennial grass bluebunch wheatgrass (*Agropyron spicatum*) has increased in abundance, but not significantly. However, Sandberg bluegrass (*Poa secunda*) has decreased significantly since 2006. The forb composition is dominated by annual and weedy species that typically act as invaders or increasers on disturbed areas. The weedy species western ragweed (*Ambrosia psilostachya*) is the dominant forb on the site. Alfalfa (*Medicago sativa*) also dominates the site as a preferred forb species. Since 1984, the weedy species Willowherb (*Epilobium brachycarpum*), storksbill (*Erodium cicutarium*), curlycup gumweed (*Grindelia squarrosa*) and the noxious weed Dyer's woad (*Isatis tinctoria*) have all been sampled on the site.

Soil: According to the soil map, the soil is located on the Rough Broken Land component, but is likely part of the Sterling series. The soils within this classification are characterized as deep and somewhat excessively drained with a permeable restrictively layer. (Soil Survey Staff 2011). The soil texture is a loam with a moderately alkaline soil reaction (pH 7.9). Protective ground cover is abundant, but comes largely from weedy plant cover and litter (Table - Basic Cover). There has been evidence of past soil movement, but no active erosion has been observed on the site and the soil erosion condition has been classified as stable since 2001.

SEED MIX--

Management unit 02, Study no: 2

Project Name: Millville WMA			
WRI Database #: 972			
Application: Aerial Seed		Acres: 900	
Seed Type		lbs in mix	lbs/acre
G	Canby Bluegrass 'Canbar'	450	0.50
G	Crested Wheatgrass 'Hycrest'	1200	1.33
G	Idaho Fescue 'Joseph'	450	0.50
G	Orchardgrass 'Paiute'	600	0.67
G	Slender Wheatgrass 'San Luis'	1500	1.67
G	Snake River Wheatgrass 'Secar'	550	0.61
F	Alfalfa 'Ladak'	450	0.50
F	Alfalfa 'Ranger'	450	0.50
F	Sainfoin 'Eski'	810	0.90
F	Small Burnet 'Delar'	1000	1.11
F	Western Yarrow	100	0.11
F	Yellow Sweetclover	600	0.67
B	Forage Kochia	450	0.50
B	Sagebrush, Mountain	218	0.24
B	Sagebrush, Wyoming	225	0.25
Total Pounds:		9053	10.06
PLS Pounds:			8.45

Trend Assessments

Browse:

- **1984 to 1990 - up (+2):** The density of basin big sagebrush increased 21% from 799 plants/acre to 964 plants/acre. The percent of decadent plants in the population decreased from 92% to 31% of the population. Poor vigor increased from 13% to 24% of the sagebrush population.
- **1990 to 1996 - up (+2):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decadence decreased to 8%, and poor vigor decreased to 1%. Recruitment in young sagebrush plants decreased from 31% to 26% of the population, but is still considered to be very good.
- **1996 to 2001 - slightly up (+1):** The density for sagebrush increased 11% from 1,680 plants/ acre to 1,860 plants per acre. Decadence in sagebrush increased to 13%, and poor vigor increased to 5%. Recruitment of young sagebrush decreased to 1% of the population.
- **2001 to 2006 - down (-2):** Sagebrush density decreased by 23% to 1,440 plants/ acre. Decadence in sagebrush increased to 17%, but poor vigor decreased to 3%. Recruitment of young sagebrush was absent.
- **2006 to 2011 - down (-2):** The wildfire effectively removed sagebrush from the site. No sagebrush was sampled within the sample area, though a few plants occurred scattered across the site. The seeded species forage kochia was sampled for the first time at 20 plants/acre.

Grass:

- **1984 to 1990 - down (-2):** All perennial grasses were a minor component of the herbaceous understory, and the sum of nested frequency for perennial grasses decreased by 26%. Bluebunch wheatgrass decreased significantly. Annual grasses were not measured. However, jointed goatgrass was measured and increased significantly in nested frequency.

- **1990 to 1996 - down (-2):** Perennial grasses remained a minor component of the herbaceous understory despite a 90% increase in the sum of nested frequency of perennial grasses. This increase is primarily due to the weedy species bulbous bluegrass, which had a significant increase in nested frequency. Annual grasses provided the major component of grass and vegetation cover. Both jointed goatgrass and winter rye increased significantly and provided 8% and 3% cover, respectively. Japanese chess, rattlesnake brome, and cheatgrass were measured for the first time and provided 17%, less than 1%, and 8% cover, respectively.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial grasses increased two-fold, but this increase is due to the increase in abundance of the weedy species bulbous bluegrass. Bulbous bluegrass had a significant increase in nested frequency, and increased in cover to 8%. Sandberg bluegrass increased significantly in nested frequency and provided 1% cover. Annual grasses make up the majority of grass cover. Jointed goatgrass and cheatgrass both had significant increases in nested frequency, and both increased in cover to 15%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Bulbous bluegrass did not show a significant increase in nested frequency, but cover increased to 11%. Annual grasses maintained dominance of the herbaceous understory. Jointed goatgrass increased significantly in nested frequency and cover increased to 26%. Conversely, cheatgrass decreased significantly in nested frequency and cover decreased to 5%.
- **2006 to 2011 - down (-2):** Perennial grasses decreased in the sum of nested frequency by 80%. Bulbous and Sandberg bluegrasses had significant decreases in nested frequency, and cover decreased to less than 1%. Annual grasses had no significant change in trend, except for winter rye, which increased significantly in nested frequency and cover increased from 5% to 29%.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased by 44%. Dyer's woad increased significantly in nested frequency. Western ragweed decreased significantly in nested frequency.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Dyer's woad decreased significantly in nested frequency.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial forbs decreased by 48%. The most abundant forbs consist of pale alyssum, ragweed, and storksbill. The only positive aspects of the forb composition are the significant decline in the nested frequency of dyer's woad and the stable frequency of alfalfa.
- **2001 to 2006 - stable (0):** The sum of nested frequency and cover for perennial forbs remained similar. The weedy species western ragweed remained similar in nested frequency, and provided nearly half of the cover within the forb community at 2% in 2006.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased just over two-fold. Alfalfa increased significantly in nested frequency, and cover increased from 1% to 6%. However, the weedy species western ragweed also increased significantly in nested frequency, and cover increased to 7%

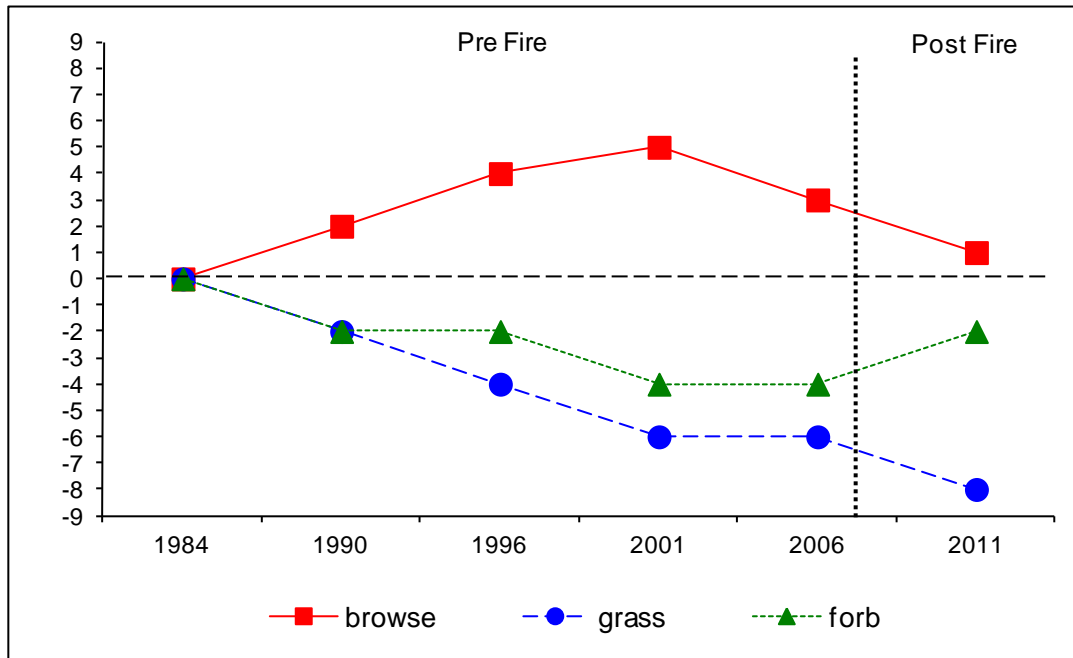
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 2

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.3	12.6	13.0	1.6	-20.0	10.0	-2.0	27.5	Very Poor
01	13.7	11.1	0.5	3.5	-20.0	6.9	-2.0	13.7	Very Poor
06	19.7	9.9	0.0	2.6	-20.0	8.1	-2.0	18.3	Very Poor
11	0.0	0.0	0.0	3.4	-20.0	10.0	-2.0	-8.6	Very Poor

Trend Summary

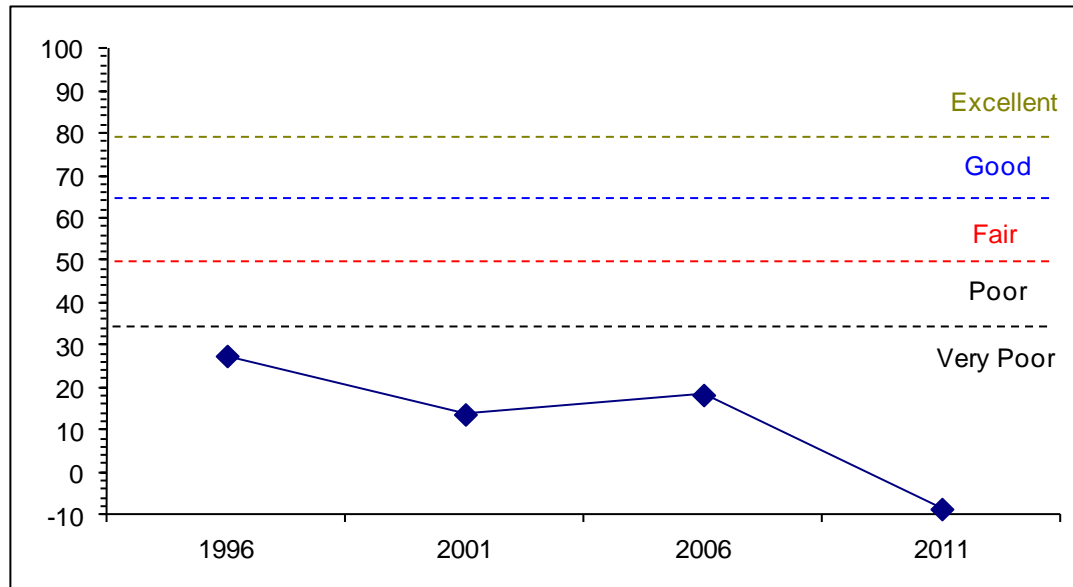
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2, Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 2, Study no: 2



HERBACEOUS TRENDS--
Management unit 02, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Aegilops cylindrica</i> (a)	a3	b81	c148	d229	e274	e275	7.88	15.26	26.07	28.22
G	<i>Agropyron cristatum</i>	-	-	-	-	-	4	-	-	-	.03
G	<i>Agropyron spicatum</i>	b46	a15	ab21	a17	a17	ab29	.73	.28	.16	1.49
G	<i>Aristida purpurea</i>	3	-	-	-	-	-	-	-	-	-
G	<i>Bromus brizaeformis</i> (a)	-	-	b48	b45	a11	a-	.19	.18	.04	-
G	<i>Bromus japonicus</i> (a)	-	-	c338	b73	a12	a6	16.71	.32	.02	.16
G	<i>Bromus tectorum</i> (a)	-	-	b262	c313	a183	a160	8.07	14.82	4.94	2.39
G	<i>Carex</i> sp.	-	-	-	4	-	-	-	.38	-	-
G	<i>Elymus cinereus</i>	-	-	-	8	3	-	-	.27	.03	-
G	<i>Koeleria cristata</i>	5	-	-	-	-	-	-	-	-	-
G	<i>Poa bulbosa</i>	-	-	a58	b171	b193	a12	1.49	7.62	10.55	.09
G	<i>Poa pratensis</i>	-	-	-	3	-	-	-	.03	-	-
G	<i>Poa secunda</i>	a12	ab34	a14	b62	b50	a10	.03	.78	1.10	.09
G	<i>Secale cereale</i> (a)	a-	a8	bc114	b89	c135	d289	2.77	2.48	5.12	29.38
Total for Annual Grasses		3	89	910	749	615	730	35.64	33.08	36.20	60.16
Total for Perennial Grasses		66	49	93	265	263	55	2.25	9.36	11.84	1.71
Total for Grasses		69	138	1003	1014	878	785	37.90	42.44	48.05	61.88
F	<i>Agoseris glauca</i>	1	5	3	-	4	4	.00	-	.01	.30
F	<i>Allium acuminatum</i>	22	-	-	-	-	-	-	-	-	-
F	<i>Alyssum alyssoides</i> (a)	-	-	b47	c106	ab21	a9	.21	.33	.04	.04
F	<i>Ambrosia psilostachya</i>	d261	bc94	c114	ab57	a44	c124	3.92	2.25	1.77	7.26
F	<i>Artemisia ludoviciana</i>	1	3	-	-	-	-	-	-	-	-
F	<i>Asclepias asperula</i>	-	8	5	11	6	10	.54	.23	.98	1.24
F	<i>Astragalus utahensis</i>	6	8	-	-	-	-	-	-	-	-
F	<i>Balsamorhiza sagittata</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	1	-	3	3	8	10	.01	.03	.02	.03
F	<i>Cirsium undulatum</i>	b22	a1	a1	a2	a-	a-	.00	.15	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	-	-	4	4	-	-	.01	.03
F	<i>Comandra pallida</i>	3	-	-	-	-	-	-	-	-	-
F	<i>Crepis acuminata</i>	5	7	-	2	1	-	-	.00	.03	-
F	<i>Cryptantha</i> sp.	-	-	-	-	2	-	-	-	.03	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	b70	a6	a-	a2	.29	.01	-	.00
F	<i>Erodium cicutarium</i> (a)	-	-	a8	b141	a19	a9	.07	4.19	.43	.03
F	<i>Gilia</i> sp. (a)	-	-	3	8	-	-	.00	.01	-	-
F	<i>Grindelia squarrosa</i>	-	-	3	-	-	-	.03	-	-	-
F	<i>Helianthus annuus</i> (a)	-	-	a-	a-	a-	a9	-	-	-	.05
F	<i>Holosteum umbellatum</i> (a)	-	-	a-	c101	b60	b25	-	.29	.14	.78
F	<i>Isatis tinctoria</i>	a1	c46	b27	ab6	ab6	a1	.19	.01	.09	.00
F	<i>Lactuca serriola</i> (a)	a-	a6	a2	a6	a2	b93	.00	.02	.03	1.44
F	<i>Linum lewisii</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Lithospermum ruderales</i>	a-	b6	a-	a-	a-	a-	.03	-	-	-
F	<i>Lomatium grayi</i>	5	-	-	-	-	5	-	-	-	.06
F	<i>Medicago sativa</i>	a15	a19	a16	a22	a26	b66	.45	.74	.96	6.36

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Melilotus alba	a ⁹	a ¹	b ²⁸	a ⁻	a ⁻	a ⁻	.30	-	-	-
F	Melilotus officinalis	-	-	-	-	-	10	-	-	-	.15
F	Petradoria pumila	2	-	-	-	-	-	-	-	-	-
F	Phlox longifolia	-	-	5	-	-	-	.01	-	-	-
F	Ranunculus testiculatus (a)	-	-	-	6	6	2	-	.01	.01	.00
F	Tragopogon dubius (a)	c ¹⁹¹	ab ³⁵	b ⁶⁰	a ⁸	a ¹⁵	c ¹⁷⁵	.71	.16	.06	3.62
F	Unknown forb-perennial	-	-	-	-	3	-	-	-	.15	-
F	Veronica biloba (a)	-	-	-	-	6	-	-	-	.01	-
F	Zigadenus paniculatus	-	-	-	4	-	-	-	.00	-	-
Total for Annual Forbs		191	41	190	382	133	328	1.29	5.05	0.75	6.03
Total for Perennial Forbs		356	198	205	107	100	230	5.50	3.44	4.07	15.42
Total for Forbs		547	239	395	489	233	558	6.80	8.50	4.82	21.46

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	'11	'96	'01	'06	'11
B	Artemisia tridentata tridentata	50	52	46	-	9.85	10.98	15.73	-
B	Gutierrezia sarothrae	7	9	6	4	.03	.69	.03	.03
B	Kochia prostrata	-	-	-	1	-	-	-	-
B	Rosa woodsii	-	-	-	1	-	-	-	-
Total for Browse		57	61	52	6	9.89	11.67	15.76	0.03

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 2

Species	Percent Cover	
	'06	'11
Artemisia tridentata tridentata	17.25	-
Gutierrezia sarothrae	.55	.16

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata tridentata	2.1	2.0	4.0

BASIC COVER--

Management unit 02, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.00	11.00	59.50	69.97	64.77	82.46
Rock	16.00	20.75	6.88	3.52	4.32	2.25
Pavement	14.00	3.50	2.87	4.34	5.37	.79
Litter	58.00	51.75	71.15	55.77	45.77	79.78
Cryptogams	1.00	0	0	0	0	0
Bare Ground	9.00	13.00	.41	.26	.55	.10

SOIL ANALYSIS DATA --

Management unit 02, Study no: 2, Study Name: Mouth of Blacksmith Fork

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	-	-	-	-	-
Elk	1	-	1	-	-	1 (2)	1 (3)
Deer	1	2	16	-	2 (5)	32 (79)	1 (3)
Cattle	1	1	-	-	2 (4)	1 (2)	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 2

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia tridentata tridentata									
84	799	0	8	92	-	0	100	13	32/40
90	964	31	38	31	-	24	3	24	25/27
96	1680	26	65	8	220	6	0	1	32/52
01	1860	1	86	13	-	16	0	5	31/41
06	1440	0	83	17	-	36	10	3	34/51
11	0	0	0	0	-	0	0	0	27/28
Chrysothamnus nauseosus									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	39/67

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Gutierrezia sarothrae										
84	99	0	67	33	-	67	0	0	19/22	
90	899	7	93	0	-	0	0	0	18/16	
96	620	45	55	0	-	0	0	0	14/19	
01	560	0	100	0	-	4	0	0	12/18	
06	140	0	100	0	-	0	0	0	13/17	
11	120	17	83	0	-	0	0	0	14/15	
Kochia prostrata										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	20	0	100	-	-	0	0	0	18/18	
Opuntia sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	33	0	100	-	-	0	0	0	6/8	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Rosa woodsii										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	0	-/-	

BEIRDNEAU - TREND STUDY NO. 2-9-11

Vegetation Type: Bitterbrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 5,450 ft (1,661 m)

Aspect: South

Slope: 50%

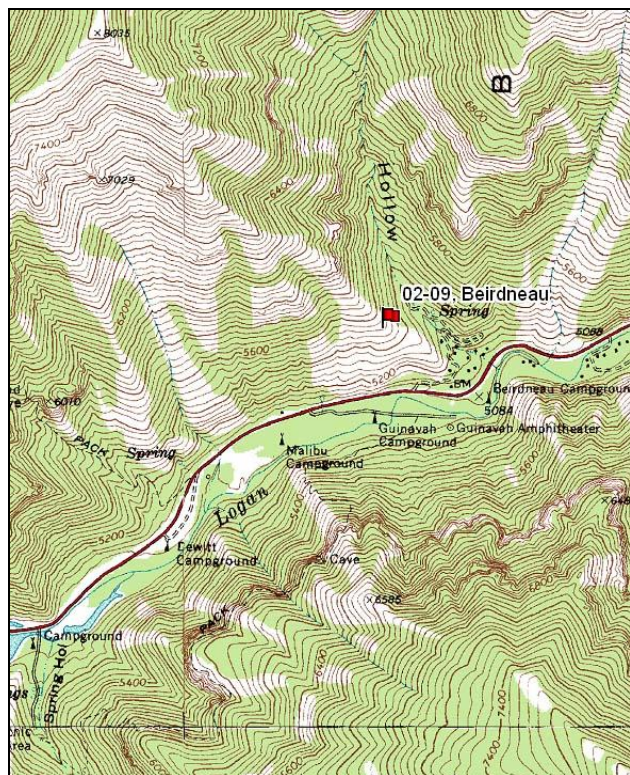
Transect bearing: 159° magnetic

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

Directions:

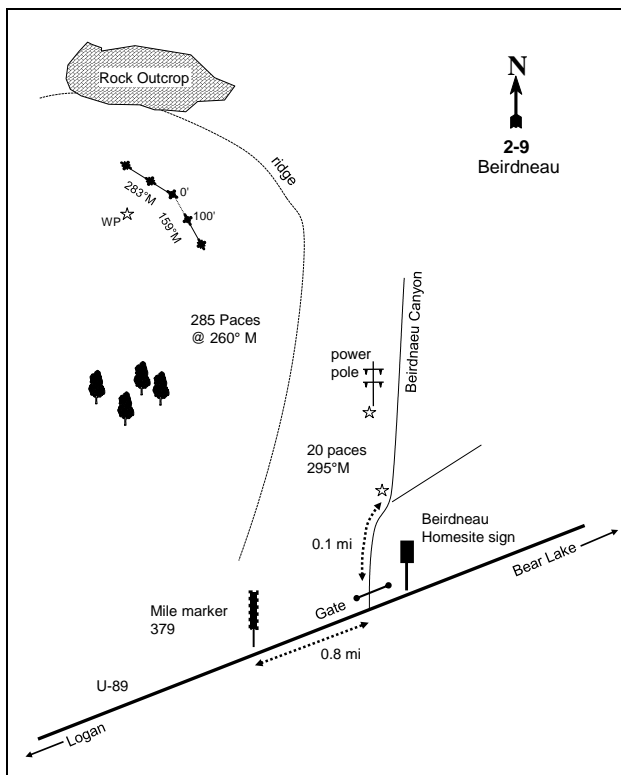
Proceed up Logan Canyon to mile marker 379 and begin to note mileage. Continue 0.8 miles to the Forest Service sign "Beirdneau Summer Home Sites." Turn left here at the home site, and proceed 0.1 miles to a fork and stop. Walk to the power pole on the left at a bearing of 295 degrees magnetic and about 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



Township: 12N Range: 2E Section: 23

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 441937 E 4623976 N

BEIRDNEAU - TREND STUDY NO. 2-9

Site Information

Site Description: This study is located slightly north of the Beirdneau cabin area in Logan Canyon. The area is considered crucial deer winter range that possesses a good mix of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), interspersed with Rocky Mountain juniper (*Juniperus scopulorum*). Wildlife occupancy was high in 1984, but has been low to moderate since 1984. Pellet groups for deer were sampled in low abundance in 2001 and 2011, but more moderate abundance in 2006. Elk pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: Browse composition consists of a mixture of bitterbrush and mountain big sagebrush. Prior to 1984, a die-off of bitterbrush and sagebrush was reported to have affected a small portion of the population. Rodent activity in 1983-85 may have contributed to the die-off, as well as disease and insect infestation. The bitterbrush population is moderately dense, but density estimates have fluctuated over the sample years. The bitterbrush population is centered within the mature age class with very little recruitment of young bitterbrush plants. Bitterbrush has displayed moderate to heavy hedging since 1984. Decadence of bitterbrush was very high in 1984, and has been mostly moderate to high in the other sample years (Table - Browse Characteristics).

Mountain big sagebrush had a dense population in 1984, but has steadily declined to a population of insignificant density in 2011. Sagebrush decadence has been high since 1984 with the exception of the 2001 and 2011 sample years. Recruitment of young sagebrush plants have been a minor component of the population during each reading. Utilization has been light to moderate since 1990, but was heavy in 1984 (Table - Browse Characteristics).

Herbaceous Understory: Grasses and forbs are irregularly distributed, but provide good cover. Composition is poor due to the overabundance of weedy annual species. Cheatgrass (*Bromus tectorum*) and Japanese brome (*B. japonicus*) have historically been the dominant species, but have decreased over the duration of the study. Cheatgrass has diminished and has become a minor component; however, Japanese brome still maintains a dominant population. The preferred species bluebunch wheatgrass (*Agropyron spicatum*) and the weedy species bulbous bluegrass (*Poa bulbosa*) are the only moderately abundant perennial grasses. The forb component has fair diversity and quality. The most common forb species include prickly lettuce (*Lactuca serriola*), yellow salsify (*Tragopogon dubius*), twolobe speedwell (*Veronica biloba*), the noxious weed Dyer's woad (*Isatis tinctoria*), spring parsley (*Cymopterus* spp.), and alfalfa (*Medicago sativa*) (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a clay loam and is moderately alkaline (pH of 7.9). Vegetation and litter cover appear to be high, while rock and pavement cover is moderate and provides adequate control for runoff. The soil erosion condition was classified as slight in 2001, but was determined to be stable in 2006 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The key browse species are antelope bitterbrush and mountain big sagebrush. The density for bitterbrush increased 11% from 599 plants per acre to 665 plants per acre. The percent of decadent plants decreased from 78% to 30%. Poor vigor increased to 10% of the population. Mountain big sagebrush decreased in density by 39% from 1,198 plants/acre to 732 plants/acre. Decadence in the population decreased from 67% to 55%. Poor vigor increased marginally from 17% to 18%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. No decadence or poor vigor was

reported in the bitterbrush population. Sagebrush had decreased in decadence to 44%, and poor vigor decreased to 6%.

- **1996 to 2001 - stable (0):** Bitterbrush increased in density by 47% from 380 plants/acre to 560 plants/acre. However, bitterbrush decadence increased to 21% within the population. The sagebrush population decreased in density by 17% from 360 plant/acre to 300 plants/acre. However, decadence decreased to 27% of the population, and poor vigor was not observed.
- **2001 to 2006 - down (-2):** Bitterbrush density decreased by 68% from 560 plant/acre to 180 plants/acre. Decadence in the population decreased to 11%. Sagebrush decreased in density by 27% from 300 plant/acre to 220 plants/acre. Decadence increased to 64%, and poor vigor affected 36% of the population.
- **2006 to 2011 - slightly down (-1):** The density for the bitterbrush population increased by 33% to 240 plants/acre. However, both decadence and poor vigor increased to 25% of the population. Sagebrush density decreased by another 27% to 160 plants/acre. Decadent plants made up 25% of the population, and poor vigor increased to 50%.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial grasses remained similar.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. The weedy perennial grass bulbous bluegrass was recorded for the first time and was fairly prevalent on the site. Bluebunch bluegrass remained stable in nested frequency. Annual grasses were included in the sample for the first time. Cheatgrass and Japanese brome were both measured as having high abundance.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. The composition for annual grasses shifted from Japanese brome being the dominant grass to cheatgrass.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 11%. Bluebunch wheatgrass increased significantly in nested frequency, but so did the weedy species bulbous bluegrass. The annual species cheatgrass decreased significantly in nested frequency.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses decreased remained similar. The annual grass Japanese brome had a significant increase in nested frequency.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs increased by 29%. Although there was an increase in the sum of nested frequency, the increase was mainly from the weedy species Dyer's woad, houndstongue (*Cynoglossum officinale*), and prickly lettuce.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs remained similar. Yellow sweet clover increased significantly in nested frequency and provided 5% cover. However, the species false dandelion (*Agoseris glauca*) and low penstemon (*Penstemon humilis*) decreased significantly in nested frequency. Prickly lettuce and the weedy annual houndstongue decreased significantly in nested frequency. However, Dyer's woad increased significantly, and had a cover just over 1%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The desirable yellow sweet clover decreased significantly in nested frequency. The noxious weed Dyer's woad and the annual species yellow salsify both decreased significantly in nested frequency.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 15%. Yellow sweet clover and alfalfa both increased significantly in nested frequency. Yellow sweet clover increased in cover from less than 1% to 1%. Alfalfa was sampled for the first time in 2006 at 2% cover. Dyer's woad decreased in nested frequency and cover decreased to less than 1%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased by 63%. This increase is linked to the significant increase in nested frequency for the preferred species alfalfa and

Lewis flax (*Linum lewisii*). Dyer's woad and pale alyssum (*Alyssum alyssoides*) also increased significantly in nested frequency. Dyer's woad increased in cover to 5%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

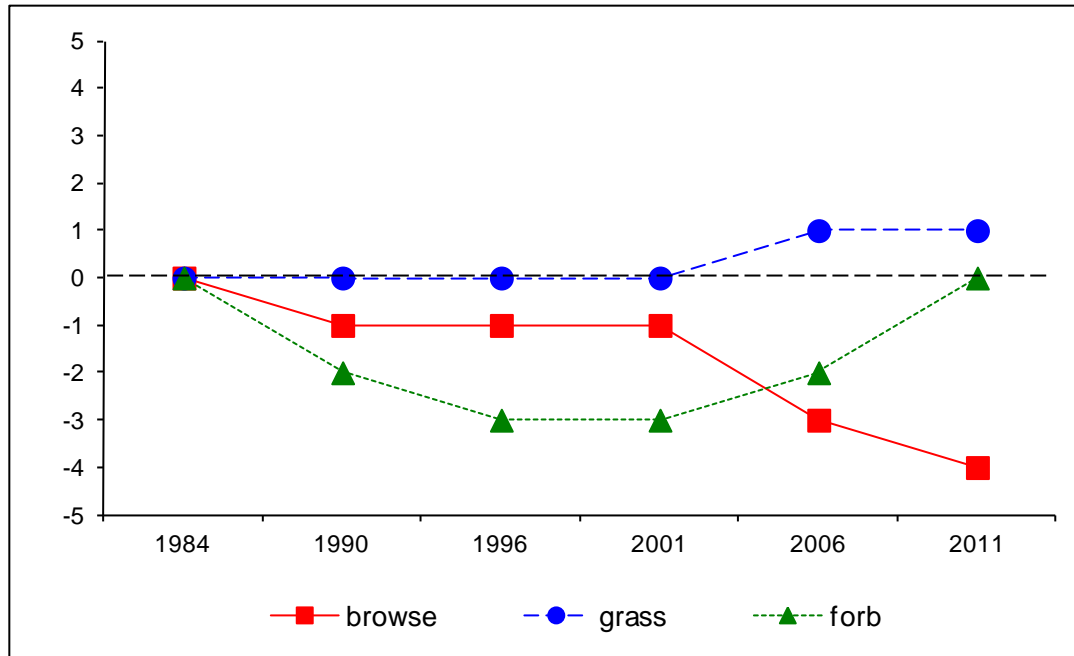
Management unit 2, study no: 9

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.1	12.6	0.6	6.2	-19.6	10.0	-2.0	23.8	Very Poor
01	11.6	8.3	1.6	6.9	-20.0	10.0	-2.0	16.4	Very Poor
06	10.8	8.2	0.0	7.7	-2.6	10.0	-2.0	32.1	Very Poor
11	8.3	7.5	0.0	4.9	-1.9	10.0	-2.0	26.8	Very Poor

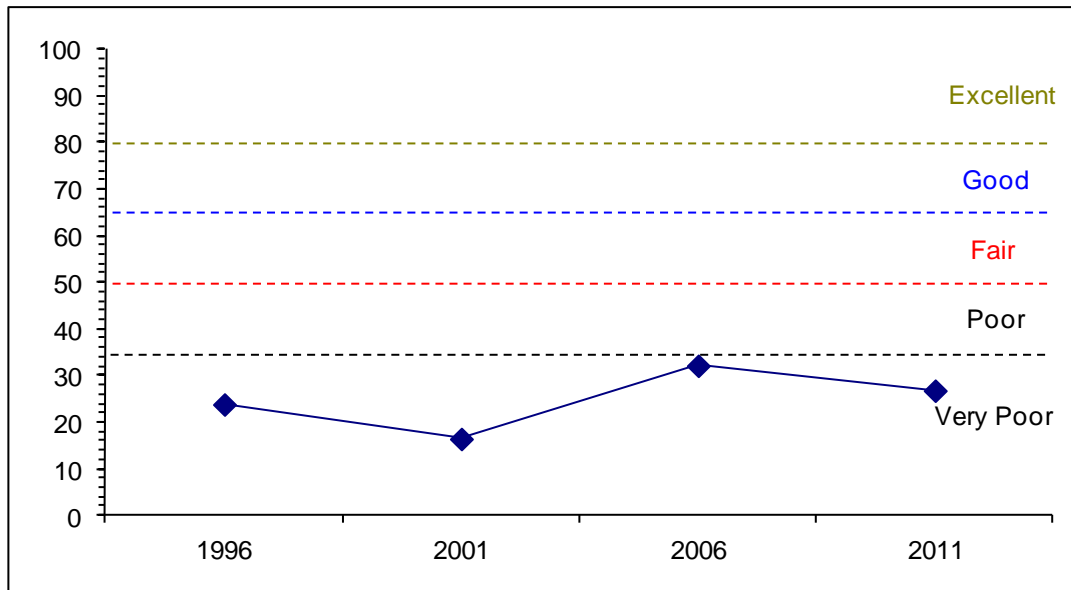
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 9



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 2, Study no: 9



HERBACEOUS TRENDS--
Management unit 02, Study no: 9

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	125	105	108	95	117	113	2.99	3.35	3.79	2.34
G	Agropyron trachycaulum	-	-	7	-	-	-	.06	-	-	-
G	Bromus brizaeformis (a)	-	-	a2	b10	a1	a-	.00	.05	.00	-
G	Bromus japonicus (a)	-	-	c343	a152	a148	b208	17.68	2.40	1.63	1.70
G	Bromus tectorum (a)	-	-	b204	c302	b177	a70	8.41	24.20	1.76	.84
G	Carex sp.	-	-	-	-	-	6	-	-	-	.03
G	Poa bulbosa	a-	a-	bc83	b73	c103	bc98	2.65	2.36	2.41	1.75
G	Poa pratensis	4	10	-	-	4	3	-	-	.00	.00
G	Poa secunda	-	10	3	19	6	4	.04	.09	.04	.06
Total for Annual Grasses		0	0	549	464	326	278	26.10	26.65	3.40	2.54
Total for Perennial Grasses		129	125	201	187	230	224	5.74	5.82	6.26	4.20
Total for Grasses		129	125	750	651	556	502	31.85	32.48	9.66	6.75
F	Achillea millefolium	14	-	-	8	5	4	-	.21	.06	.18
F	Agoseris glauca	ab14	b26	a1	a1	ab10	a-	.00	.03	.10	-
F	Allium acuminatum	b45	ab29	a6	ab26	a14	c88	.04	.17	.11	.39
F	Alyssum alyssoides (a)	-	-	b137	b151	a35	c206	.39	.71	.07	1.53
F	Arctium minus	-	-	-	-	-	3	-	-	-	.15
F	Artemisia ludoviciana	4	3	10	6	14	8	.26	.30	1.54	1.08
F	Aster chilensis	b49	b40	a2	a4	a4	a1	.00	.01	.09	.03
F	Astragalus beckwithii	a-	b13	a-	a-	a2	a1	-	-	.03	.03
F	Astragalus sp.	-	-	-	-	-	-	-	-	.03	-
F	Astragalus utahensis	1	3	2	1	1	-	.00	.03	.03	-
F	Balsamorhiza sagittata	5	5	3	5	2	3	.53	.22	.60	.03
F	Camelina microcarpa (a)	-	-	-	6	5	9	-	.01	.01	.05

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Chaenactis douglasii	-	1	-	-	-	-	-	-	-	-
F	Cirsium undulatum	2	5	5	-	7	-	.33	-	.21	-
F	Collinsia parviflora (a)	-	-	-	-	3	-	-	-	.00	-
F	Collomia linearis (a)	-	-	-	-	-	2	-	-	-	.00
F	Comandra pallida	8	-	2	-	-	8	.03	-	-	.01
F	Crepis acuminata	-	-	-	1	2	2	-	.02	.03	.03
F	Cymopterus sp.	97	118	107	125	131	142	2.99	6.04	7.21	11.53
F	Cynoglossum officinale	a5	c27	a2	ab11	bc28	abc18	.00	.12	1.25	.29
F	Epilobium brachycarpum (a)	-	-	b46	a24	ab38	ab41	.22	1.66	.24	.61
F	Erodium cicutarium (a)	-	-	-	-	-	-	-	-	.15	-
F	Galium aparine (a)	-	-	b36	a-	bc59	c57	.40	-	.36	.72
F	Gilia aggregata	-	4	-	-	-	-	-	-	-	-
F	Hackelia patens	a1	a10	a-	b47	a13	a-	-	.79	.13	.00
F	Holosteum umbellatum (a)	-	-	5	6	-	-	.01	.03	-	-
F	Isatis tinctoria	a-	a23	b65	a25	a5	b97	1.33	1.20	.11	5.15
F	Lactuca serriola (a)	a-	c67	b28	c99	c118	d172	.15	.93	2.84	3.36
F	Lappula occidentalis (a)	-	-	-	1	-	-	-	.00	-	-
F	Lepidium densiflorum (a)	-	-	-	-	3	-	-	-	.03	-
F	Linum lewisii	a20	a22	a29	a15	a21	b60	.37	.16	.33	.22
F	Lithospermum ruderae	10	8	9	11	7	16	.54	.58	.45	.93
F	Medicago sativa	a-	a-	a-	a-	a24	b95	-	-	2.07	3.85
F	Melilotus officinalis	a2	a15	c100	a4	b68	ab38	5.01	.19	1.26	.21
F	Microsteris gracilis (a)	-	-	-	-	8	-	-	-	.02	-
F	Penstemon humilis	ab2	b10	a1	ab3	ab5	a1	.03	.06	.12	.03
F	Phlox hoodii	12	13	-	-	2	-	-	-	.03	-
F	Ranunculus testiculatus (a)	-	-	-	-	1	-	-	-	.00	-
F	Tragopogon dubius (a)	b159	b163	b156	a102	ab124	a88	2.96	1.90	1.79	1.15
F	Trifolium sp.	a-	a-	a-	b32	b9	b23	-	.45	.02	.19
F	Unknown forb-perennial	-	-	1	-	-	-	.06	-	-	-
F	Veronica biloba (a)	-	-	a31	bc103	b76	c124	.11	.60	.63	2.51
F	Zigadenus paniculatus	-	-	-	-	1	2	-	-	.00	.00
Total for Annual Forbs		159	230	439	492	470	699	4.27	5.87	6.18	9.97
Total for Perennial Forbs		291	375	345	325	375	610	11.58	10.61	15.86	24.39
Total for Forbs		450	605	784	817	845	1309	15.85	16.49	22.05	34.36

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	14	14	9	6	2.04	1.60	1.67	.21
B	Chrysothamnus viscidiflorus viscidiflorus	4	5	2	3	.30	.15	.15	.15
B	Gutierrezia sarothrae	10	11	3	0	.43	.51	.15	-
B	Juniperus scopulorum	1	0	0	1	.85	-	-	.63
B	Purshia tridentata	17	20	8	12	9.03	6.37	5.82	5.35
B	Symphoricarpos oreophilus	10	9	10	9	1.38	1.96	1.77	2.25
Total for Browse		56	59	32	31	14.05	10.60	9.57	8.60

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 9

Species	Percent Cover		
	'01	'06	'11
Artemisia tridentata vaseyana	-	1.61	.61
Chrysothamnus nauseosus albicaulis	-	-	.03
Chrysothamnus viscidiflorus viscidiflorus	-	.20	.61
Gutierrezia sarothrae	-	.11	-
Juniperus scopulorum	1.00	-	1.73
Purshia tridentata	-	9.35	11.44
Symphoricarpos oreophilus	-	2.70	2.95

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 9

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	-	2.4	2.2
Purshia tridentata	3.0	3.7	2.9

BASIC COVER--

Management unit 02, Study no: 9

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.25	14.50	54.68	54.55	41.26	49.97
Rock	20.25	9.00	12.78	11.34	10.78	16.55
Pavement	19.50	31.00	5.56	16.53	16.43	12.96
Litter	48.00	39.00	48.74	43.50	31.27	29.63
Cryptogams	.25	0	.20	.07	0	.00
Bare Ground	10.75	6.50	6.39	5.70	11.91	10.30

SOIL ANALYSIS DATA --

Management unit 02, Study no: 9, Study Name: Beirdneau

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Elk	-	-	6	2	3 (8)	14 (35)	18 (45)
Deer	1	6	8	2	17 (41)	25 (61)	11 (26)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 9

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	42/53
11	0	0	0	-	-	0	0	0	35/48
Artemisia tridentata vaseyana									
84	1198	6	28	67	-	6	94	17	22/27
90	732	0	45	55	-	9	0	18	24/32
96	360	6	50	44	-	33	0	6	23/40
01	300	0	73	27	-	13	0	0	30/45
06	220	0	36	64	-	45	9	36	28/40
11	160	0	75	25	-	13	0	50	25/36
Chrysothamnus nauseosus albicaulis									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	45/61
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	54/72
11	0	0	0	-	-	0	0	0	61/96
Chrysothamnus viscidiflorus viscidiflorus									
84	0	0	0	0	-	0	0	0	-/-
90	199	67	33	0	66	0	0	0	25/30
96	100	20	80	0	-	0	0	0	28/41
01	140	0	86	14	-	0	0	0	24/21
06	60	0	100	0	-	0	0	0	16/28
11	60	0	100	0	-	0	0	0	21/20

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
84	1865	25	75	-	-	0	0	0	15/19	
90	66	0	100	-	-	0	0	0	9/14	
96	400	0	100	-	-	0	0	0	14/17	
01	580	0	100	-	-	0	0	0	13/17	
06	60	0	100	-	-	0	0	0	14/23	
11	0	0	0	-	-	0	0	0	14/26	
<i>Juniperus scopulorum</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	20	0	100	-	-	0	0	0	-/-	
<i>Purshia tridentata</i>										
84	599	0	22	78	-	0	100	0	45/53	
90	665	0	70	30	-	50	0	10	63/92	
96	380	0	100	0	-	74	5	0	52/88	
01	560	4	75	21	-	75	11	0	58/93	
06	180	0	89	11	-	33	44	0	53/81	
11	240	0	75	25	-	25	17	25	50/75	
<i>Symphoricarpos oreophilus</i>										
84	332	60	40	0	-	40	0	0	32/31	
90	732	45	55	0	-	0	0	0	16/28	
96	240	25	67	8	-	8	0	17	24/51	
01	200	0	100	0	160	0	0	0	30/57	
06	300	0	100	0	-	7	0	0	29/49	
11	240	17	75	8	-	0	0	8	21/44	

SECOND DAM BLACKSMITH FORK - TREND STUDY NO. 2-12-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 5,600 ft (1,707 m)

Aspect: Southwest

Slope: 36%

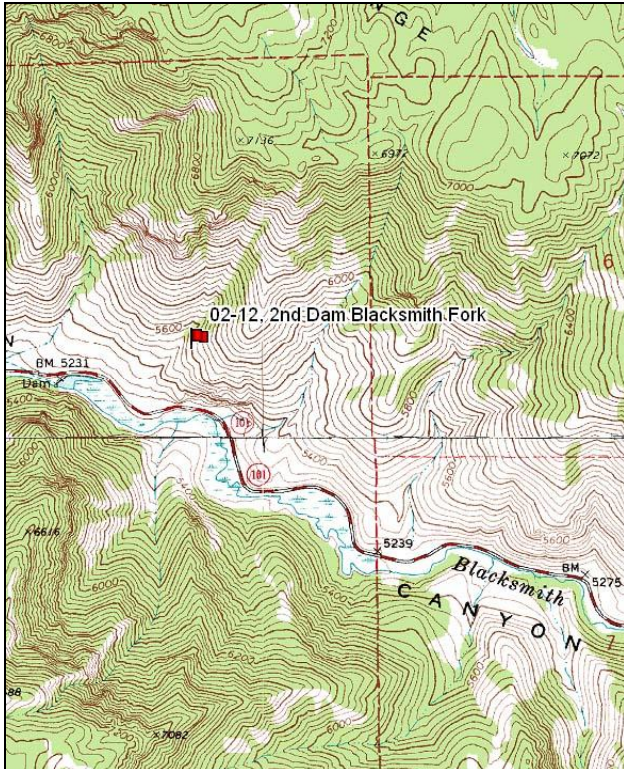
Transect bearing: 151° magnetic

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

Directions:

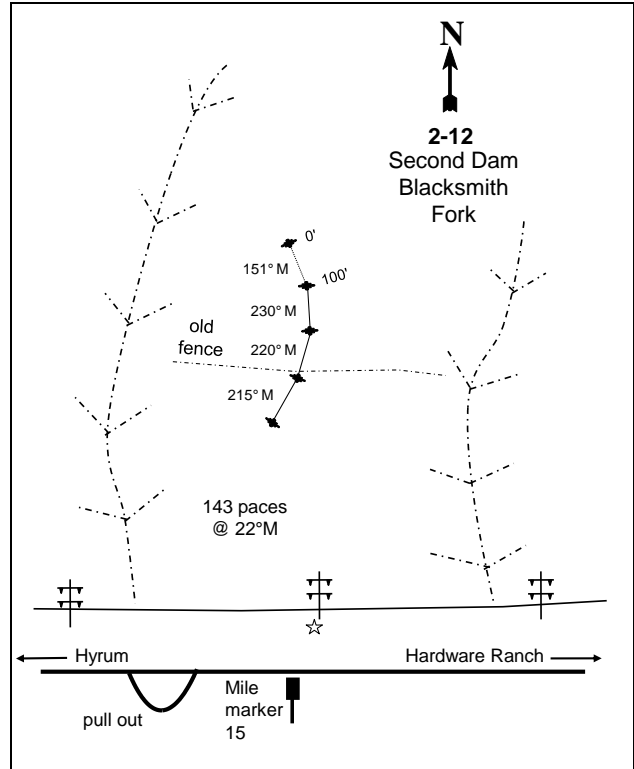
In Hyrum, proceed east up Blacksmith Fork Canyon (U-101) to mile marker 15. Continue 200 feet to the pull-out before mile marker 15. Look for a power pole north of the east of the pull-out. From the pole, take a azimuth of 22 degrees magnetic and walk 143 paces to the 400-foot baseline stake marked by 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



Township: 10N Range: 2E Section: 1

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 444088 E 4608732 N

SECOND DAM BLACKSMITH FORK - TREND STUDY NO. 2-12

Site Information

Site Description: This study samples crucial deer winter range north of the second reservoir in Blacksmith Fork Canyon. The study is dominated by a mountain big sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) community with scattered Rocky Mountain junipers (*Juniperus scopulorum*). Deer occupy the area during all but the most severe winters. It was noted that prior to 1984, the preferred browse species were heavily hedged, but have since only received light to moderate use. Deer and elk pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: Browse composition consists of mountain big sagebrush and antelope bitterbrush populations, both of which are sparse in density. There is very little young mountain big sagebrush recruitment. Mature sagebrush comprises only a moderate amount of the population. The majority of sagebrush population is comprised mainly of senescing and dead individuals. Generally, the mature and decadent plants are lightly to moderately hedged, with the mature population appearing normal and vigorous, while the decadent population contains mostly chlorotic and diseased individuals (Table - Browse Characteristics).

Antelope bitterbrush is sparse, but has had a fairly stable population since 1984. There has been little recruitment of young bitterbrush to the population, yet the population is centered within the mature age class. Decadence was high in 1984, 1990 and 2001, but has been low in the other sample years. Poor vigor was low throughout the early part of the study, but increased substantially in 2011 (Table - Browse Characteristics).

Other browse species in the area include Saskatoon serviceberry (*Amelanchier alnifolia*), blueberry elder (*Sambucus cerulea*), Woods rose (*Rosa woodsii*), Rocky Mountain maple (*Acer glabrum*), and curlleaf mountain mahogany (*Cercocarpus ledifolius*) which provide a desirable variety of forage, but are of minor importance because of their limited abundance. Rocky Mountain juniper trees are located mostly in the drainage bottoms which provide good escape cover for big game.

Herbaceous Understory: The dominant perennial grasses found on the site are Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*). Other perennial grasses include prairie junegrass (*Koeleria cristata*), Kentucky bluegrass (*P. pratensis*), and the weedy species bulbous bluegrass (*P. bulbosa*). The dominant annual grasses found on the site are Japanese brome (*Bromus japonicus*), cheatgrass (*B. tectorum*), and rattlesnake brome (*B. brizaeformis*). Cheatgrass comprises the majority of the herbaceous cover and is widely distributed across the site (Table - Herbaceous Trends).

Forbs are diverse on the site; however, contain few valuable perennial species. The majority are annuals or weedy perennials. Common species include pale alyssum (*Alyssum alyssoides*), arrowleaf balsamroot (*Balsamorhiza sagittata*), rock goldenrod (*Petradoria pumila*), Gray lomatium (*Lomatium grayi*), and yellow salsify (*Tragopogon dubius*). Dyer's woad (*Isatis tinctoria*) is a state listed noxious weed and has been sampled in low abundance for the duration of the study (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The texture of the soil is a clay loam with a slightly alkaline soil reaction (7.4 pH) (Table - Soil Analysis Data). Bare ground cover is low. Protective ground cover is provided by high amounts of vegetation and rock, which provide adequate cover from erosion (Table - Basic Cover). Soils show little development and tend to erode easily. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for mountain big sagebrush decreased by 32% from 932 plants/acre to 632 plants/acre. Decadence in the sagebrush population increased from 64% to 69%; however, poor vigor decreased from 29% to 5% of the population. Recruitment of young sagebrush plants remained poor at 5%. The density for antelope bitterbrush displayed no change at 199 plants/acre. Decadence for bitterbrush decreased from 67% to 33% of the population. Poor vigor was not observed within the population.
- **1990 to 1996 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence for sagebrush has decreased to 53% of the population, but is still considered very high. Poor vigor increased to 16% of the population. Bitterbrush decreased in decadence with no decadence being observed within the population for 1996.
- **1996 to 2001 - down (-2):** The density for sagebrush decreased by 21% from 380 plants/acre to 300 plants/acre. Decadence within the population remained at 53%. Poor vigor increased to 20% of the population. Density for bitterbrush decreased by 44% from 180 plants/acre to 100 plants/acre. Bitterbrush decadence increased to 40% of the population.
- **2001 to 2006 - down (-2):** Sagebrush density decreased by 47% to 160 plants/acre. Sagebrush decadence and poor vigor both increased to 63% of the population. Bitterbrush density did not change. Decadence and poor vigor were not observed within the bitterbrush population.
- **2006 to 2011 - stable (0):** Density of sagebrush decreased by 13% to 140 plants/acre. Both decadence and poor vigor decreased to 57% of the population. Recruitment of young sagebrush comprised 14% of the population. Density of bitterbrush increased just over two-fold. The increase in density is due to the increase in young bitterbrush. Bitterbrush decadence increased to 8% of the population, while 25% of the population displayed poor vigor.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 49%. The increase is largely due to an increase in the preferred grass Sandberg bluegrass.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass decreased significantly in nested frequency. Annual species were included in the sample for the first time in 1996. Japanese brome and cheatgrass both had high nested frequencies.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass had a significant increase in nested frequency. Cheatgrass increased significantly in nested frequency and cover increased from 4% to 19%. Japanese chess and rattlesnake brome decreased significantly in nested frequency.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass decreased significantly in nested frequency. The preferred species bluebunch wheatgrass had a slight increase in nested frequency and increased in cover from 7% to 11%. Both Japanese brome and cheatgrass decreased significantly in nested frequency. Cheatgrass decreased in cover to 8%.
- **2006 to 2011 - down (-2):** The sum of nested frequency for perennial grasses decreased 32%. Sandberg bluegrass decreased significantly in nested frequency and is directly associated with the decrease in the sum of nested frequency, though cover increased from 2% to 6%.

Forb:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 18%. The forb community on the site is fairly diverse; however, few perennial species are considered valuable to big game.

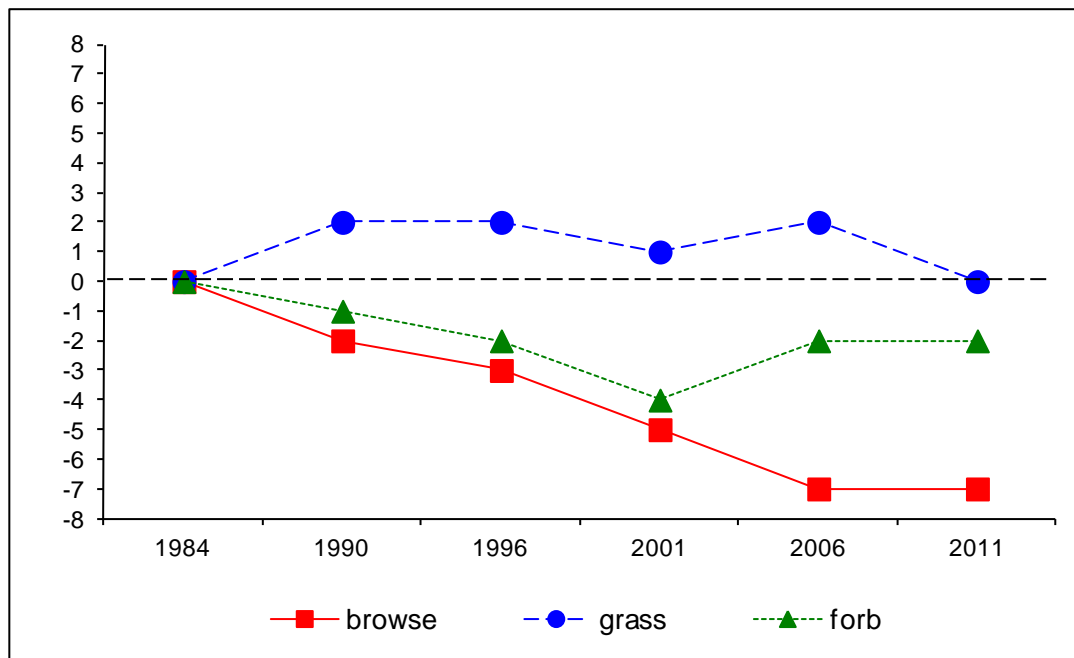
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 15%. The forb community maintained fair diversity, but few useful perennial forbs.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial forbs decreased 29%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 78%. The increase is directly associated with the significant increase in nested frequencies for pale agoseris (*Agoseris glauca*) and Gray lomatium.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Tapertip onion (*Allium acuminatum*) had a significant increase in nested frequency.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 12

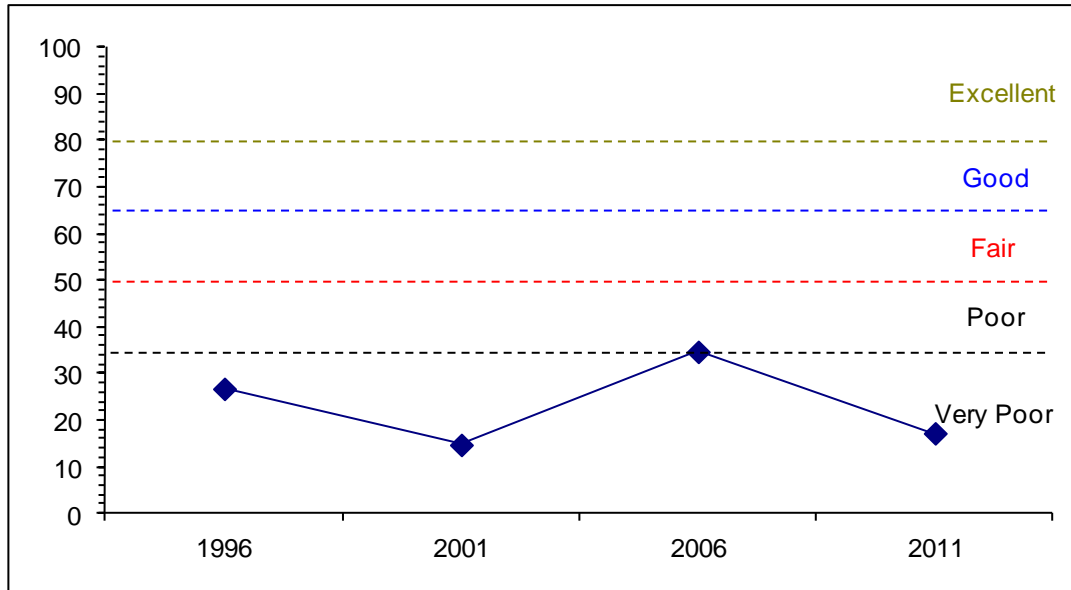
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	7.0	0.0	0.0	20.6	-7.2	8.4	-2.0	26.7	Very Poor
01	4.5	0.0	0.0	19.1	-15.5	6.6	0.0	14.7	Very Poor
06	5.1	0.0	0.0	28.0	-6.5	10.0	-2.0	34.7	Very Poor-Poor
11	6.6	0.0	0.0	23.4	-19.6	8.8	-2.0	17.2	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 12



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 2, Study no: 12



HERBACEOUS TRENDS--
Management unit 02, Study no: 12

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron smithii	-	-	-	-	3	-	-	-	.15	-
G	Agropyron spicatum	151	176	154	168	180	147	6.40	6.50	11.37	5.44
G	Bromus brizaeformis (a)	-	-	a11	b49	b77	c175	.03	.35	.56	7.55
G	Bromus japonicus (a)	-	-	c280	b95	a45	b90	5.56	1.16	.34	1.43
G	Bromus tectorum (a)	-	-	a213	c347	ab268	b261	4.00	19.09	7.70	17.11
G	Koeleria cristata	18	8	11	9	5	4	.21	.11	.03	.15
G	Poa bulbosa	-	-	4	8	10	21	.01	.18	.07	.10
G	Poa fendleriana	-	-	-	-	2	2	-	-	.03	.00
G	Poa pratensis	-	4	-	-	11	-	-	-	.11	-
G	Poa secunda	a66	c162	ab158	c164	b121	a52	3.68	2.92	2.30	6.11
Total for Annual Grasses		0	0	504	491	390	526	9.60	20.61	8.61	26.11
Total for Perennial Grasses		235	350	327	349	332	226	10.30	9.72	14.08	11.81
Total for Grasses		235	350	831	840	722	752	19.91	30.33	22.69	37.93
F	Achillea millefolium	6	1	-	-	-	-	-	-	.00	-
F	Agoseris glauca	a-	a1	a3	a9	b32	a4	.00	.16	.19	.01
F	Allium acuminatum	b60	a3	a28	a24	a13	b92	2.14	.09	.08	.60
F	Alyssum alyssoides (a)	-	-	a227	b286	a212	b282	.89	4.43	1.34	7.35
F	Astragalus sp.	-	-	-	-	1	-	-	-	.03	-
F	Astragalus utahensis	2	4	1	-	-	-	.03	-	-	-
F	Balsamorhiza sagittata	a17	b24	a12	a11	a7	a8	.43	1.60	1.19	1.73
F	Calochortus nuttallii	2	1	3	-	6	3	.00	-	.01	.01
F	Camelina microcarpa (a)	-	-	-	1	6	4	-	.00	.01	.18
F	Castilleja linariaefolia	-	-	-	1	-	-	-	.03	-	-
F	Cirsium undulatum	2	4	5	-	4	6	.19	.12	.24	.24

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Collinsia parviflora</i> (a)	-	-	a7	a5	b28	a8	.01	.01	.09	.04
F	<i>Collomia linearis</i> (a)	ab7	a-	a1	ab6	b12	ab11	.00	.01	.04	.05
F	<i>Comandra pallida</i>	b35	a2	ab17	a10	a3	a8	.07	.09	.03	.05
F	<i>Crepis acuminata</i>	a5	b28	a17	a8	a12	a13	.25	.19	.31	.35
F	<i>Delphinium nuttallianum</i>	-	-	-	-	2	-	-	-	.00	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	3	-	-	-	.00	-	-
F	<i>Draba sp.</i> (a)	-	-	-	3	2	-	-	.00	.01	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	b11	a-	c49	c35	.02	-	.51	.39
F	<i>Eriogonum umbellatum</i>	1	2	2	5	-	-	.15	.03	-	-
F	<i>Erodium cicutarium</i> (a)	-	-	a-	a5	b46	b42	-	.06	1.37	.26
F	<i>Galium aparine</i> (a)	-	-	ab3	a3	b24	ab14	.01	.03	.04	.08
F	<i>Hackelia patens</i>	-	-	-	2	3	4	-	.00	.04	.01
F	<i>Holosteum umbellatum</i> (a)	-	a-	a10	c161	b55	a30	.05	.81	.17	.11
F	<i>Isatis tinctoria</i>	a-	bc13	c19	a-	a-	ab3	.07	-	.00	.15
F	<i>Lactuca serriola</i> (a)	a-	bc15	b5	d58	c25	bc16	.06	.62	.19	.21
F	<i>Lappula occidentalis</i> (a)	-	-	-	-	9	-	-	-	.02	-
F	<i>Linum lewisii</i>	2	1	3	-	-	5	.03	-	-	.18
F	<i>Lithospermum arvense</i> (a)	-	-	-	-	1	9	-	-	.01	.06
F	<i>Lithospermum ruderales</i>	2	-	-	5	5	-	.03	.06	.18	.06
F	<i>Lomatium grayi</i>	ab13	bc27	a4	ab5	c59	ab15	.01	.01	2.56	.23
F	<i>Medicago sativa</i>	-	-	-	-	-	-	-	-	-	.03
F	<i>Melilotus officinalis</i>	-	5	1	-	3	-	.00	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	-	8	2	-	-	.02	.01
F	<i>Oenothera sp.</i>	-	-	-	-	1	-	-	-	.00	-
F	<i>Penstemon sp.</i>	-	-	3	-	-	-	.03	-	-	-
F	<i>Petroradia pumila</i>	bc34	c34	a9	ab10	a9	a6	.71	.89	1.31	.71
F	<i>Ranunculus testiculatus</i> (a)	-	-	a13	a31	b76	a6	.02	.07	.42	.01
F	<i>Senecio sp.</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Tragopogon dubius</i> (a)	a18	a53	d175	b98	bc112	cd149	2.85	1.29	3.09	3.89
F	<i>Veronica biloba</i> (a)	-	-	a46	a54	b97	a40	.15	.67	.43	.21
Total for Annual Forbs		25	68	498	714	762	648	4.09	8.06	7.79	12.89
Total for Perennial Forbs		182	150	127	90	160	167	4.18	3.30	6.21	4.39
Total for Forbs		207	218	625	804	922	815	8.28	11.36	14.01	17.28

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	19	13	8	7	3.20	1.74	.74	.45
B	Chrysothamnus nauseosus hololeucus	2	2	3	3	.76	1.96	.76	.30
B	Chrysothamnus viscidiflorus viscidiflorus	5	4	3	3	.06	.23	.31	.00
B	Eriogonum heracleoides	1	0	0	0	-	-	-	
B	Gutierrezia sarothrae	25	26	16	5	.65	.66	.39	-
B	Purshia tridentata	9	5	5	7	1.99	1.41	2.67	3.88
B	Rosa woodsii	0	2	2	2	-	.15	.15	.15
Total for Browse		61	52	37	27	6.67	6.17	5.03	4.79

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 12

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	.83	.85
Chrysothamnus nauseosus hololeucus	2.16	1.43
Chrysothamnus viscidiflorus viscidiflorus	.83	.01
Gutierrezia sarothrae	.90	.13
Purshia tridentata	5.56	6.33
Rosa woodsii	.41	.41

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 12

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.8	2.9	3.6
Purshia tridentata	3.9	3.8	4.3

BASIC COVER--

Management unit 02, Study no: 12

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.25	9.75	33.04	52.43	34.54	50.87
Rock	43.00	39.00	31.60	29.89	36.88	35.43
Pavement	12.25	8.25	3.85	2.98	6.91	7.90
Litter	26.25	25.00	31.88	36.83	30.38	25.27
Cryptogams	4.25	1.75	4.36	3.26	1.75	2.53
Bare Ground	13.00	16.25	4.64	4.52	9.03	5.32

SOIL ANALYSIS DATA --

Management unit 02, Study no: 12, Study Name: Second Dam Blacksmith Fork

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.2	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	4	-	-	-	-
Elk	6	1	5	2	6 (15)	16 (40)	3 (8)
Deer	8	4	11	5	12 (30)	16 (40)	10 (25)
Cattle	-	-	1	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 12

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Amelanchier alnifolia										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	54/47	
01	0	0	0	-	-	0	0	0	51/52	
06	0	0	0	-	-	0	0	0	36/43	
11	0	0	0	-	-	0	0	0	48/49	
Artemisia tridentata vaseyana										
84	932	0	36	64	-	18	82	29	34/30	
90	632	0	31	69	-	0	0	5	30/31	
96	380	5	42	53	-	21	5	16	30/47	
01	300	0	47	53	20	80	0	20	29/40	
06	160	0	38	63	20	25	25	63	30/42	
11	140	14	29	57	-	29	29	57	29/44	
Chrysothamnus nauseosus hololeucus										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	40	0	100	0	-	0	0	0	47/72	
01	40	0	100	0	-	0	0	0	33/44	
06	60	0	67	33	-	0	0	0	27/34	
11	60	0	100	0	-	0	0	0	29/71	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	132	25	50	25	-	0	0	0	15/10	
90	99	0	100	0	-	0	0	0	18/23	
96	140	14	86	0	-	0	0	0	18/30	
01	100	0	100	0	-	0	0	0	15/25	
06	80	0	75	25	-	0	0	0	16/32	
11	80	0	100	0	-	0	0	0	20/30	
<i>Eriogonum heracleoides</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	3/4	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	1260	35	65	0	60	0	0	0	10/16	
01	1080	0	100	0	-	0	0	0	9/13	
06	500	0	92	8	-	0	0	4	11/16	
11	100	0	100	0	-	0	0	0	11/12	
<i>Purshia tridentata</i>										
84	199	0	33	67	-	0	100	0	28/36	
90	199	0	67	33	-	17	0	0	24/30	
96	180	11	89	0	-	44	0	0	33/76	
01	100	0	60	40	-	60	20	0	39/76	
06	100	0	100	0	-	20	80	0	38/71	
11	240	50	42	8	40	42	8	25	42/70	
<i>Rosa woodsii</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	10/6	
01	40	100	0	-	-	0	0	0	-/-	
06	180	11	89	-	-	0	0	0	16/11	
11	180	33	67	-	-	0	0	0	18/15	
<i>Sambucus racemosa</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	62/95	
11	0	0	0	-	-	0	0	0	60/90	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	22/26	
<i>Tetradymia canescens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	34/47	

HARDWARE PLATEAU - TREND STUDY NO. 2-13-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Stony Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,000 ft (1,829 m)

Aspect: West

Slope: 50%

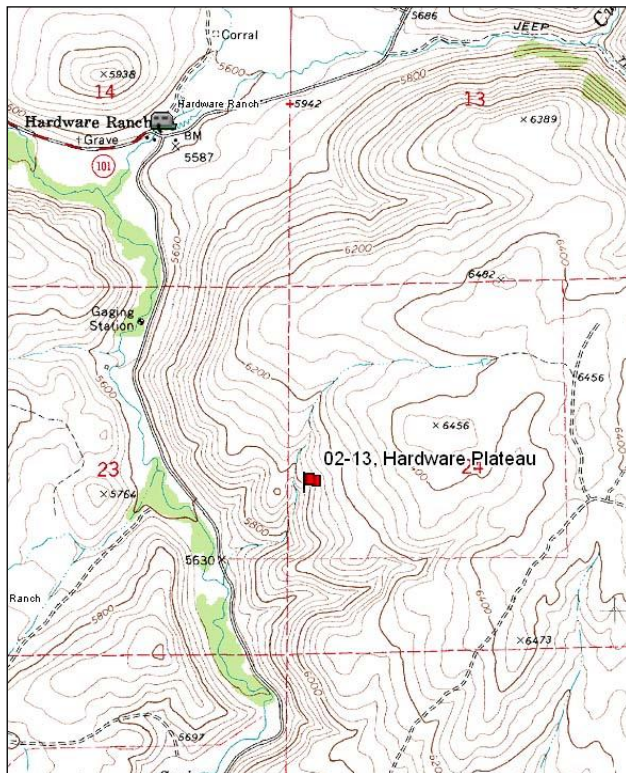
Transect bearing: 163° magnetic

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

Directions:

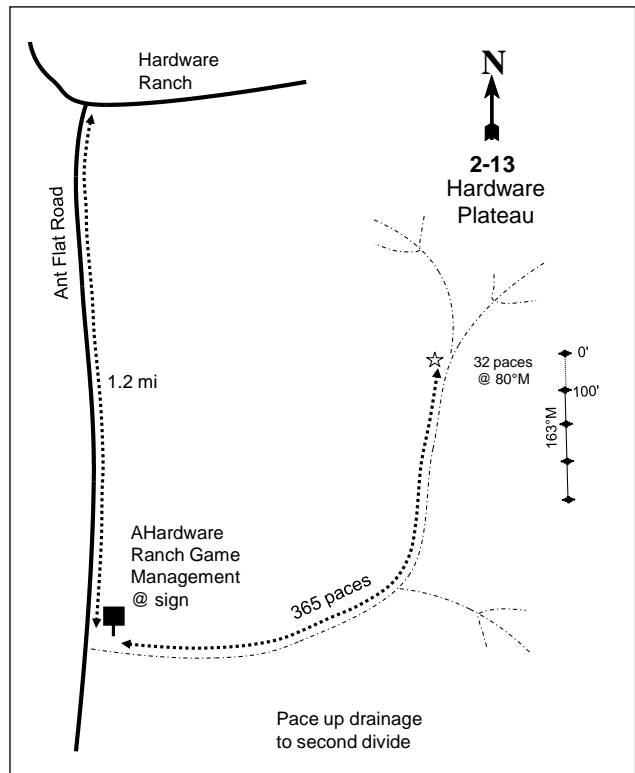
From Hardware Ranch, proceed south on the Ant Flat road for 1.2 miles. This mileage should end at a sign that reads: "Welcome to Hardware Ranch Game Management Area." Stop here. Walk up the bottom of the wash (to the east of the sign) 365 paces, to the second very definite fork in the drainage. From 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



Township: 10N Range: 3E Section: 24

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 453427 E 4604171 N

HARDWARE PLATEAU - TREND STUDY NO. 2-13

Site Information

Site Description: This study is located a short distance up one of the small draws at the western edge of the Hardware Plateau, which is located on Hardware Ranch administrated by the Division of Wildlife Resources (DWR). The area is crucial wintering range for deer and elk. The site is characterized by a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community, but the study area is dominated by perennial grasses. Pellet groups for elk were numerous in 1984. However, elk pellet groups have been sampled in low abundance since 2001. Deer pellet groups were high in abundance in 2001, but have been sampled in low abundance since 2006. Deer carcasses were found in all sample years, except 1990 and 2011; and a deer was flushed from a draw in 1996. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data). Chukars were seen in 1990, and yellow bellied marmots were seen in 2001.

Browse: The preferred browse species found on the site are mountain big sagebrush, Saskatoon serviceberry (*Amelanchier alnifolia*), and antelope bitterbrush (*Purshia tridentata*). Mountain big sagebrush occurs in low densities, with decreases in density over the course of the study. The sagebrush population has had a history of high decadence. The population is centered within the mature age class, with little recruitment of young plants over the duration of the study. Dead sagebrush plants have been numerous in the past; however, no dead plants were observed in 2011. Saskatoon Serviceberry and antelope bitterbrush both are low density populations. The serviceberry population has historically been centered within the young age class. However, the serviceberry demographic population has shifted to the mature age class. Serviceberry has displayed good health and low decadence over the duration of the study. Serviceberry was heavily browsed in 2011. The bitterbrush population has historically had lower numbers within the mature population and centered within the decadent population, but has since become an exclusively mature population. Bitterbrush was moderately browsed in 2011. Woods rose (*Rosa woodsii*) and mountain snowberry (*Symphoricarpos oreophilus*) are the most numerous browse species, but have displayed mostly light use. Increaser shrubs are numerous on the site and include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and Oregon grape (*Mahonia repens*) (Table - Browse Characteristics).

Herbaceous Understory: The study area has good perennial grass cover; however, cheatgrass (*Bromus tectorum*) provided a high amount of fine fuel litter. Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) are the dominant perennial grasses occupying the site. Bluebunch wheatgrass appears to be maintaining a stable population, while Sandberg bluegrass has slowly decreased in abundance. Cheatgrass cover and nested frequency have steadily declined with each reading since 1996. However, cover for cheatgrass increased in 2011 that is likely due to a cool, wet spring. Common perennial forbs include Louisiana sagebrush (*Artemisia ludoviciana*), arrowleaf balsamroot (*Balsamorhiza sagittata*), western yarrow (*Achillea millefolium*), tapertip hawksbeard (*Crepis acuminata*), and silvery lupine (*Lupinus argenteus*) (Table - Herbaceous Trends). Forbs and grasses show little evidence of grazing with the exception of Arrowleaf balsomroot, the noxious weed Dyer's woad (*Isatis tinctoria*) and tapertip hawksbeard, which were moderately browsed in 2011.

Soil: The soil is part of the Yeates Hollow component, and is found on mountain slopes. The parent material consists of residuum, colluvium, and alluvium derived from quartzite and sandstone. The soil has poor permeability and runoff is quite rapid (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). Bare ground cover is low with a high amount of vegetation, rock, and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2001 and 2006 due to gullies and rills. In 2011, the soil erosion condition was classified as stable.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for mountain big sagebrush decreased 60% from 332 plants/acre to 132 plants/acre. Decadence increased from 70% to 75% of the population, and poor vigor increased to 0% to 25% of the population. No recruitment of young plants was observed. Serviceberry increased in density by 55% from 365 plants/acre to 566 plants/acre. Decadence increased from 9% to 23% of the serviceberry population. Young serviceberry plants comprised 82% of the population. Poor vigor increased to 6% of the population. The density for bitterbrush decreased 60% from 332 plants/acre to 132 plants/acre. Decadence decreased from 60% to 50% of the population, but is still considered to be very high.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decreased in decadence to 21% of the population, and poor vigor decreased to 7% of the population. Serviceberry had no decadence or poor vigor observed within the population. Bitterbrush had 25% of the population displaying decadence, while poor vigor was not observed within the population.
- **1996 to 2001 - down (-2):** The density for sagebrush decreased 57% from 280 plants/acre to 120 plants/acre, and cover decreased to less than 1%. Decadence increased to 50% of the population, while poor vigor was not observed within the population. Serviceberry decreased in density by 64% from 440 plants/acre to 160 plants/acre. The serviceberry population displayed no decadence, and had good vigor. Bitterbrush displayed no change in density at 80 plants/acre. Decadence remained at 25% of the population, and poor vigor was not observed within the bitterbrush population.
- **2001 to 2006 - stable (0):** The density for the sagebrush population had no change. However, decadence decreased to 33% of the population, and poor vigor was not observed within the population. Serviceberry increased in density by 25% to 200 plants/acre. Decadence was not observed within the serviceberry population and was vigorous. The bitterbrush population did not change in density. Decadence and poor vigor was not observed.
- **2006 to 2011 - stable (0):** The density for sagebrush decreased 33% from 120 plants/acre to 80 plants/acre. Decadence decreased to 25% of the sagebrush population, and poor vigor increased to 25% of the population. There was no new recruitment of young plants. The serviceberry population decreased in density by 20% from 200 plants/acre to 160 plants/acre. Decadence and poor vigor was not observed within the serviceberry population. The density for bitterbrush increased by 25% from 80 plants/acre to 100 plants/acre. Decadence and poor vigor was not observed within the bitterbrush population. All plants were classified as mature.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 10%. The increase in nested frequency is associated with the significant increase in the nested frequency for bluebunch wheatgrass.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses decreased 23% and is associated with the significant decrease in nested frequency for bluebunch wheatgrass and Sandberg bluegrass. However, cover for both grasses were 10% and 8%, respectively. In 1996, annual grasses were included in the sample for the first time. The weedy annual cheatgrass (*Bromus tectorum*) had a high nested frequency, and provided 10% cover.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 14%. The increase was directly related to a significant increase in nested frequency for Sandberg bluegrass, which increased in cover to 8%. Bluebunch wheatgrass remained similar in nested frequency, but cover increased to 18%. Cheatgrass had a significant decrease in nested frequency, and cover decreased to 6%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar, though cover decreased from 26% to 22%. Sandberg blue grass had a significant decrease in nested

frequency, and cover decreased to 3%. Cheatgrass also had a significant decrease in nested frequency, and cover decreased to 1%.

- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 19%, though cover increased to 24%. Sandberg bluegrass decreased significantly in nested frequency, but maintained cover near 3%.

Forb:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The forb community is fairly diverse, but occurs in low frequencies.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 52%. The preferred forbs within the study include western yarrow, arrowleaf balsamroot, sulfur eriogonum (*Eriogonum umbellatum*), and silvery lupine, which have all declined significantly in nested frequency.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 11%. Spotted stickseed (*Hackelia patens*) decreased significantly in nested frequency, and had a cover near 0%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar, though cover increased from 7% to 9%. The cymopterus species (*Cymopterus sp.*) and tapertip hawksbeard increased significantly in nested frequency, and increased in cover from less than 1% to 2% and from 1% to 2%, respectively. The sum of nested frequency of annual forbs has increased substantially since 1996, and cover has increased from 2% to 13% over the sample years.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

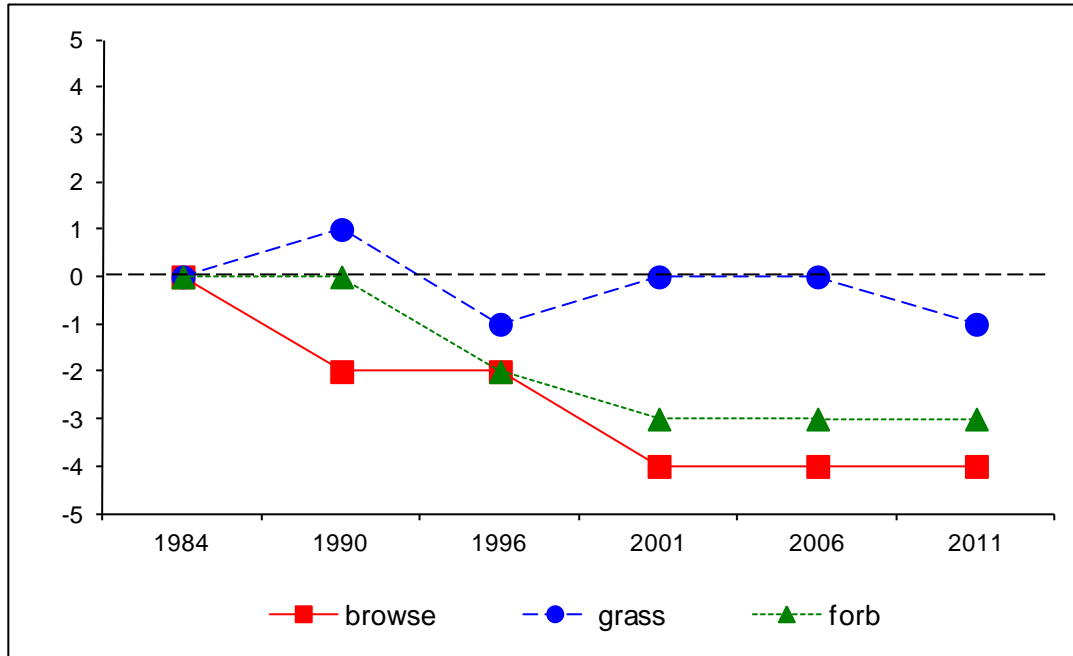
Management unit 2, study no: 13

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	3.2	0.0	0.0	30.0	-7.3	10.0	0.0	35.9	Very Poor-Poor
01	2.7	0.0	0.0	30.0	-4.5	10.0	-2.0	36.2	Very Poor-Poor
06	1.6	0.0	0.0	30.0	-0.8	10.0	-2.0	38.8	Poor
11	1.6	0.0	0.0	30.0	-3.3	10.0	-2.0	36.3	Very Poor-Poor

Trend Summary

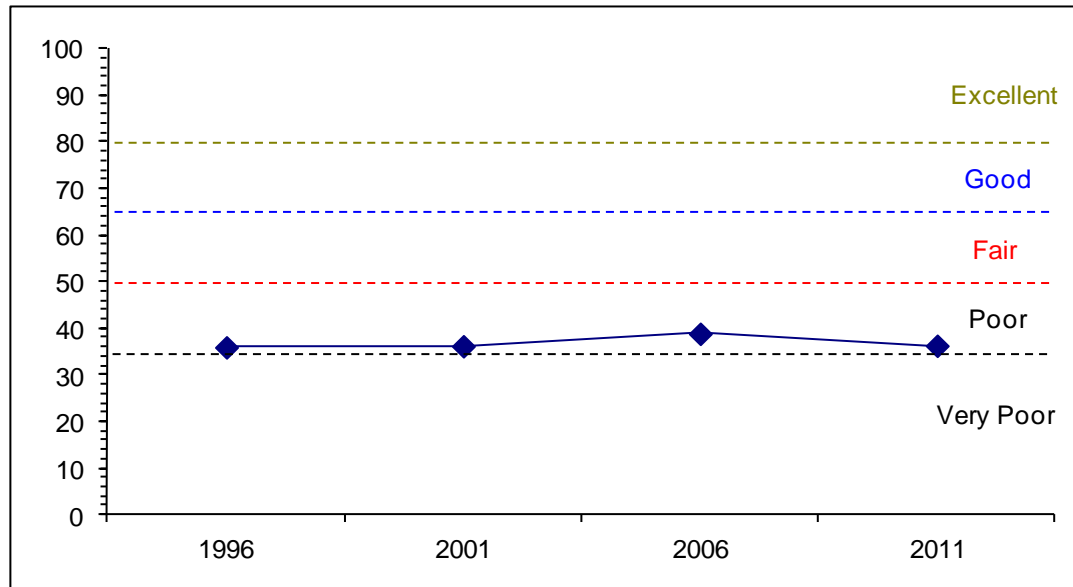
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 13



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 2, Study no: 13



HERBACEOUS TRENDS--
Management unit 02, Study no: 13

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron intermedium	-	-	-	-	-	3	-	-	-	.00
G	Agropyron spicatum	a267	c305	a232	ab244	bc258	ab237	9.70	17.86	18.21	18.88
G	Bromus japonicus (a)	-	-	ab10	ab14	a2	b29	.05	.10	.00	.15
G	Bromus tectorum (a)	-	-	c296	b250	a174	a201	9.67	5.96	1.04	4.28
G	Koeleria cristata	-	2	-	2	2	2	-	.03	.03	.03
G	Poa bulbosa	-	-	-	-	-	3	-	-	-	.01
G	Poa fendleriana	-	-	4	-	-	-	.04	-	-	-
G	Poa pratensis	a-	a4	a3	a3	b62	b29	.03	.03	1.49	2.12
G	Poa secunda	c244	c252	bc197	c249	b171	a128	7.83	7.89	2.53	2.70
Total for Annual Grasses		0	0	306	264	176	230	9.72	6.06	1.05	4.44
Total for Perennial Grasses		511	563	436	498	493	402	17.61	25.82	22.27	23.76
Total for Grasses		511	563	742	762	669	632	27.33	31.88	23.32	28.20
F	Achillea millefolium	b175	b133	a69	a65	a48	a49	.82	1.52	1.93	2.00
F	Agoseris glauca	-	1	-	6	6	3	-	.04	.05	.00
F	Alyssum alyssoides (a)	-	-	ab64	bc95	a37	c138	.42	.30	.10	.43
F	Arabis sp.	-	6	8	2	-	-	.01	.00	-	-
F	Artemisia ludoviciana	15	20	21	23	21	23	2.30	1.77	1.02	2.43
F	Balsamorhiza sagittata	c60	c61	b26	ab19	ab13	a2	.77	.60	.66	.22
F	Calochortus nuttallii	-	3	-	-	-	5	-	-	-	.01
F	Camelina microcarpa (a)	-	-	-	-	-	10	-	-	-	.19
F	Cirsium undulatum	10	19	5	13	12	3	.19	.71	.30	.18
F	Collinsia parviflora (a)	-	-	a50	a66	a47	b147	.15	.16	.09	1.68
F	Collomia linearis (a)	-	-	a-	b15	c74	c68	-	.03	.22	.36
F	Comandra pallida	-	-	-	1	-	-	-	.00	-	-
F	Crepis acuminata	a-	d153	b28	b18	b34	c60	.34	.45	1.17	1.47
F	Cymopterus sp.	a-	a-	a2	a21	b32	c57	.00	.40	.38	1.64
F	Descurainia sp. (a)	-	-	a-	a-	a-	b36	-	-	-	.18
F	Draba sp. (a)	-	-	a-	b21	c92	d175	-	.03	.27	1.54
F	Epilobium brachycarpum (a)	-	-	b83	a11	c123	c124	.93	.03	.90	1.72
F	Eriogonum umbellatum	20	12	7	-	-	-	.33	-	-	-
F	Erodium cicutarium (a)	-	-	a52	c132	b103	a25	.65	7.74	1.45	.08
F	Galium aparine (a)	-	-	-	-	2	-	-	-	.00	-
F	Hackelia patens	b27	ab15	b33	a7	ab24	a3	.33	.07	.69	.18
F	Holosteum umbellatum (a)	-	-	a12	b168	c205	ab205	.03	.65	.49	2.70
F	Isatis tinctoria	-	-	-	1	3	7	-	.15	.15	.12
F	Lactuca serriola (a)	a-	a-	a16	a19	a8	b110	.03	.07	.02	.84
F	Lappula occidentalis (a)	-	-	a-	a1	a-	b162	-	.03	-	1.82
F	Lomatium grayi	-	1	-	1	6	-	-	.03	.06	-
F	Lupinus argenteus	c58	b34	a12	a11	a5	a6	.34	.39	.30	.18
F	Microsteris gracilis (a)	-	-	a-	a4	b67	b72	-	.01	.16	.49
F	Navarretia intertexta (a)	-	-	-	-	-	3	-	-	-	.03
F	Penstemon humilis	13	12	4	4	4	2	.06	.24	.21	.18
F	Phacelia sp.	-	-	12	10	-	-	.48	.12	.00	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Phlox longifolia	-	-	-	-	2	-	-	-	.00	-
F	Ranunculus testiculatus (a)	-	-	ab ²³	a ¹³	c ¹¹⁸	b ⁴⁶	.07	.05	.47	.32
F	Senecio multilobatus	b ⁸⁰	a ⁻	a ⁻	a ⁻	a ⁴	a ³	-	-	.03	.03
F	Sisymbrium altissimum (a)	-	-	b ¹²	a ⁻	a ⁻	b ¹⁵	.09	-	-	.28
F	Tragopogon dubius (a)	2	-	2	3	3	8	.01	.06	.00	.21
Total for Annual Forbs		2	0	314	548	879	1344	2.41	9.19	4.20	12.93
Total for Perennial Forbs		458	470	227	202	214	223	6.00	6.53	7.00	8.68
Total for Forbs		460	470	541	750	1093	1567	8.41	15.72	11.20	21.62

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	9	7	8	7	.06	.03	.06	.03
B	Artemisia tridentata vaseyana	14	6	6	4	1.30	.36	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	17	16	18	10	1.79	1.27	.91	.56
B	Eriogonum heracleoides	0	1	1	0	-	-	-	-
B	Mahonia repens	15	19	18	18	.07	.67	.49	1.30
B	Prunus virginiana	5	4	5	5	.03	.03	.03	.15
B	Purshia tridentata	3	3	3	5	.38	1.00	.21	.33
B	Rosa woodsii	12	16	14	14	.72	.51	.95	.70
B	Sambucus cerulea	0	2	0	0	-	.03	-	-
B	Symphoricarpos oreophilus	6	4	8	6	1.31	1.62	1.25	.93
Total for Browse		81	78	81	69	5.68	5.55	3.90	4.01

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 13

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.98	.90
Artemisia tridentata vaseyana	.18	.50
Chrysothamnus viscidiflorus viscidiflorus	2.20	2.25
Mahonia repens	.90	1.25
Prunus virginiana	.43	.45
Purshia tridentata	.90	.88
Rosa woodsii	.70	.86
Symphoricarpos oreophilus	2.36	1.23

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 13

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	-	4.8	3.5
Artemisia tridentata vaseyana	4.9	2.5	3.4
Purshia tridentata	5.3	-	2.9

BASIC COVER--

Management unit 02, Study no: 13

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.75	16.25	43.72	48.98	36.74	53.76
Rock	17.50	20.50	25.35	30.16	30.41	30.43
Pavement	2.25	.75	5.00	4.30	3.75	3.55
Litter	66.75	44.50	45.87	33.00	29.17	27.56
Cryptogams	6.50	1.25	1.18	1.94	.56	4.30
Bare Ground	5.25	16.75	7.04	4.88	16.10	5.41

SOIL ANALYSIS DATA --

Management unit 02, Study no: 13, Study Name: Hardware Plateau

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	6	-	1	-	-	-
Elk	7	3	-	2	13 (31)	9 (22)	9 (23)
Deer	18	19	8	3	39 (96)	28 (69)	7 (18)
Cattle	-	-	-	-	-	3 (7)	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 13

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	365	82	9	9	166	82	18	0	27/22
90	566	77	0	23	-	29	53	6	-/-
96	440	55	45	0	-	36	36	0	17/21
01	160	13	88	0	-	38	25	0	20/21
06	200	50	50	0	-	0	90	0	21/21
11	160	0	100	0	-	13	38	0	18/24

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
84	332	0	30	70	-	30	50	0	14/9	
90	132	0	25	75	-	0	75	25	13/13	
96	280	14	64	21	-	71	14	7	24/34	
01	120	17	33	50	-	67	0	0	32/37	
06	120	17	50	33	-	33	17	0	29/37	
11	80	0	75	25	-	0	0	25	30/34	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	765	13	83	4	-	4	0	4	16/18	
90	432	8	92	0	-	8	0	0	17/21	
96	440	0	100	0	-	9	0	0	15/24	
01	500	4	96	0	-	0	0	0	12/22	
06	480	13	83	4	-	0	4	0	16/26	
11	240	8	92	0	-	0	0	8	14/20	
<i>Eriogonum heracleoides</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	4/7	
06	20	0	100	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Gutierrezia sarothrae</i>										
84	66	50	50	-	-	0	0	0	7/11	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Mahonia repens</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	980	16	84	0	-	0	0	0	4/5	
01	3120	2	97	1	-	0	0	0	4/5	
06	3380	0	100	0	-	0	0	0	2/6	
11	1040	56	44	0	100	0	0	0	3/4	
<i>Prunus virginiana</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	100	40	60	0	-	20	40	0	19/18	
01	100	40	60	0	-	80	0	0	16/35	
06	260	92	8	0	-	38	62	0	14/19	
11	240	50	42	8	-	33	8	8	13/15	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Purshia tridentata										
84	332	0	40	60	-	0	100	0	18/20	
90	132	0	50	50	-	0	100	0	15/18	
96	80	0	75	25	-	0	50	0	19/36	
01	80	0	75	25	-	25	75	0	20/44	
06	80	0	100	0	-	0	100	0	23/59	
11	100	0	100	0	-	20	40	0	26/54	
Rhus glabra cismontana										
84	66	0	100	-	-	50	0	0	43/41	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	55/78	
Rosa woodsii										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	1520	22	78	-	20	11	62	0	12/11	
01	1220	36	64	-	-	8	0	0	13/12	
06	1900	15	85	-	-	26	0	0	12/11	
11	1460	36	64	-	-	12	0	0	12/13	
Sambucus cerulea										
84	0	0	0	-	-	0	0	0	-/-	
90	33	0	100	-	-	0	100	0	31/20	
96	0	0	0	-	-	0	0	0	84/135	
01	60	0	100	-	-	0	0	0	47/69	
06	0	0	0	-	-	0	0	0	73/91	
11	0	0	0	-	-	0	0	0	43/76	
Symphoricarpos oreophilus										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	460	35	65	0	-	78	0	0	20/27	
01	100	0	100	0	-	0	0	0	26/50	
06	180	11	89	0	-	44	0	0	28/46	
11	180	22	67	11	-	11	0	11	20/30	

GARDEN CITY CANYON - TREND STUDY NO. 2-16-11

Vegetation Type: Curleaf Mountain Mahogany

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Mountain Shallow Loam \(Mountain Big Sagebrush\), R047XA446UT](#)

Land Ownership: USFS

Elevation: 6,580 ft (2,006 m)

Aspect: Southeast

Slope: 38%

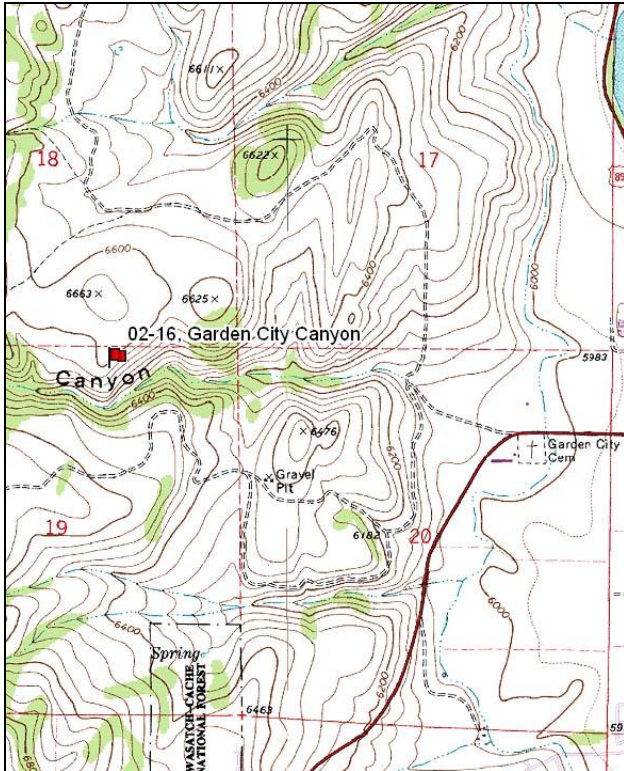
Transect bearing: 166° magnetic

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

Directions:

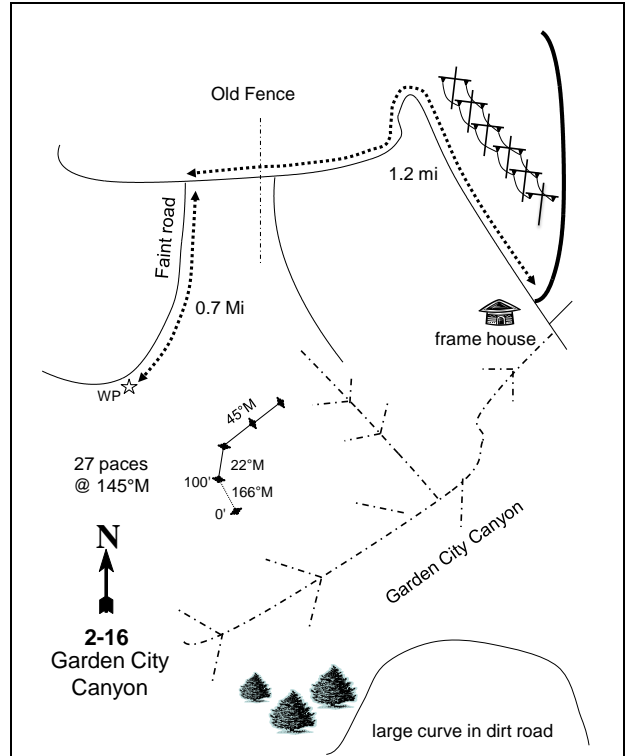
From Garden City, proceed west on US-89. Turn right at 525 W. Proceed 0.25 miles and turn right. While staying on the main road, continue for 1.2 miles to a fence. Turn onto a faint road immediately after the fence for 0.7 miles; stay right at the fork to the witness post on the left at the edge of the 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. Line 3 and 4 run 45 degrees magnetic.

Map Name: Garden City



Township: 14N Range: 5E Section: 19

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 464620 E 4644227 N

GARDEN CITY CANYON - TREND STUDY NO. 2-16

Site Information

Site Description: This study samples winter range on the north rim of Garden City Canyon in Rich County. The vegetation type is characterized by curlleaf mountain mahogany (*Cercocarpus ledifolius*) 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 (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*). The area is heavily occupied by deer and elk, and they seem to prefer the more exposed and less densely vegetated knolls and hillsides. Deer pellet groups were sampled in high abundance in 2001, but sampled in moderate abundance during the 2006 and 2011 sample years. A deer carcass was seen on site in 2011. Elk pellet groups were sampled in moderate abundance in all sample years except 2006 when pellet groups were sampled in high abundance. Moose pellet groups were reported as having low abundance in 2006 (Table - Pellet Group Data).

Browse: The browse composition includes 14 species of shrubs with seven species that are preferred by wildlife. The most conspicuous shrub, although not the most numerous, is curlleaf mountain mahogany. Many of the mahogany are tree-like in growth form and are unavailable to browsing. The majority of the mature plants are over 8 feet in height. Shrub density strips indicate a slight decrease in the population. Most of the tall mahogany has been highlined, but utilization of available plants is moderate to heavy. Smaller plants are heavily hedge and display a clubbed and armored growth form. The majority of the mahogany population consists of mature plants. Plants are vigorous and decadence is low within the population (Table - Browse Trends).

Other important browse species include a combination of low sagebrush (*Artemisia arbuscula*), mountain big sagebrush, bitterbrush, and serviceberry (*Amelanchier alnifolia*). Low sagebrush is much more abundant and widespread than the other shrubs. Utilization of low sagebrush was heavy in 1984, but use has been light to moderate in all other sample years. Low sagebrush is a vigorous, mature population, with moderate decadence. Low sagebrush has had minimal recruitment to the population over the course of the study years (Table - Browse Trends).

Herbaceous Understory: The herbaceous understory consists primarily of the perennial grasses bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*). Other perennial grasses found on the site are prairie junegrass (*Koeleria cristata*), mutton bluegrass (*Poa fendleriana*), Kentucky bluegrass (*P. pratensis*), bottlebrush squirreltail (*Sitanion hystrix*), Letterman needlegrass (*Stipa lettermani*), and oniongrass (*Melica bulbosa*). The weedy annual grasses cheatgrass (*Bromus tectorum*) and Japanese brome (*B. japonicus*) are both found on the site and are very common. It was reported in 1996 that about half of the brome grasses were infected with smut, which may have contributed in the decline of nested frequency for cheatgrass. Forbs are a minor component of the herbaceous understory and few are perennial. Total cover for the perennial forb community has been near 1% and remained similar over the course of the study (Table - Herbaceous Trends).

Soil: The soil is part of the Foxol series, which are found on mountainsides and hillslopes. The parent material consists of colluviums and/or slope alluvium over residuum weathered from quartzite. The soil is well drained as the restrictive layer has moderately high permeability (Soil Survey Staff 2011). The soil texture is a clay loam with a soil reaction that is moderately acidic (pH of 5.8) (Table - Soil Analysis Data). Bare ground cover is moderately low. Adequate protective ground cover is provided by a moderate amount of vegetation and rock, and a high amount of vegetation litter (Table - Basic Cover). The soil erosion condition was classified as slight in 2006, but stable in 2001 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** The density for the preferred species curleaf mountain mahogany increased 31% from 432 plants/acre to 565 plants/acre. Decadence increased to 29% of the mahogany population. Poor vigor was not observed within the population. The majority of the mature age class is unavailable to big game due to height. Low sagebrush decreased in density 6% from 1,731 plants/acre to 1,631 plants/acre. Low sagebrush decadence decreased from 35% to 29%, and poor vigor decreased from 19% to 12% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the mahogany population decreased to 21%. Low sagebrush decreased to 11% decadence within the population. Low sagebrush was vigorous with 2% of the population displaying poor vigor.
- **1996 to 2001 - slightly down (-1):** The density for mountain mahogany decreased 21% from 280 plants/acre to 220 plants/acre. Decadence within the mahogany population increased to 36%, and poor vigor increased to 18% of the population. Low sagebrush density decreased 17% from 2,600 plants/acre to 2,160 plants/acre. Low sagebrush increased in decadence to 20%, and poor vigor increased within the population to 5%.
- **2001 to 2006 - slightly down (-1):** The density for mahogany decreased 36% to 140 plants/acre. Decadence and poor vigor decreased and were not observed within the population. Low sagebrush remained similar in density at 2,140 plants/acre. Decadence decreased to 19%. Poor vigor increased to 12%.
- **2006 to 2011 - slightly up (+1):** Mountain mahogany increased in density by 57% to 220 plants/acre. Decadence increased to 9% of the population, while poor vigor was not observed. The young age class comprised 27% of the population. Low sagebrush remained similar in density at 2,160 plants/acre. Low sagebrush decadence increased to 23%, while poor vigor within the low sagebrush population was maintained at 12%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 26%. The perennial species bluebunch wheatgrass was the dominant species. Sandberg bluegrass increased significantly in nested frequency.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses remained similar. The population for bluebunch wheatgrass and Sandberg bluegrass remained stable, and provided 7% and 3% cover, respectively. Annual grasses were included in the sample for the first time in 1996. Cheatgrass was the most abundant grass species, and had a cover of 19%.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses increased 34%. Bluebunch wheatgrass maintained a stable population, with a cover of 8%. Sandberg bluegrass increased significantly in nested frequency, and cover increased to 8%. Cheatgrass decreased significantly in nested frequency, and decreased in cover to 2%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Bluebunch wheatgrass and Sandberg bluegrass maintained stable populations, and cover remained similar at 7% and 8%, respectively. Oniongrass was sampled for the first time, and had a cover of less than 1%. Annual grasses did not change in composition.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar. Bluebunch wheatgrass increased significantly in nested frequency, and increased in cover to 11%; while Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to 6%. The weedy annual Japanese brome increased significantly in nested frequency and increased in cover from less than 1% to 2%.

Forb:

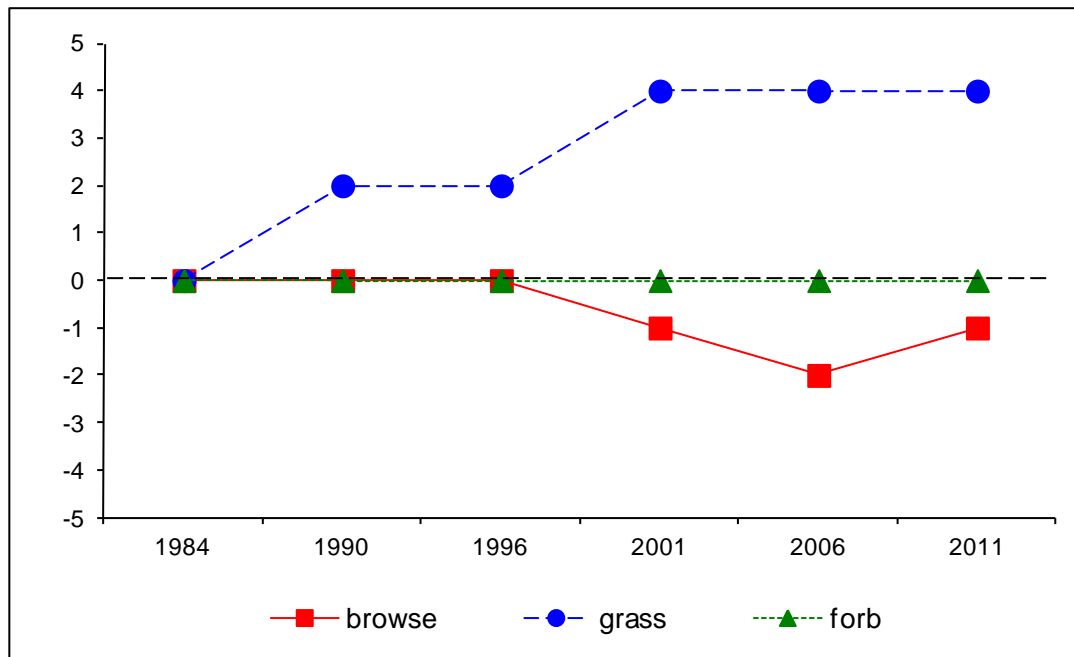
- **1984 to 1990 - stable (0):** Perennial forbs are rare on the site.
- **1990 to 1996 - stable (0):** Perennial forbs remained rare. Annual forb species were included in the sample for the first time in 1996 and were abundant.
- **1996 to 2001 - stable 0):** Perennial forbs remained rare on the site. Annual forbs increased substantially in sum of nested frequency.
- **2001 to 2006 - stable (0):** Perennial forbs remained rare on the site. Sum of nested frequency of annual forbs remained similar.
- **2006 to 2011 - stable (0):** Perennial forbs remained rare on the site. Sum of nested frequency and cover of annual forbs increased markedly.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 16

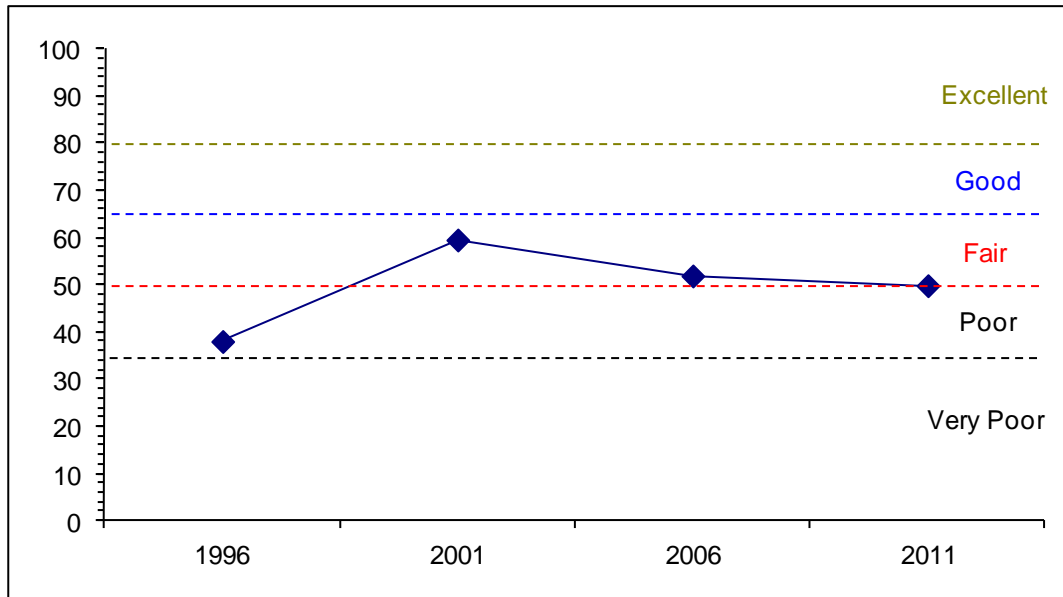
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	17.0	10.6	2.9	21.1	-15.1	1.6	0.0	38.0	Poor
01	17.2	9.2	1.8	30.0	-1.8	3.2	0.0	59.5	Fair
06	14.2	7.8	0.0	29.8	-2.0	2.1	0.0	51.9	Poor-Fair
11	12.9	7.6	1.3	30.0	-4.3	2.3	0.0	49.8	Poor-Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 16



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 16



HERBACEOUS TRENDS--
 Management unit 02, Study no: 16

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron spicatum</i>	a157	ab167	ab165	ab176	a157	b203	7.06	8.40	6.54	10.72
G	<i>Bromus brizaeformis</i> (a)	-	-	-	-	-	1	-	-	-	.00
G	<i>Bromus japonicus</i> (a)	-	-	a55	a24	a43	b167	1.23	.10	.13	2.15
G	<i>Bromus tectorum</i> (a)	-	-	b341	a142	a157	a149	18.94	2.33	2.54	3.59
G	<i>Koeleria cristata</i>	7	-	-	3	3	3	-	.03	.06	.04
G	<i>Melica bulbosa</i>	-	-	-	-	11	5	-	-	.07	.06
G	<i>Poa bulbosa</i>	-	-	-	-	-	3	-	-	-	.02
G	<i>Poa fendleriana</i>	a3	a-	a-	a-	a-	b19	-	-	.03	.16
G	<i>Poa pratensis</i>	b25	a-	a-	a-	a-	a2	-	-	-	.15
G	<i>Poa secunda</i>	a44	b131	b137	c226	c217	b147	3.46	7.52	8.17	5.83
G	<i>Sitanion hystrix</i>	-	-	1	-	-	-	.03	-	-	-
G	<i>Stipa lettermani</i>	-	-	-	1	-	-	-	.03	-	.00
Total for Annual Grasses		0	0	396	166	200	317	20.17	2.44	2.67	5.75
Total for Perennial Grasses		236	298	303	406	388	382	10.55	15.98	14.88	17.00
Total for Grasses		236	298	699	572	588	699	30.72	18.43	17.55	22.75
F	<i>Agoseris glauca</i>	4	1	4	13	12	2	.00	.07	.08	.01
F	<i>Alyssum alyssoides</i> (a)	-	-	b122	b150	a69	c218	.56	.67	.14	.81
F	<i>Arabis</i> sp.	-	3	4	4	4	12	.04	.01	.01	.07
F	<i>Artemisia ludoviciana</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Balsamorhiza sagittata</i>	-	-	-	-	-	-	-	.03	.00	-
F	<i>Calochortus nuttallii</i>	-	6	-	-	-	-	-	-	-	-
F	<i>Camelina microcarpa</i> (a)	-	-	3	6	14	4	.00	.07	.03	.02
F	<i>Cirsium undulatum</i>	7	7	11	5	-	4	.28	.36	-	.09

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Collinsia parviflora</i> (a)	-	-	a4	b135	b101	b117	.01	.42	.41	.68
F	<i>Collomia linearis</i> (a)	-	-	-	3	2	-	-	.03	.01	-
F	<i>Comandra pallida</i>	19	24	24	24	18	20	.15	.33	.31	.33
F	<i>Crepis acuminata</i>	a-	a1	ab7	bc18	abc19	c26	.24	.72	.58	.45
F	<i>Descurainia pinnata</i> (a)	-	-	-	3	-	2	-	.01	-	.01
F	<i>Draba verna</i> (a)	-	-	a-	a15	a36	b91	-	.07	.07	.66
F	<i>Epilobium brachycarpum</i> (a)	-	-	ab48	a29	b69	b73	.28	.14	.37	.67
F	<i>Erigeron divergens</i>	-	1	-	-	-	-	-	-	-	-
F	<i>Erigeron pumilus</i>	-	-	-	-	3	-	-	-	.00	-
F	<i>Eriogonum umbellatum</i>	-	-	-	-	3	3	-	.00	.03	.15
F	<i>Erodium cicutarium</i> (a)	-	-	-	8	3	3	-	.09	.15	.01
F	<i>Galium aparine</i> (a)	-	-	-	-	-	6	-	-	-	.04
F	<i>Gayophytum ramosissimum</i> (a)	-	-	a1	a-	b46	a7	.00	-	.23	.01
F	<i>Gilia</i> sp. (a)	-	-	-	-	-	7	-	-	-	.01
F	<i>Holosteum umbellatum</i> (a)	-	-	a-	a1	a6	b19	-	.00	.02	.07
F	<i>Lactuca serriola</i> (a)	-	-	-	-	-	6	-	-	-	.01
F	<i>Lappula occidentalis</i> (a)	-	-	a2	a1	a16	b51	.00	.00	.03	.28
F	<i>Microsteris gracilis</i> (a)	-	-	a-	c64	c67	b27	-	.22	.18	.07
F	<i>Pedicularis centranthera</i>	-	-	-	-	-	1	-	-	-	.00
F	<i>Pellaea breweri</i>	5	-	-	-	-	-	-	-	-	-
F	<i>Penstemon</i> sp.	-	1	-	-	-	-	-	-	-	-
F	<i>Petradoria pumila</i>	-	-	1	-	-	-	.03	.03	-	.03
F	<i>Phlox longifolia</i>	a-	a2	a-	a1	b16	a-	-	.00	.03	-
F	<i>Polygonum douglasii</i> (a)	-	-	a3	a2	a-	b20	.00	.01	-	.14
F	<i>Sisymbrium altissimum</i> (a)	-	-	3	-	-	7	.03	.03	-	.19
F	<i>Tragopogon dubius</i> (a)	b15	a4	a6	ab8	a3	a-	.01	.06	.01	.00
F	<i>Wyethia amplexicaulis</i>	1	3	3	-	-	-	.03	-	-	-
Total for Annual Forbs		15	4	192	425	432	658	0.90	1.87	1.67	3.71
Total for Perennial Forbs		37	49	54	65	75	68	0.77	1.59	1.06	1.16
Total for Forbs		52	53	246	490	507	726	1.68	3.46	2.73	4.87

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	11	8	6	6	.41	.30	.30	.56
B	Artemisia arbuscula	56	54	51	55	7.85	8.18	6.48	7.54
B	Artemisia tridentata vaseyana	0	4	3	3	-	1.16	1.16	.38
B	Cercocarpus ledifolius	14	10	7	10	3.65	1.72	1.67	.39
B	Eriogonum heracleoides	2	2	2	3	-	-	-	-
B	Eriogonum microthecum	1	0	1	1	-	.15	.38	-
B	Juniperus scopulorum	0	0	0	0	.88	1.02	1.41	.38
B	Mahonia repens	7	10	9	7	.03	.48	.07	.45
B	Opuntia sp.	3	3	3	4	.18	.38	.63	.15
B	Pachistima myrsinites	3	4	2	1	.18	.18	-	.15
B	Purshia tridentata	6	6	6	7	.71	1.64	.81	1.08
B	Symphoricarpos oreophilus	16	16	14	12	1.72	3.23	1.98	2.16
Total for Browse		119	117	104	109	15.64	18.46	14.91	13.25

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 16

Species	Percent Cover		
	'01	'06	'11
Amelanchier alnifolia	-	.45	.88
Artemisia arbuscula	-	8.81	10.96
Artemisia tridentata vaseyana	-	.51	.21
Cercocarpus ledifolius	15.60	17.06	17.28
Eriogonum heracleoides	-	.08	-
Eriogonum microthecum	-	.11	-
Juniperus scopulorum	.60	2.28	1.00
Mahonia repens	-	.28	.58
Opuntia sp.	-	.36	-
Pachistima myrsinites	-	-	.30
Purshia tridentata	-	1.56	1.66
Symphoricarpos oreophilus	-	3.23	3.53

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 16

Species	Average leader growth (in)		
	'01	'06	'11
Cercocarpus ledifolius	3.3	3.0	2.1
Purshia tridentata	-	2.8	1.9

POINT-QUARTER TREE DATA--

Management unit 02, Study no: 16

Species	Trees per Acre			
	'96	'01	'06	'11
Cercocarpus ledifolius	67	-	70	68

Average diameter (in)			
'96	'01	'06	'11
6	-	6.3	6

BASIC COVER--

Management unit 02, Study no: 16

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	10.25	50.30	37.32	33.77	38.97
Rock	33.75	28.00	20.68	22.32	27.85	25.17
Pavement	.50	.25	.58	3.29	1.12	2.01
Litter	58.75	55.00	56.87	44.82	54.39	43.19
Cryptogams	1.75	1.75	.48	.56	.31	.16
Bare Ground	3.00	4.75	2.30	8.35	6.93	7.25

SOIL ANALYSIS DATA --

Management unit 02, Study no: 16, Study Name: Garden City Canyon

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	6	8	3	4	-	-	-
Elk	25	10	29	10	16 (40)	67 (165)	15 (38)
Deer	19	36	36	23	55 (136)	23 (56)	38 (94)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 16

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
84	665	35	50	15	-	30	35	0	31/33
90	498	20	13	67	33	33	40	20	35/25
96	220	18	55	27	-	64	0	36	27/26
01	200	50	40	10	-	60	20	0	26/28
06	140	0	86	14	-	14	57	0	25/29
11	140	0	100	0	-	43	57	0	31/42
Artemisia arbuscula									
84	1731	6	60	35	66	58	40	19	13/26
90	1631	10	61	29	-	16	2	12	17/16
96	2600	5	84	11	-	18	2	2	13/26
01	2160	2	78	20	-	8	0	5	13/29
06	2140	0	81	19	-	0	3	12	10/24
11	2160	2	75	23	320	41	2	12	11/29

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	100	0	80	20	-	0	0	0	20/29	
06	60	0	33	67	-	0	0	67	32/57	
11	80	0	25	75	80	75	25	25	30/61	
<i>Cercocarpus ledifolius</i>										
84	432	8	92	0	133	0	23	0	68/74	
90	565	29	41	29	33	12	29	0	183/83	
96	280	7	71	21	-	7	14	0	-/-	
01	220	9	55	36	-	9	27	18	46/46	
06	140	0	100	0	180	0	0	0	-/-	
11	220	27	64	9	420	0	0	0	31/45	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	18/52	
11	0	0	0	-	-	0	0	0	-/-	
<i>Eriogonum heracleoides</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	0	100	-	-	0	0	0	-/-	
01	40	0	100	-	-	0	0	0	16/9	
06	60	0	100	-	-	0	0	0	5/11	
11	80	0	100	-	-	0	0	0	6/19	
<i>Eriogonum microthecum</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	10/26	
01	0	0	0	-	-	0	0	0	12/22	
06	20	0	100	-	-	0	0	0	-/-	
11	40	0	100	-	-	0	0	0	9/20	
<i>Juniperus scopulorum</i>										
84	66	50	50	-	-	50	0	0	67/83	
90	66	50	50	-	-	0	0	0	118/98	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Mahonia repens</i>										
84	2465	31	69	-	-	0	0	0	8/6	
90	4265	12	88	-	199	3	0	0	7/4	
96	800	0	100	-	-	0	0	0	4/6	
01	2140	0	100	-	-	0	0	0	3/4	
06	2260	0	100	-	-	0	0	0	5/5	
11	820	0	100	-	-	0	0	0	4/40	
<i>Opuntia sp.</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	100	0	100	0	-	0	0	0	6/29	
01	160	13	88	0	-	0	0	0	5/15	
06	120	0	83	17	-	0	0	0	5/20	
11	140	0	71	29	-	0	0	57	7/17	
<i>Pachistima myrsinites</i>										
84	33	0	100	-	-	0	0	0	6/7	
90	0	0	0	-	-	0	0	0	-/-	
96	180	33	67	-	-	0	0	0	7/12	
01	140	43	57	-	-	0	0	0	5/7	
06	40	0	100	-	-	0	0	0	9/14	
11	140	0	100	-	-	0	0	0	18/23	
<i>Purshia tridentata</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	132	50	25	25	-	0	25	0	24/33	
96	140	0	86	14	-	43	57	0	16/36	
01	120	0	100	0	-	50	17	0	18/40	
06	120	0	33	67	-	33	50	50	14/39	
11	160	0	63	38	-	50	50	25	19/47	
<i>Ribes sp.</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	14/78	
<i>Symphoricarpos oreophilus</i>										
84	99	33	67	0	-	0	0	0	18/26	
90	199	17	83	0	-	0	0	0	15/28	
96	460	22	70	9	-	4	0	4	19/37	
01	400	0	95	5	-	0	0	5	27/52	
06	600	7	87	7	-	0	0	13	21/34	
11	260	15	85	0	-	15	0	0	21/39	

MEADOWVILLE - TREND STUDY NO. 2-17-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Upland Shallow Loam \(Black Sagebrush\), R047XA316UT](#)

Land Ownership: Private

Elevation: 6,400 ft (1,951 m)

Aspect: South

Slope: 24%

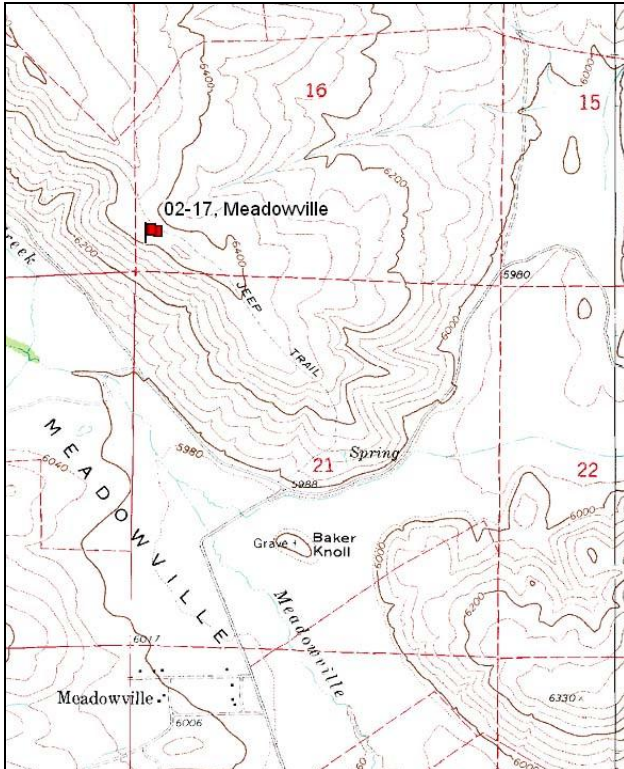
Transect bearing: 161° magnetic

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

Directions:

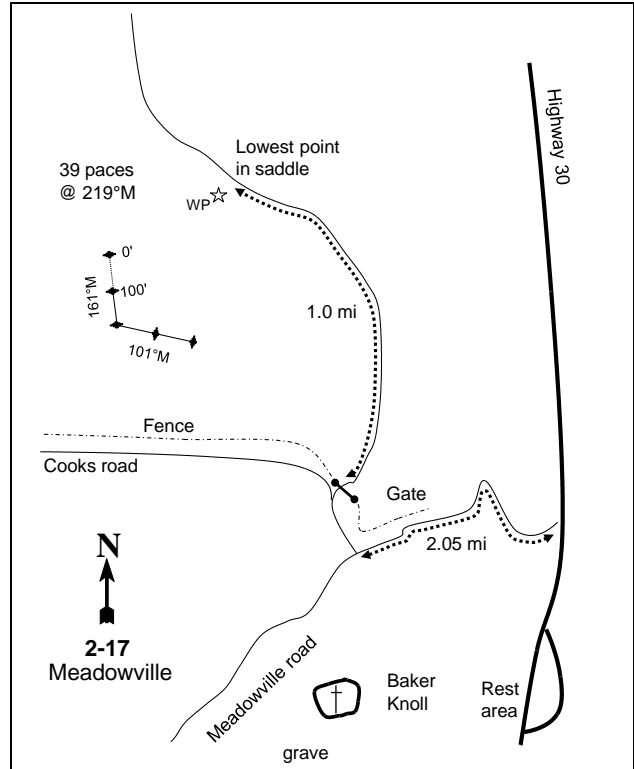
At the intersection of Highway 30 and Meadowville Road, turn west on Meadowville Road and proceed 2.05 miles. Turn right (north) onto Cook's Road and turn immediately right through a large gate. Proceed 1.1 miles, passing a spring on the right and following the ridgetop, to the witness post in the low 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 state is also approximately 75 yards form a fence to the west. The base line runs 161 degrees magnetic. Line 3 and 4 dogleg and run parallel to the fence at a bearing of 101 degrees magnetic.

Map Name: Meadowville



Township: 13N Range: 5E Section: 16

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 466749 E 4634613 N

MEADOWVILLE - TREND STUDY NO. 2-17

Site Information

Site Description: This study is located on the private land Hideaway Ranch, which overlooks the north end of the Meadowville Valley. The site is in a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. The area is considered crucial deer winter range. Pellet groups were reported to be abundant from 1984 to 1990. Pellet groups were sampled in high abundance for deer and low abundance for elk in 2001. In 2006, deer and elk pellet groups were moderately abundant. In 2011, deer pellet groups were sampled in low abundance, and elk pellet groups were moderately abundant. Deer shed antlers were found in 1984, and deer carcasses were found in 1984 and 2006. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: Mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*) are the key browse species. The sagebrush population has consistently declined with each reading since 1984. The entire sagebrush population was classified as decadent in 1984 and remained high through 2001, but has been low since 2006. Recruitment of young sagebrush has been minimal for the duration of the study, though in 2011, recruitment of young sagebrush was good. Antelope bitterbrush is a sparse, stable population that is centered within the mature age class. Recruitment of young bitterbrush plants has been mostly good over the course of the study with the exception of the 2001 and 2011 sample years. Bitterbrush has been moderately to heavily utilized by wildlife over the course of the study. Saskatoon serviceberry (*Amelanchier alnifolia*) is a highly preferred species and is very sparse on the site. The dominant shrub found on site is stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). Broom snakeweed (*Gutierrezia sarothrae*) is also abundant, but has declined in density over the duration of the study (Table - Browse Characteristics).

Herbaceous Understory: The most abundant perennial grasses are bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), and Sandberg bluegrass (*Poa secunda*). In 1984, all of the previously mentioned grass species showed evidence of light to moderate utilization by cattle. The weedy annual species cheatgrass is widely distributed and abundant, which can be detrimental to sagebrush recruitment. Forb growth is sparse and generally low in stature. The most numerous perennial forbs are Utah milkvetch (*Astragalus utahensis*), arrowleaf balsamroot (*Balsamorhiza sagittata*), thistle (*Cirsium* sp.), and wayside gromwell (*Lithospermum ruderale*) (Table - Herbaceous Trends).

Soil: The soil is in the Solak series. The soils occur on hillslopes and ridges; with parent material consisting of colluvium and/or alluvium over residuum derived from conglomerate (Soil Survey Staff 2011). The soil has a clay loam texture with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover is moderate, while protective ground cover is provided by a high amount of vegetation, litter, and pavement (Table - Basic Cover). The soil erosion condition was classified as slight in 2006, but stable in 2001 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density for mountain big sagebrush decreased 34% from 1,466 plants/acre to 964 plants/acre. Decadence of sagebrush plants decreased from 100% to 69%, and poor vigor decreased from 48% to 28% of the sagebrush population. Recruitment of young sagebrush plants increased from 0% to 10% of the population. Antelope bitterbrush increased over two-fold in density from 165 plants/acre to 431 plants/acre. Decadence of bitterbrush plants increased from 0% to 15%, but poor vigor decreased from 20% to 0% of the population. Young bitterbrush comprised 60% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence for sagebrush decreased to 69% of the population, and poor vigor decreased to 28%. The recruitment of young sagebrush was

good at 10%. Decadence for bitterbrush increased to 15%, and poor vigor was not observed within the bitterbrush population.

- **1996 to 2001 - down (-2):** The density for sagebrush decreased 40% from 860 plants/acre to 520 plants/acre. The health of the sagebrush population was mixed with decadence decreasing to 60%, but poor vigor increasing to 58% of the population. Bitterbrush displayed no change in density. Decadence and poor vigor was not observed within the bitterbrush population.
- **2001 to 2006 - slightly down (-1):** The density for sagebrush decreased 23% to 400 plants/acre. Decadence decreased to 10%, and poor vigor decreased to 5%. The density for bitterbrush increased two-fold from 200 plants/acre to 400 plants/acre. Decadence and poor vigor was not observed within the population.
- **2006 to 2011 - slightly down (-1):** The sagebrush population exhibited no change in density. Decadence and poor vigor was maintained at 10% and 5%, respectively. Bitterbrush decreased in density by 45% to 220 plants/acre. Decadence and poor vigor was not observed within the population.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 33%. Sandberg bluegrass had a significant increase in nested frequency.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass had a significant decrease in nested frequency, and had a cover of 2%. Out of the perennial species, bluebunch wheatgrass provided the largest amount of cover at 7%. Annual species were included in the sample for the first time in 1996. The weedy species cheatgrass was very prolific and widespread and had a cover of 20%.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses increased 16%. Sandberg bluegrass increased significantly in nested frequency, and cover remained similar at 1%. The weedy annual species cheatgrass decreased significantly in nested frequency, and decreased in cover to 7%.
- **2001 to 2006 - stable (0):** The sum of nested frequency remained similar. Bluebunch wheatgrass had a significant increase in nested frequency, and increased in cover to 12%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial grasses remained similar. No significant change in nested frequency was observed for perennial grasses. The annual species cheatgrass had a significant increase in nested frequency, and increased in cover from 8% to 23%.

Forb:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Forbs are a minor component of the herbaceous understory.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 18%. The perennial species Lewis flax (*Linum lewisii*) was observed for the first time. Annual species were included in the sample for the first time in 1996. Pale allysum (*Alyssum alyssoides*) was prolific and widespread on the study site, and had a cover of 2%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 13%. The perennial longleaf phlox (*Phlox longifolia*) had a significant increase in nested frequency, but had a cover of less than 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The annual species pale allysum decreased significantly in nested frequency.
- **2006 to 2011 - down (-2):** The sum of nested frequency for perennial forbs decreased 25%. Pale agoseris decreased significantly in nested frequency, and had minimal cover. The annual species pale allysum increased significantly in nested frequency, and increased in cover from 1% to 9%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

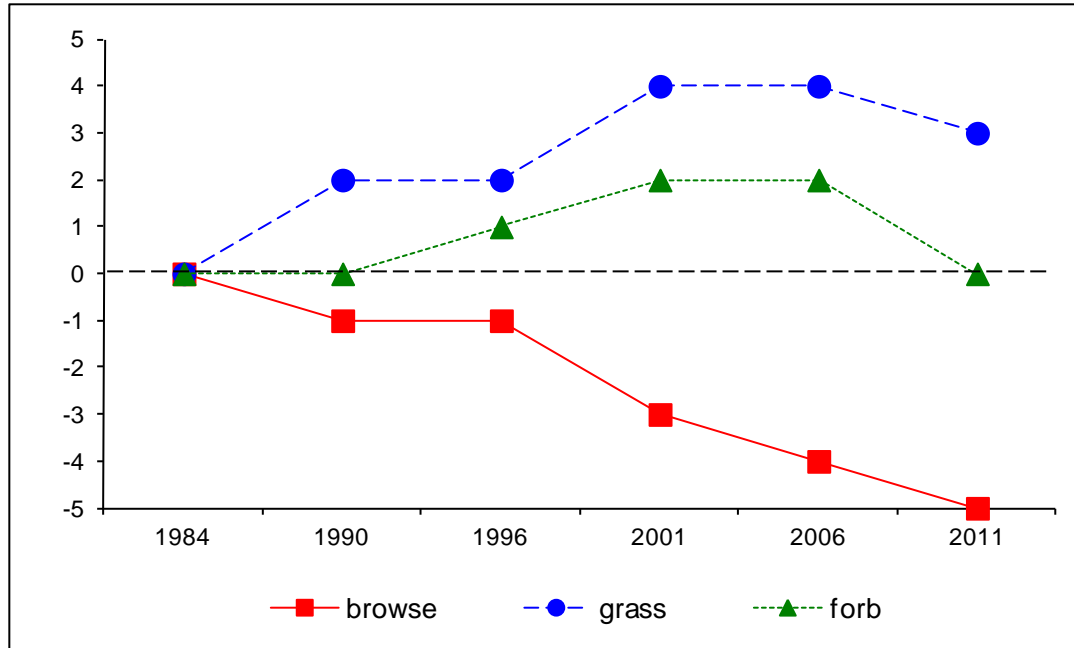
Management unit 2, study no: 17

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	7.5	0.0	0.0	23.8	-14.7	6.2	0.0	22.7	Very Poor
01	5.9	0.0	0.0	28.5	-5.1	7.6	0.0	36.9	Very Poor-Poor
06	4.2	0.0	0.0	30.0	-6.1	7.8	0.0	35.8	Very Poor-Poor
11	7.0	0.0	0.0	17.1	-17.5	6.0	0.0	12.5	Very Poor

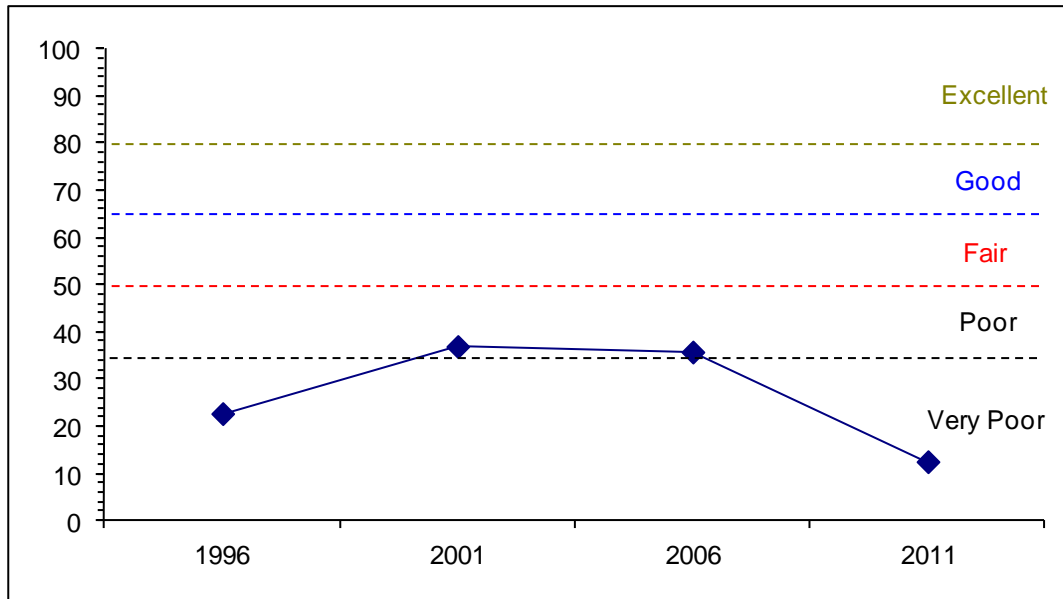
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 17



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 17



HERBACEOUS TRENDS--
 Management unit 02, Study no: 17

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	5	-	-	-	-	-	-	-	-	-
G	Agropyron spicatum	a ⁹⁵	ab ¹²⁰	bc ¹⁴⁶	bc ¹⁵⁶	c ¹⁸⁷	bc ¹⁶²	6.50	7.13	11.75	4.29
G	Bromus tectorum (a)	-	-	367	294	307	354	19.65	6.85	8.19	23.37
G	Oryzopsis hymenoides	ab ⁶¹	ab ⁶¹	b ⁷³	b ⁷¹	ab ⁴⁶	a ³⁷	3.82	5.69	1.89	.80
G	Poa bulbosa	-	-	-	-	4	5	-	-	.01	.04
G	Poa pratensis	3	-	3	1	15	6	.03	.03	.97	.06
G	Poa secunda	a ⁸³	b ¹⁵²	a ⁸⁹	b ¹³⁸	ab ¹²⁷	b ¹⁶⁰	1.50	1.41	1.83	3.40
G	Sitanion hystrix	5	3	4	-	2	-	.03	-	.03	-
Total for Annual Grasses		0	0	367	294	307	354	19.65	6.85	8.19	23.37
Total for Perennial Grasses		252	336	315	366	381	370	11.90	14.27	16.50	8.60
Total for Grasses		252	336	682	660	688	724	31.56	21.13	24.69	31.97
F	Achillea millefolium	-	-	5	6	7	6	.04	.06	.06	.06
F	Agoseris glauca	a ⁻	a ⁴	a ⁻	a ⁻	b ²¹	a ⁸	-	-	.10	.01
F	Allium sp.	-	-	-	-	-	1	-	-	-	.00
F	Alyssum alyssoides (a)	-	-	b ²⁹²	b ²⁹³	a ¹⁸⁷	a ³¹⁹	2.44	2.25	.61	8.87
F	Astragalus sp.	-	-	-	-	4	-	-	-	.06	-
F	Astragalus utahensis	d ⁵⁶	cd ⁵¹	cbd ³⁴	ab ¹⁷	a ¹³	abc ²⁰	.48	.17	.14	.15
F	Balsamorhiza sagittata	2	6	4	13	15	16	.39	.30	.83	.70
F	Camelina microcarpa (a)	-	-	2	2	4	2	.01	.00	.01	.00
F	Castilleja chromosa	8	1	4	-	3	-	.01	-	.00	-
F	Chaenactis douglasii	1	8	5	-	4	2	.04	-	.01	.03
F	Cirsium sp.	-	-	-	-	1	-	-	-	.03	-
F	Cirsium undulatum	ab ²²	b ¹⁹	b ²⁵	ab ¹⁹	a ⁵	ab ⁵	.39	.55	.04	.06

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Collinsia parviflora</i> (a)	-	-	a3	ab9	b16	a2	.00	.04	.08	.01
F	<i>Collomia linearis</i> (a)	-	-	-	10	-	-	-	.02	-	-
F	<i>Comandra pallida</i>	1	-	-	10	2	8	-	.10	.01	.02
F	<i>Crepis acuminata</i>	-	-	-	7	9	2	-	.21	.30	.06
F	<i>Descurainia pinnata</i> (a)	-	-	15	14	5	2	.03	.03	.01	.00
F	<i>Draba</i> sp. (a)	-	-	-	1	3	-	-	.00	.01	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	-	3	-	-	-	.00	-
F	<i>Lactuca serriola</i> (a)	-	-	-	2	3	3	-	.00	.03	.01
F	<i>Linum lewisii</i>	-	-	b10	ab5	a2	ab3	.02	.06	.00	.01
F	<i>Lithospermum ruderales</i>	a11	ab16	ab22	ab22	ab20	b27	1.00	1.33	1.13	1.45
F	<i>Lomatium</i> sp.	-	-	-	-	-	-	-	-	-	.01
F	<i>Microsteris gracilis</i> (a)	-	-	-	3	7	-	-	.03	.01	-
F	<i>Navarretia intertexta</i> (a)	-	-	3	-	-	1	.00	-	-	.00
F	<i>Oenothera</i> sp.	-	-	-	-	-	-	-	.00	-	-
F	<i>Phlox hoodii</i>	8	4	16	18	9	7	.16	.28	.27	.20
F	<i>Phlox longifolia</i>	a-	a3	ab11	b36	bc23	ab8	.02	.35	.32	.01
F	<i>Polygonum douglasii</i> (a)	-	-	3	3	-	-	.00	.00	-	-
F	<i>Sisymbrium altissimum</i> (a)	-	-	a3	a-	b12	ab10	.03	-	.51	.09
F	<i>Tragopogon dubius</i> (a)	ab26	a19	b49	ab43	b48	ab25	.54	.38	.44	.16
F	Unknown forb-perennial	-	3	-	-	-	-	-	-	-	-
F	<i>Zigadenus paniculatus</i>	a-	a-	a-	a-	b12	a-	-	-	.05	-
Total for Annual Forbs		26	19	370	380	288	364	3.07	2.78	1.73	9.16
Total for Perennial Forbs		109	115	136	153	150	113	2.55	3.43	3.40	2.80
Total for Forbs		135	134	506	533	438	477	5.63	6.22	5.14	11.97

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	0	1	2	2	-	-	-	.00
B	<i>Artemisia tridentata vaseyana</i>	35	18	14	17	4.47	2.40	.66	1.16
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	44	43	43	43	3.99	2.88	4.51	5.80
B	<i>Eriogonum microthecum</i>	3	1	4	6	.15	-	.00	.06
B	<i>Gutierrezia sarothrae</i>	24	20	12	7	.32	.36	.21	.15
B	<i>Opuntia</i> sp.	7	10	11	8	.27	.46	.91	.45
B	<i>Purshia tridentata</i>	9	9	10	10	1.14	1.93	2.22	3.64
B	<i>Tetradymia canescens</i>	21	18	20	19	.60	.97	1.67	2.50
Total for Browse		143	120	116	112	10.96	9.04	10.21	13.78

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 17

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	-	.31
Artemisia tridentata vaseyana	.81	1.79
Chrysothamnus viscidiflorus viscidiflorus	8.21	7.31
Eriogonum microthecum	-	.41
Gutierrezia sarothrae	.31	.28
Opuntia sp.	.18	.15
Purshia tridentata	3.23	3.59
Tetradymia canescens	1.00	2.00

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 17

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.2	2.8	3.6
Purshia tridentata	4.6	6.1	4.3

BASIC COVER--

Management unit 02, Study no: 17

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.50	11.50	53.66	41.42	40.98	54.68
Rock	10.00	9.00	10.95	8.15	8.44	6.65
Pavement	13.75	16.25	3.86	17.51	11.26	14.46
Litter	66.25	45.00	52.17	38.69	43.56	39.38
Cryptogams	.25	1.75	.09	.18	.19	.22
Bare Ground	7.25	16.50	4.17	10.99	12.70	5.80

SOIL ANALYSIS DATA --

Management unit 02, Study no: 17, Study Name: Meadowville

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.7	7.0	46.2	20.0	33.8	2.2	14.2	192.0	0.7

PELLET GROUP DATA--

Management unit 02, Study no: 17

Type	Quadrat Frequency			
	'96	'01	'06	'11
Rabbit	3	2	6	8
Elk	7	4	8	15
Deer	15	25	16	7
Cattle	2	1	3	3

Days use per acre (ha)		
'01	'06	'11
-	-	-
3 (7)	19 (46)	19 (48)
56 (139)	24 (60)	7 (18)
4 (9)	6 (14)	6 (14)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 17

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	33	0	0	100	-	0	100	0	-/-	
96	0	0	0	0	40	0	0	0	-/-	
01	20	0	100	0	-	0	0	0	17/19	
06	40	50	50	0	-	50	0	0	28/38	
11	40	50	50	0	-	100	0	0	33/44	
<i>Artemisia tridentata vaseyana</i>										
84	1466	0	0	100	-	9	91	48	-/-	
90	964	10	21	69	99	24	7	28	24/22	
96	860	9	30	60	60	28	28	58	25/33	
01	520	4	50	46	-	38	4	42	21/34	
06	400	0	90	10	-	25	0	5	15/23	
11	400	25	65	10	20	50	0	5	18/31	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	232	14	86	0	-	0	0	0	9/11	
90	133	0	100	0	-	0	0	0	10/10	
96	1900	2	95	3	40	0	0	0	13/24	
01	1960	2	80	18	20	0	0	2	11/20	
06	1720	3	90	7	-	3	1	3	13/24	
11	1640	10	90	0	-	1	1	0	14/23	
<i>Eriogonum microthecum</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	100	20	80	-	-	0	0	0	12/11	
01	20	0	100	-	-	0	0	0	14/17	
06	120	0	100	-	-	0	0	0	15/24	
11	140	0	100	-	-	14	0	14	9/15	
<i>Gutierrezia sarothrae</i>										
84	7598	49	49	2	-	0	0	0	7/11	
90	11931	78	20	2	1399	2	0	.27	9/11	
96	1400	11	86	3	120	0	0	1	7/10	
01	820	2	98	0	40	0	0	0	5/8	
06	480	4	92	4	-	0	0	0	6/11	
11	260	31	69	0	-	0	0	0	10/14	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Opuntia</i> sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	180	44	56	-	20	0	0	0	5/12	
01	300	7	93	-	-	0	0	0	5/11	
06	320	19	81	-	-	0	0	0	5/14	
11	280	0	100	-	-	0	0	0	4/15	
<i>Purshia tridentata</i>										
84	165	60	40	0	-	40	20	20	11/49	
90	431	39	46	15	-	23	62	0	13/21	
96	200	30	60	10	-	30	40	10	14/44	
01	200	0	100	0	-	50	50	0	21/48	
06	400	10	90	0	-	30	0	0	25/54	
11	220	0	100	0	-	27	73	0	28/58	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	34/72	
<i>Tetradymia canescens</i>										
84	132	0	75	25	-	0	0	0	7/12	
90	99	0	67	33	-	0	0	0	8/15	
96	600	17	73	10	-	10	10	3	11/17	
01	820	7	80	12	40	2	0	2	9/14	
06	860	9	88	2	-	16	0	0	10/19	
11	720	25	75	0	-	0	0	0	11/20	

RIGHT FORK LOGAN CANYON - TREND STUDY NO. 2-19-11

Vegetation Type: Bitterbrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 6,200 ft (1,890 m)

Aspect: South

Slope: 35%

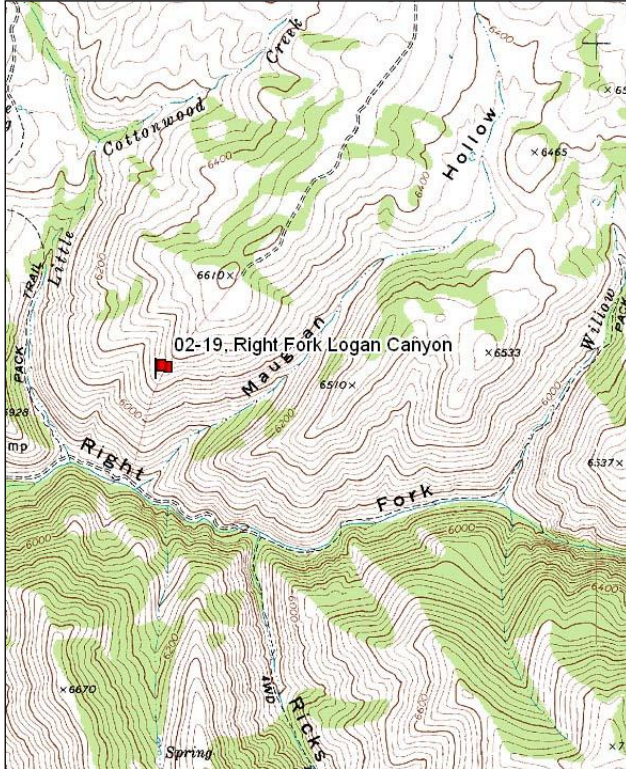
Transect bearing: 189° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 8ft, belt 3 on 1ft, belt 5 on 8ft.

Directions:

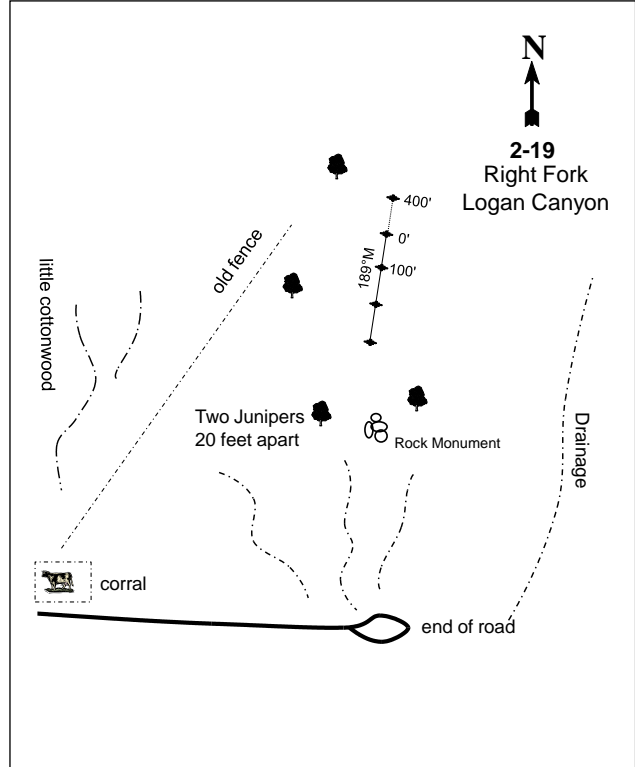
Drive up the Right Fork of Logan Canyon. Bear left at the girls' camp. Go 0.6 miles to the end of the road just past the corral. Hike up the ridge to the north, going about 3/4 mile towards the ridgeline. Look for a rock monument between two junipers that are 20 feet apart. The hike from the bottom to 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



Township: 12N Range: 3E Section: 16

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 449531 E 4625350 N

RIGHT FORK LOGAN CANYON - TREND STUDY NO. 2-19

Site Information

Site Description: This study was established in 1990 and samples important elk and deer winter range that extends from Cowley to Willow Canyon. The land is administered by the United States Forest Service (USFS). Pellet group data suggests this area serves as important elk winter range. Elk pellet groups were common in 1996, and elk pellet groups have been sampled in high abundance since 2001. Deer pellet groups have been sampled in low abundance since 2001. Sampled cattle sign has been low since 2001 (Table - Pellet Group Data). Cattle graze in the Little Cottonwood drainage for part of the summer and typically stay off of the higher, steeper slopes where the study is located. It has been noted that cattle have been seen in the area during every sample year.

Browse: The dominant and key browse species within the browse community is antelope bitterbrush (*Purshia tridentata*). The bitterbrush population is moderately dense. Since the outset of the study, utilization within the bitterbrush population has been heavy. Due to heavy use, the bitterbrush plants on the site display a clubbed growth form with some armoring taking place. The bitterbrush population has maintained vigorous health and decadence has fluctuated within the population, but has generally been moderate to high over the sample years. The recruitment of young bitterbrush plants to the population has been minimal during all readings. Other key browse species include Saskatoon serviceberry (*Amelanchier alnifolia*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), which offer additional preferred forage, but occur in small numbers. Serviceberry has displayed moderate and occasional heavy use since 1990. The serviceberry is a mature population, with a moderate amount of recruitment. Mountain big sagebrush use has been light to moderate over the duration of the study (Table - Browse Characteristics).

Herbaceous Understory: The area supports a vigorous stand of bluebunch wheatgrass (*Agropyron spicatum*), but the weedy species bulbous bluegrass (*Poa bulbosa*) is the most abundant species and provides the majority of the vegetation cover on the study site. The annual grasses cheatgrass (*Bromus tectorum*) and rattlesnake brome (*B. brizaeformis*) are also present, but are not abundant. Forbs are diverse and moderately productive with an average of approximately 10% cover of perennials since 1996. Perennial forbs are primarily early season species, yet are numerous enough to provide some spring forage. Spring parsley (*Cymopterus spp.*) is the most abundant perennial forb and provides the most forb cover. Arrowleaf balsamroot (*Balsamorhiza sagittata*) and tapertip hawksbeard (*Crepis acuminata*) are also moderately abundant. The noxious weed Dyer's woad (*Isatis tinctoria*) is also present, but occurs in very low abundance (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a clay loam with slightly alkaline soil reactivity (pH 7.6). Erosion potential is high due to the steep slopes on the site. Bare ground cover was high in 1990 to 2006, but was low in 2011. Rock, pavement, vegetation, and litter have provided adequate protective ground cover. In 2001, there was evidence of some soil movement and pedestaling; therefore, the soil erosion condition was classified as slight, but was stable in 2006 and 2011.

Trend Assessments

Browse:

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the antelope bitterbrush population decreased from 72% to 19%. Poor vigor also decreased from 14% to 0% of the population. Mountain big sagebrush did not appear in the smaller sample in 1990, but was observed in the larger sample plot in 1996. Decadence and poor vigor within the sagebrush population were estimated to affect 13% of the sagebrush population.

- **1996 to 2001 - stable (0):** The density for bitterbrush increased 19% from 320 plants/acre to 380 plants/acre. Decadence was observed within 11% of the bitterbrush population, but poor vigor was not observed. The density for mountain big sagebrush decreased 13% from 160 plants/acre to 140 plants/acre. Decadence and poor vigor was not observed within the population.
- **2001 to 2006 - down (-2):** The density for bitterbrush decreased 42% to 220 plants/acre. Decadence and poor vigor affected 9% of the bitterbrush population. The density for sagebrush decreased 57% to 60 plants/acre. Decadence and poor vigor was not observed within the sagebrush population.
- **2006 to 2011 - slightly up (+1):** The density for bitterbrush increased 27% to 280 plants/acre. Decadence in bitterbrush increased to 9%. Poor vigor increased to 14% of the bitterbrush population. The density for sagebrush did not change; however, decadence and poor vigor both increased to 33% of the population.

Grass:

- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 22%. The preferred perennial species bluebunch wheatgrass increased significantly in nested frequency and had a cover of 11%, but Sandberg bluegrass (*Poa secunda*) decreased significantly in nested frequency. The nested frequency for the weedy species bulbous bluegrass increased significantly, and had a cover of 18%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. All perennial grass species maintained stable populations. The weedy species cheatgrass decreased significantly in nested frequency, though cover remained similar at 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses decreased 13%. Bulbous bluegrass decreased significantly in nested frequency, though cover increased from 15% to 18%. Annual grasses remained similar in nested frequency and cover.
- **2006 to 2011 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 23%. Sandberg bluegrass decreased significantly. The weedy perennial species bulbous bluegrass maintained dominance within the perennial community, and cover increased to 21%. Since the outset of the study in 1990, the sum of nested frequency of perennial grasses excluding bulbous bluegrass has decreased 49%, and cover has decreased from 11% to 5%.

Forb:

- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 24%. Tapertip hawksbeard decreased significantly in nested frequency, and had a cover of 1%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The weedy annual species pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency and had a cover of 2%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Arrowleaf Balsam root increased significantly in nested frequency, and had a cover of less than 1%. Pale alyssum decreased significantly in nested frequency, and cover decreased from 2% to less than 1%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 11%. The increase is associated with the significant increase in nested frequency for wild onion (*Allium sp.*).

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

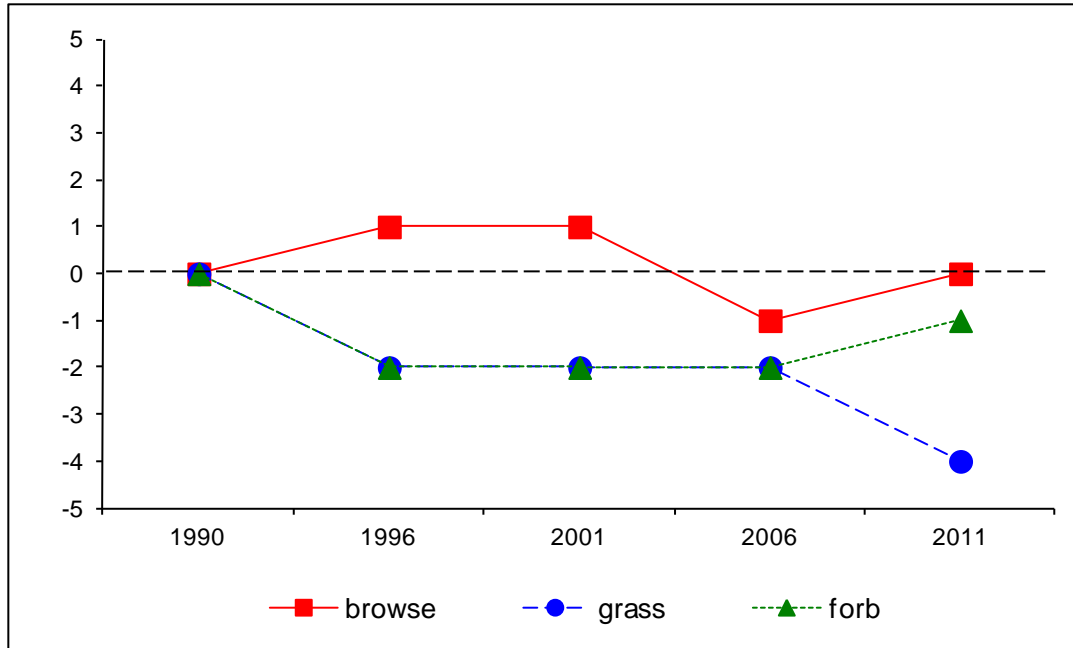
Management unit 2, study no: 19

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	4.4	0.0	0.0	21.4	-1.0	10.0	0.0	34.8	Very Poor-Poor
01	5.7	0.0	0.0	13.0	-1.1	10.0	0.0	27.6	Very Poor
06	7.6	0.0	0.0	14.5	-0.5	10.0	-2.0	29.7	Very Poor
11	4.3	0.0	0.0	10.4	-0.4	10.0	0.0	24.3	Very Poor

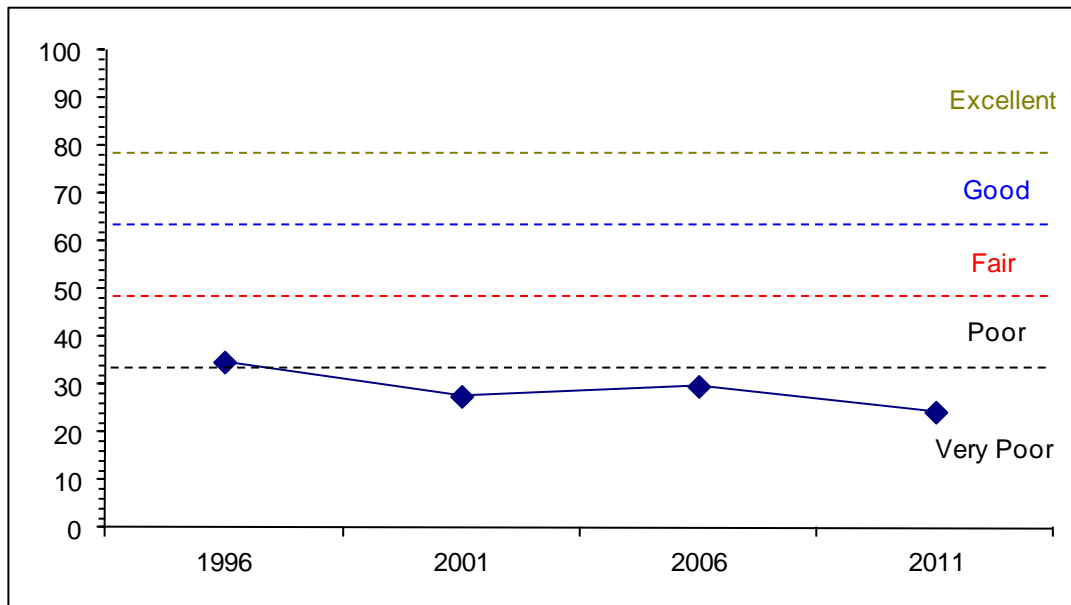
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 19



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 19



HERBACEOUS TRENDS--
 Management unit 02, Study no: 19

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a161	b229	b180	b173	b155	10.63	6.05	6.98	5.21
G	Bromus brizaeformis (a)	-	a14	a27	a36	b93	.23	.53	.11	.53
G	Bromus tectorum (a)	-	c148	b83	b90	a8	1.09	.92	.58	.06
G	Poa bulbosa	a208	c342	c340	b283	b277	17.93	14.90	18.02	20.67
G	Poa pratensis	2	-	3	6	-	-	.15	.09	-
G	Poa secunda	c144	ab10	b36	b27	a3	.07	.26	.18	.01
Total for Annual Grasses		0	162	110	126	101	1.33	1.45	0.69	0.59
Total for Perennial Grasses		515	581	559	489	435	28.64	21.38	25.28	25.89
Total for Grasses		515	743	669	615	536	29.97	22.83	25.97	26.49
F	Agoseris glauca	-	-	1	5	9	-	.00	.01	.01
F	Allium sp.	a5	a-	a-	a3	b26	-	-	.00	.09
F	Alyssum alyssoides (a)	-	b179	c253	a35	b144	.48	2.07	.08	.51
F	Aster chilensis	-	3	-	4	-	.15	-	.01	-
F	Astragalus utahensis	8	2	3	6	1	.06	.06	.06	.00
F	Balsamorhiza sagittata	a-	ab1	a-	b6	ab3	.71	.42	.39	.04
F	Calochortus nuttallii	-	-	-	-	2	-	-	-	.00
F	Camelina microcarpa (a)	-	-	-	-	3	-	-	-	.00
F	Chaenactis douglasii	-	-	-	-	-	.00	-	-	-
F	Cirsium undulatum	-	1	1	2	-	.00	.00	.03	-
F	Collinsia parviflora (a)	-	a6	a-	a-	b38	.03	-	-	.17
F	Collomia linearis (a)	-	3	-	-	6	.00	-	-	.01
F	Comandra pallida	2	5	8	7	9	.07	.19	.09	.21
F	Crepis acuminata	b89	a29	a45	a34	a38	.62	.76	.68	.68

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cymopterus sp.	234	205	209	203	210	7.01	7.31	8.52	11.46
F	Descurainia pinnata (a)	-	2	-	-	-	.00	-	-	-
F	Epilobium brachycarpum (a)	-	7	-	-	-	.01	-	-	-
F	Erodium cicutarium (a)	-	3	-	-	6	.00	-	-	.03
F	Hackelia patens	2	-	2	-	-	-	.03	-	-
F	Holosteum umbellatum (a)	-	-	-	-	1	-	-	-	.00
F	Isatis tinctoria	-	-	-	-	-	-	-	.00	-
F	Lactuca serriola (a)	15	4	15	4	23	.01	.13	.02	.13
F	Machaeranthera canescens	-	2	3	-	-	.03	.03	-	-
F	Microsteris gracilis (a)	-	-	-	1	-	-	-	.00	-
F	Penstemon humilis	9	17	7	7	8	.12	.07	.09	.19
F	Phacelia sp.	-	2	-	-	-	.03	-	-	-
F	Phlox longifolia	-	-	1	-	-	-	.00	-	-
F	Sisymbrium altissimum (a)	16	-	15	3	2	-	.14	.01	.03
F	Tragopogon dubius (a)	_a 7	_b 48	_b 41	_a 12	_b 42	.42	.63	.08	.60
F	Veronica biloba (a)	-	3	-	3	7	.00	-	.00	.01
Total for Annual Forbs		38	255	324	58	272	0.99	2.99	0.19	1.51
Total for Perennial Forbs		349	267	280	277	306	8.82	8.91	9.91	12.72
Total for Forbs		387	522	604	335	578	9.81	11.90	10.11	14.23

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	3	2	2	2	.18	.03	-	-
B	Artemisia tridentata vaseyana	6	6	3	3	.03	.66	.18	.15
B	Chrysothamnus viscidiflorus viscidiflorus	15	17	11	9	.48	1.38	.24	.21
B	Mahonia repens	4	5	7	8	.21	.16	.09	.13
B	Purshia tridentata	12	15	9	12	2.35	2.59	4.30	2.12
B	Sambucus cerulea	2	1	1	1	.38	.63	.63	.63
B	Symphoricarpos oreophilus	8	6	6	6	2.04	2.04	1.95	2.04
Total for Browse		50	52	39	41	5.68	7.52	7.39	5.29

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 19

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.36	.05
Artemisia tridentata vaseyana	.81	.93
Chrysothamnus viscidiflorus viscidiflorus	.06	.46
Mahonia repens	.03	.21
Purshia tridentata	7.51	5.21
Sambucus cerulea	.35	.16
Symphoricarpos oreophilus	2.91	2.70

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 19

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	-	2.1	3.4
Purshia tridentata	3.0	1.5	4.8

BASIC COVER--

Management unit 02, Study no: 19

Cover Type	Average Cover %				
	'90	'96	'01	'06	'11
Vegetation	10.00	42.68	46.01	42.00	47.52
Rock	31.50	23.11	21.66	19.88	15.64
Pavement	12.50	3.64	5.80	4.00	4.40
Litter	26.25	30.87	20.84	17.52	13.69
Cryptogams	1.00	1.75	3.45	3.77	.88
Bare Ground	18.75	13.05	14.32	12.17	4.80

SOIL ANALYSIS DATA --

Management unit 02, Study no: 19, Study Name: Right Fork Logan Canyon

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.4	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Elk	47	53	55	40	83 (205)	158 (390)	148 (365)
Deer	22	22	18	8	17 (41)	6 (15)	9 (22)
Cattle	1	-	1	-	2 (4)	3 (7)	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 19

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier alnifolia</i>									
90	66	100	0	0	33	50	50	0	-/-
96	60	0	67	33	-	67	33	100	25/28
01	40	0	100	0	-	100	0	0	29/33
06	60	33	67	0	-	0	67	0	30/33
11	60	67	33	0	60	33	0	0	26/28
<i>Artemisia tridentata vaseyana</i>									
90	0	0	0	0	-	0	0	0	-/-
96	160	25	63	13	-	25	0	13	28/45
01	140	0	100	0	-	29	14	0	27/34
06	60	0	100	0	-	0	0	0	26/43
11	60	0	67	33	-	33	0	33	24/33
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
90	599	11	89	0	-	28	22	0	13/15
96	340	12	88	0	-	0	0	0	15/26
01	400	10	80	10	-	5	0	0	15/26
06	220	0	100	0	-	0	0	0	13/22
11	280	0	100	0	-	0	0	0	12/17
<i>Mahonia repens</i>									
90	0	0	0	-	-	0	0	0	-/-
96	520	8	92	-	-	0	0	0	3/4
01	760	8	92	-	-	0	0	0	3/6
06	940	0	100	-	-	0	0	0	2/4
11	1640	0	100	-	-	0	0	0	3/5
<i>Purshia tridentata</i>									
90	232	0	28	72	-	0	100	14	29/56
96	320	6	75	19	-	56	44	0	40/74
01	380	0	89	11	-	37	42	0	43/72
06	220	0	91	9	-	18	82	9	41/67
11	280	0	50	50	-	43	43	14	34/55
<i>Ribes sp.</i>									
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	43/93

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Sambucus cerulea										
90	0	0	0	-	-	0	0	0	-/-	
96	40	0	100	-	-	0	0	0	29/44	
01	40	0	100	-	-	0	0	0	37/77	
06	20	0	100	-	-	100	0	0	47/69	
11	40	0	100	-	-	100	0	0	32/34	
Symphoricarpos oreophilus										
90	1531	15	78	6	-	11	2	7	26/21	
96	200	10	90	0	-	0	0	10	27/50	
01	120	0	100	0	-	0	0	0	33/50	
06	180	0	89	11	-	0	0	33	28/48	
11	160	0	100	0	-	25	0	0	25/45	
Tetradymia canescens										
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	13/27	
11	0	0	0	-	-	0	0	0	-/-	

SWAN CREEK - TREND STUDY NO. 2-21-11

Vegetation Type: Curleaf Mountain Mahogany

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: USFS

Elevation: 6,400 ft (1,951 m)

Aspect: East

Slope: 27%

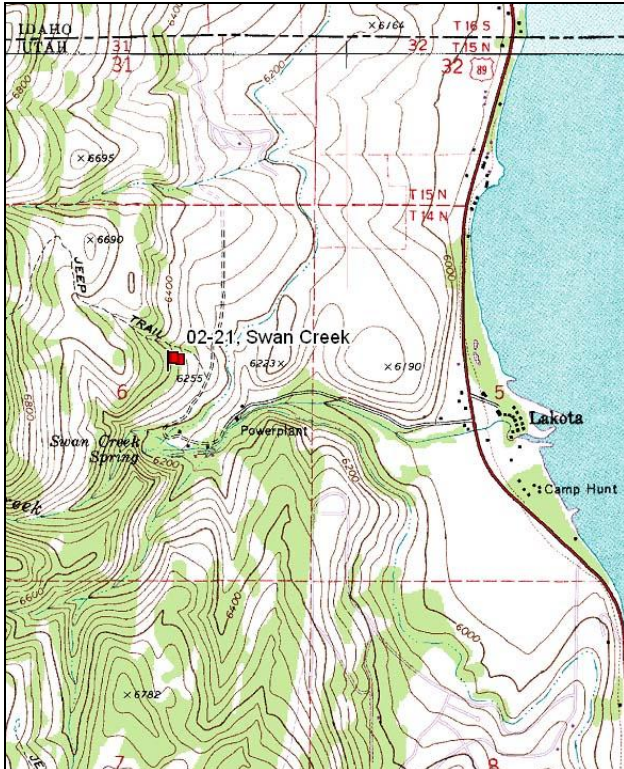
Transect bearing: 114° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 5ft., belt 2 on 5ft., & belt 4 no rebar.

Directions:

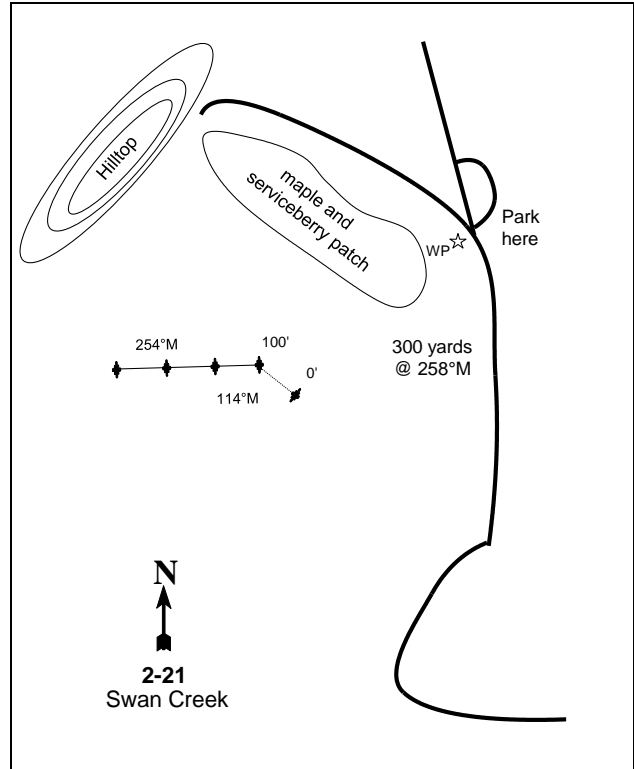
Drive approximately 3.0 miles north of Garden City on US 89. Turn left on 2150 North in Lakota (1 mile south of Idaho border). Go approximately 1 mile on the narrow road up Swan Creek, staying right at one major fork. Just past the creek from the spring, before the pump house, turn right and go 0.2 miles up a jeep road to another fork. Park here, then walk up and 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 runs 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



Township: 14N Range: 5E Section: 6

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 464642 E 4648467 N

SWAN CREEK - TREND STUDY NO. 2-21

Site Information

Site Description: This study was established on Utah Division of Wildlife Resources (UDWR) property in the Swan Creek drainage. The UDWR administrates only a portion of the section; the remainder is privately owned and is used for cabins, recreation, and limited agriculture. The site is dominated by curleaf mountain mahogany (*Cercocarpus ledifolius*) and has areas that receive significant use by wintering elk, deer, and moose. Since 2001, deer pellet groups have been sampled in high abundance. Elk pellet groups were sampled in moderate abundance in 2001 and 2011, but high abundance in 2006. Quadrat data indicated high pellet group frequency by deer and elk in 1996. Moose pellet groups were sampled in low abundance in 2006 (Table - Pellet Group Data).

Browse: The preferred browse species is curleaf mountain mahogany. The curleaf mahogany population is tree like in form and creates the upper browse canopy on the site. The majority of curleaf mahogany is unavailable to browsing due to height, but the available portions have been browsed moderately to heavily. The mahogany is a mostly mature population that has had good vigor and low decadence in most sample years. Decadence of mahogany plants was high in 2006. The recruitment of young mahogany plants to the population has been good over the course of the study. The associated understory shrubs are composed of antelope bitterbrush (*Purshia tridentata*), Saskatoon serviceberry (*Amelanchier alnifolia*), mountain snowberry (*Symphoricarpos oreophilus*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Saskatoon serviceberry is moderately abundant and has steadily increased over the duration of the study. Serviceberry has consistently received moderate to heavy use since 1990, while maintaining a vigorous population. Poor vigor was noted on a small portion of plants sampled in 1996 due to an infestation of a rust. Recruitment of young serviceberry plants has been excellent. Mountain big sagebrush and antelope bitterbrush have small, vigorous populations, with little decadence observed within the populations (Table - Browse Characteristics).

Herbaceous Understory: Bluebunch wheatgrass (*Agropyron spicatum*) is the dominant perennial grass and comprises the majority of herbaceous understory cover. The weedy annual species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are the dominant annual grasses. The exotic weedy species bulbous bluegrass (*Poa bulbosa*) has historically had low abundance, but has been steadily increasing over the course of the study. Forbs are moderately diverse, but only a few species are abundant. The most common perennial forbs include arrowleaf balsamroot (*Balsamorhiza sagittata*), rock goldenrod (*Petradoria pumila*), and tapertip hawksbeard (*Crepis acuminata*).

Soil: The study is part of the Agassiz-Richville complex and likely as part of the Agassiz component. The parent material consists of colluvium over residuum weathered from limestone (Soil Survey Staff 2011). The soil has a loam texture with a soil reaction that is slightly alkaline (pH 7.5). The soil is rocky on the surface and throughout the profile with bedrock layers exposed on the slope. Protective cover is relatively high with vegetation, litter, and rock leaving little exposed bare ground. The soil erosion condition was classified as stable in 2001 and 2011, but slight in 2006.

Trend Assessments

Browse:

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence and poor vigor for curleaf mountain mahogany was not observed within the population. Saskatoon serviceberry displayed an increase in decadence from 8% to 17%. Serviceberry increased in poor vigor from 4% to 10% of the total population.
- **1996 to 2001 - slightly up (+1):** The density for curleaf mountain mahogany decreased 21% from 280 plants/acre to 220 plants/acre. Decadence within the mahogany population increased to 9%, while

poor vigor was not observed within the population. The density of serviceberry increased 26% from 840 plants/acre to 1,060 plants/acre. Decadence and poor vigor was not observed within the serviceberry population.

- **2001 to 2006 - slightly up (+1):** The density for curlleaf mountain mahogany increased 73% to 380 plants/acre. Curlleaf mountain mahogany had a high amount of decadence and poor vigor, both of which increased to 37% of the total population. Serviceberry increased in density by 15% to 1,220 plants/acre. Serviceberry decadence increased to 5%, and poor vigor increased to 7%.
- **2006 to 2011 - stable (0):** The density for curlleaf mountain mahogany decreased 42% to 220 plants/acre. There was no display of decadence and poor vigor within the mahogany population. The density for serviceberry increased 15% to 1,400 plants/acre. Decadence and poor vigor for serviceberry were minimal at 3% and 1%, respectively.

Grass:

- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses remained similar. The preferred grass bluebunch wheatgrass had a significant decrease in nested frequency, and had a cover of 7%. However, Sandberg bluegrass had a significant increase in nested frequency, and had a cover of 2%. Annual species were included in the sample for the first time in 1996. The weedy annual cheatgrass was the dominant grass with a cover of 9%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 10%. The majority of grass cover was comprised of bluebunch wheatgrass, which had a significant increase in nested frequency. Moreover, bluebunch wheatgrass increased in cover to 10%. Cheatgrass had a significant decrease in nested frequency, and decreased in cover to 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. There was no significant increase in nested frequencies for perennial grasses. The weedy annual species cheatgrass and Japanese chess both had a significant increase in nested frequencies. Cover for cheatgrass increased to 2%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass had a significant decrease in nested frequency. The weedy annual Japanese brome had a significant increase in nested frequency, and cover increased to 3%. Cheatgrass did not change significantly in nested frequency, but did increase in cover to 3%.

Forb:

- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 53%. Several species decreased significantly in nested frequencies including longleaf phlox (*Phlox longifolia*), tapertip hawksbeard (*Crepis acuminata*), bastard toadflax (*Comandra pallida*), and sego lily (*Calochortus nuttallii*), all of which had covers less than 1%. Balsamroot sagittata was the most common forb and provided cover of 4%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. No one perennial forb species increased significantly in nested frequency.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 25%. However, the cover for perennial forbs was maintained near 9%. The perennial forb species low penstemon (*Penstemon humilis*) had a significant increase in nested frequency, but cover was less than 1%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. No significant change was observed within the perennial forb community. The weedy annual species pale alyssum had a significant increase in nested frequency, and had an increase in cover from less than 1% to 2%.

DEER DESIRABLE COMPONENTS INDEX - MID LEVEL POTENTIAL SCALE --

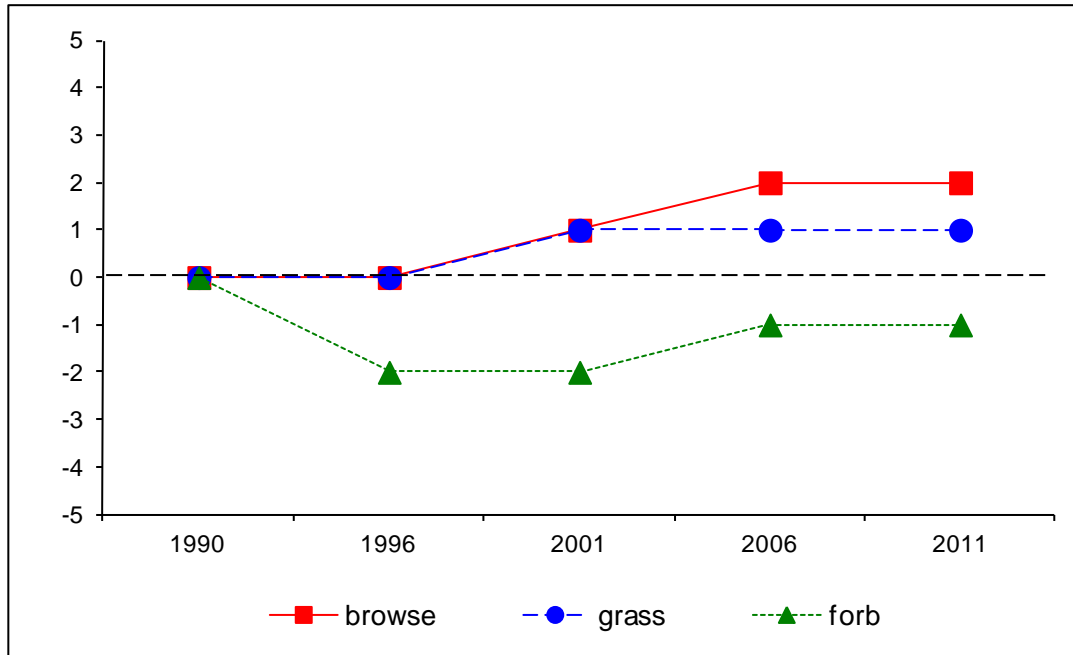
Management unit 2, study no: 21

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	9.2	0.0	0.0	16.9	-10.4	10.0	0.0	25.7	Very Poor
01	7.2	0.0	0.0	22.5	-1.0	10.0	0.0	38.7	Poor
06	6.2	0.0	0.0	28.3	-1.6	10.0	0.0	42.9	Poor
11	6.1	0.0	0.0	29.7	-3.9	10.0	0.0	41.9	Poor

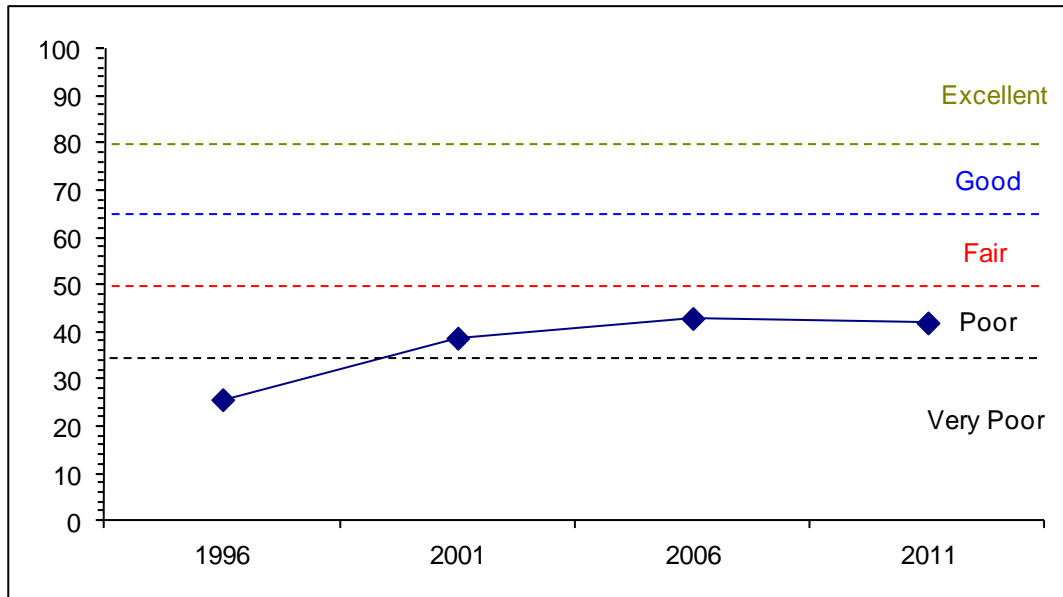
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 21



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 21



HERBACEOUS TRENDS--
 Management unit 02, Study no: 21

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	b286	a222	ab241	a220	ab253	6.91	9.72	10.45	12.64
G	Bromus japonicus (a)	-	c162	a44	b89	d226	5.26	.26	.57	3.22
G	Bromus tectorum (a)	-	b168	a75	b136	a90	8.59	1.02	1.62	2.49
G	Koeleria cristata	-	-	-	2	5	-	-	.15	.01
G	Oryzopsis hymenoides	-	4	1	2	6	.03	.06	.07	.09
G	Poa bulbosa	-	a3	ab20	b39	c72	.09	.69	1.32	3.25
G	Poa pratensis	-	1	1	7	13	.03	.01	.30	.10
G	Poa secunda	a55	ab105	b122	b125	a74	1.46	1.46	3.18	1.98
Total for Annual Grasses		0	330	119	225	316	13.85	1.29	2.19	5.71
Total for Perennial Grasses		341	335	385	395	423	8.53	11.94	15.48	18.09
Total for Grasses		341	665	504	620	739	22.39	13.24	17.68	23.80
F	Achillea millefolium	6	7	1	9	10	.16	.03	.07	.21
F	Agoseris glauca	25	26	23	25	37	.12	.06	.18	.16
F	Alyssum alyssoides (a)	-	b183	b198	a131	c257	.99	.76	.43	1.65
F	Arabis sp.	b10	a-	a-	a-	a-	-	-	-	-
F	Balsamorhiza sagittata	b76	ab52	ab40	a31	a40	3.67	4.35	2.85	1.60
F	Calochortus nuttallii	b19	a-	a3	a-	ab7	-	.00	-	.02
F	Camelina microcarpa (a)	a-	a12	b43	a10	ab29	.06	.12	.05	.09
F	Castilleja linariaefolia	4	-	2	-	-	-	.03	-	-
F	Chaenactis douglasii	-	-	-	-	4	-	-	-	.04
F	Cirsium undulatum	7	4	2	6	6	.19	.15	.21	.13
F	Collinsia parviflora (a)	-	a9	b99	b85	b63	.01	.19	.20	.18
F	Collomia linearis (a)	-	-	7	-	2	-	.01	-	.01

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Comandra pallida</i>	_b 26	_a 4	_a 2	_a 3	_a 6	.01	.03	.06	.09
F	<i>Crepis acuminata</i>	_c 106	_a 16	_{ab} 33	_b 55	_b 47	.19	.54	1.54	.63
F	<i>Delphinium nuttallianum</i>	-	-	2	-	-	-	.01	-	-
F	<i>Descurainia pinnata</i> (a)	-	_a -	_b 13	_a 3	_{ab} 5	-	.03	.00	.01
F	<i>Draba sp.</i> (a)	-	-	3	-	-	-	.03	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	2	-	-	10	.01	-	-	.04
F	<i>Eriogonum umbellatum</i>	5	-	-	-	9	-	-	.00	.21
F	<i>Gayophytum ramosissimum</i> (a)	-	-	3	5	-	-	.01	.03	-
F	<i>Hackelia patens</i>	7	16	18	11	2	.19	.19	.14	.02
F	<i>Holosteum umbellatum</i> (a)	-	-	-	-	4	-	-	-	.01
F	<i>Lactuca serriola</i> (a)	3	-	3	-	1	-	.03	-	.00
F	<i>Lappula occidentalis</i> (a)	-	-	25	23	2	-	.19	.05	.01
F	<i>Lithospermum arvense</i> (a)	-	-	-	-	6	-	-	-	.04
F	<i>Lomatium sp.</i>	5	-	1	-	10	-	.00	-	.05
F	<i>Machaeranthera canescens</i>	-	-	-	2	5	-	.03	.01	.01
F	<i>Microsteris gracilis</i> (a)	-	_a -	_{bc} 41	_c 59	_b 40	-	.08	.16	.10
F	<i>Penstemon humilis</i>	-	_a -	_a 2	_b 28	_a 14	-	.04	.24	.13
F	<i>Penstemon sp.</i>	_b 25	_{ab} 13	_{ab} 9	_a 8	_a 4	.13	.10	.30	.01
F	<i>Petradoria pumila</i>	58	58	50	46	47	3.01	3.36	2.84	4.31
F	<i>Phlox longifolia</i>	_b 28	_a -	_a 7	_{ab} 17	_a 12	-	.02	.08	.05
F	<i>Polygonum douglasii</i> (a)	-	-	-	1	-	-	-	.00	-
F	<i>Tragopogon dubius</i> (a)	_a 7	_a 9	_{ab} 19	_{ab} 25	_b 29	.02	.18	.14	.45
F	<i>Veronica biloba</i> (a)	-	10	5	9	9	.07	.01	.01	.02
F	<i>Zigadenus paniculatus</i>	9	-	5	8	4	-	.04	.08	.01
Total for Annual Forbs		10	225	459	351	457	1.17	1.65	1.11	2.64
Total for Perennial Forbs		416	196	200	249	264	7.69	9.01	8.65	7.71
Total for Forbs		426	421	659	600	721	8.87	10.67	9.76	10.35

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	26	23	27	27	2.77	2.39	2.18	2.40
B	Artemisia tridentata vaseyana	7	5	3	5	.30	.00	.03	.15
B	Cercocarpus ledifolius	11	11	7	10	2.38	1.84	1.32	.25
B	Cercocarpus montanus	1	1	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	9	12	12	12	.86	1.38	1.06	1.71
B	Eriogonum microthecum	23	23	15	17	.87	.66	.73	1.58
B	Gutierrezia sarothrae	32	44	33	31	.69	1.74	1.36	.93
B	Mahonia repens	29	35	34	29	.40	.93	.70	1.37
B	Purshia tridentata	4	6	5	4	.06	.03	.30	.03
B	Symphoricarpos oreophilus	22	19	23	18	.93	1.10	.86	1.40
Total for Browse		164	179	159	153	9.30	10.11	8.57	9.85

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 21

Species	Percent Cover		
	'01	'06	'11
Amelanchier alnifolia	-	2.84	2.03
Artemisia tridentata vaseyana	-	.61	.91
Cercocarpus ledifolius	22.00	18.29	21.50
Chrysothamnus viscidiflorus viscidiflorus	-	1.11	2.04
Eriogonum microthecum	-	.58	1.39
Gutierrezia sarothrae	-	2.00	1.23
Mahonia repens	-	.66	1.13
Purshia tridentata	-	.40	.01
Symphoricarpos oreophilus	-	.43	2.04

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 21

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.9	3.1	1.5
Cercocarpus ledifolius	4.1	3.0	1.6
Purshia tridentata	-	3.1	1.6

POINT-QUARTER TREE DATA--

Management unit 02, Study no: 21

Species	Trees per Acre			
	'96	'01	'06	'11
Cercocarpus ledifolius	148	-	126	198

Average diameter (in)			
'96	'01	'06	'11
4.7	-	10.1	6.8

BASIC COVER--

Management unit 02, Study no: 21

Cover Type	Average Cover %				
	'90	'96	'01	'06	'11
Vegetation	7.50	39.27	33.79	34.61	42.88
Rock	21.25	21.62	23.00	28.97	22.56
Pavement	3.00	1.18	2.80	2.49	.83
Litter	53.25	48.38	45.56	42.52	42.27
Cryptogams	0	.50	.99	.85	1.40
Bare Ground	15.00	5.15	9.51	8.11	6.03

SOIL ANALYSIS DATA --

Management unit 02, Study no: 21, Study Name: Swan Creek

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
10.3	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	'11	'01	'06	'11
Sheep	-	-	-	1	-	-	-
Rabbit	2	1	1	4	-	-	-
Moose	-	-	1	-	-	1 (2)	-
Elk	27	13	34	21	36 (89)	80 (198)	20 (50)
Deer	32	29	38	27	47 (116)	56 (137)	42 (103)
Cattle	-	-	1	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 21

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
90	865	54	38	8	66	58	12	4	28/17
96	840	24	60	17	-	55	17	10	18/31
01	1060	38	62	0	20	49	19	0	18/28
06	1220	31	64	5	60	33	39	7	17/29
11	1400	27	70	3	-	29	56	1	21/38
Artemisia tridentata vaseyana									
90	99	0	33	67	33	33	33	0	26/17
96	180	22	33	44	-	44	0	11	10/22
01	100	0	60	40	-	0	0	0	16/32
06	60	0	100	0	-	0	0	0	12/24
11	100	0	100	0	-	40	0	0	12/25

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Cercocarpus ledifolius									
90	166	20	80	0	33	0	20	0	157/152
96	280	14	86	0	-	29	36	0	11/24
01	220	45	45	9	-	18	27	0	20/22
06	380	16	47	37	80	0	11	37	-/-
11	220	36	64	0	2760	9	0	0	19/24
Cercocarpus montanus									
90	0	0	0	-	-	0	0	0	-/-
96	20	0	100	-	-	0	100	0	36/54
01	20	0	100	-	-	100	0	0	32/59
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	25/48
Chrysothamnus viscidiflorus viscidiflorus									
90	66	0	50	50	-	0	50	0	10/10
96	300	7	93	0	-	7	0	0	14/24
01	500	0	100	0	-	0	0	0	12/25
06	440	5	95	0	-	0	0	36	10/16
11	560	0	100	0	-	0	0	0	14/27
Eriogonum microthecum									
90	0	0	0	0	-	0	0	0	-/-
96	540	0	85	15	-	7	0	4	14/19
01	760	0	100	0	-	0	0	0	12/16
06	480	0	100	0	-	0	0	0	11/17
11	540	0	100	0	20	15	0	0	13/20
Gutierrezia sarothrae									
90	2198	15	82	3	66	0	0	2	11/16
96	1100	9	91	0	-	0	0	0	8/10
01	1600	3	96	1	20	0	0	1	10/15
06	1080	2	89	9	80	0	0	4	8/14
11	1240	0	98	2	20	0	0	2	11/15
Mahonia repens									
90	2898	31	69	-	-	2	0	0	4/4
96	2380	43	57	-	-	0	0	0	5/6
01	4360	5	95	-	-	0	0	0	3/5
06	5020	0	100	-	-	0	0	0	4/4
11	4060	2	98	-	-	0	0	0	4/10
Purshia tridentata									
90	132	25	75	-	-	25	0	0	11/12
96	80	0	100	-	-	100	0	0	7/20
01	120	17	83	-	-	33	33	0	19/41
06	100	0	100	-	-	0	80	0	9/22
11	80	0	100	-	-	0	0	0	13/36

		Age class distribution			Utilization				
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus									
90	931	18	72	11	66	7	0	14	19/17
96	600	30	67	3	-	0	0	0	14/23
01	600	3	90	7	-	3	0	3	14/23
06	620	0	77	23	-	0	0	42	15/24
11	660	15	85	0	-	42	3	0	15/25

FLAT BOTTOM CANYON - TREND STUDY NO. 2-23-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Shallow Loam \(Low Sagebrush\), R047XA442UT](#)

Land Ownership: Private

Elevation: 5,600 ft (1,707 m)

Aspect: South

Slope: 45%

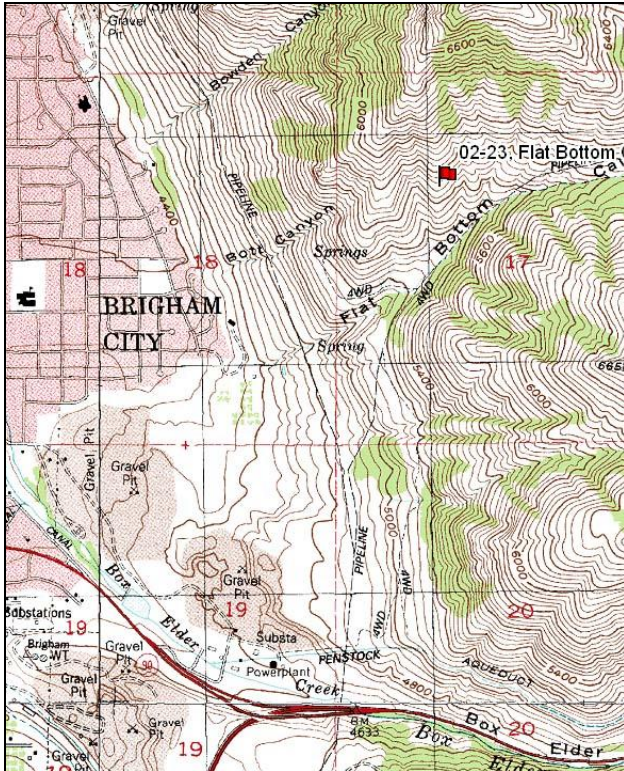
Transect bearing: 167° magnetic

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

Directions:

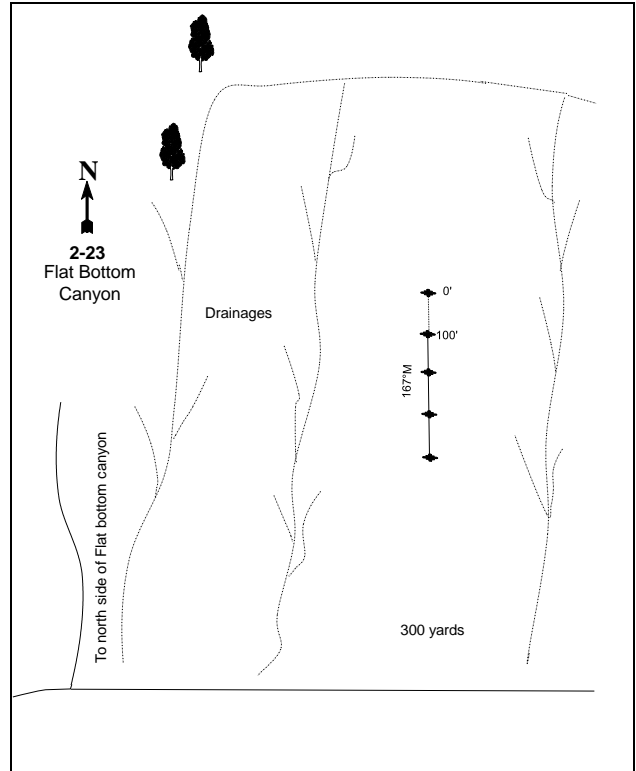
Ask for permission and directions to the mouth of the canyon at the Bingham sand and gravel pit. Four-wheel drive is needed. From mouth of canyon proceed to the ridge on north side of canyon where the site is located. Walk up the ridge about 300 yards to the 400-foot stake. The 0-foot baseline stake 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



Township: 9N Range: 1W Section: 17

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 417991 E 4596973 N

FLAT BOTTOM CANYON - TREND STUDY NO. 2-23

Site Information

Site Description: This study is located in Flat Bottom Canyon, which is just east of the Brigham City gravel pit. The site is utilized by deer in winter, but the study area produces relatively little browse forage. Due to the steep south facing canyon slopes, the soils are shallow and likely limits plant growth and plant densities. Deer pellet groups were sampled in moderate abundance in 2001. However, pellet groups for deer were sampled in low abundance in 2006 and 2011 (Table - Pellet Group Data). Pellet groups are concentrated near the bottom of the slope where the density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is highest.

Browse: Browse is a minor component of the sites vegetation and consists of a meager population of mountain big sagebrush. The population for sagebrush has historically been moderate in density, but has steadily decreased over the duration of the study. Utilization was moderate to heavy in 1984 and has displayed light to moderate use since. Mature plants are short and stunted; however, the sagebrush population is vigorous and decadence is low. 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. Historically, the dominant browse species has been broom snakeweed (*Gutierrezia sarothrae*), but is not preferred by big game. Snakeweed has had a highly dense population, but has since become a sparse population and no plants were sampled in 2011 (Table - Browse Characteristics).

Herbaceous Understory: Annual grasses and weedy forbs are very abundant and considered dominant, especially on lower slopes. Cheatgrass (*Bromus tectorum*), rattlesnake brome (*B. brizaeformis*), and rattail fescue (*Festuca myuros*) dominated the herbaceous understory during all sample years; however, annual grass cover decreased in 2006.. The perennial grasses bluebunch wheatgrass (*Agropyron spicatum*), purple three-awn (*Aristida purpurea*), and Sandberg bluegrass (*Poa secunda*) are moderately abundant. The weedy perennial bulbous bluegrass (*Poa bulbosa*) was a minor component until 2006, but became the dominant perennial grass in 2011. The forb community is moderately diverse, however, the dominant forbs on the site include pale alyssum (*Alyssum alyssoides*), the weedy species western ragweed (*Ambrosia psilostachya*), and storksbill (*Erodium cicutarium*). As a noxious weed in the state of Utah, Dyer's woad (*Isatis tinctoria*) has been on the study since 1984 and has maintained a stable population (Table - Herbaceous Trends).

Soil: The soil is part of the Foxol series, and is found on mountain sides. The parent material consists of colluvium derived from quartzite and/or residuum weathered from quartzite. The soil is well drained with a moderately permeable restrictive layer (Soil Survey Staff 2011). The soil is very rocky with a loam texture, and with a soil reaction that is moderately acidic (pH 5.9) (Table - Soil Analysis Data). Bare ground cover is low to moderate, while protective ground cover is provided by high amounts of vegetation, rock, and pavement that decrease the erosion potential. The soil erosion condition was classified as slight in 2006, but stable for all other sample years.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for mountain big sagebrush decreased 75% from 2,231 plants/acre to 565 plants/acre. Decadence within the sagebrush population increased from 21% of the population to 24%. Poor vigor decreased from 4% to 0%. Recruitment of young sagebrush decreased from 48% to 18% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend is determined using other parameters. Sagebrush decadence and poor vigor decreased and was not observed within the population.

- **1996 to 2001 - down (-2):** The density for mountain big sagebrush decreased 20% from 200 plants/acre to 160 plants/acre. Decadence increased to 13% of the sagebrush population, while poor vigor was not observed within the population. Young sagebrush recruitment decreased significantly from 70% of the population to 0%.
- **2001 to 2006 - down (-2):** The density for mountain big sagebrush decreased 88% to 20 plants/acre. Decadence and poor vigor was not measured within the small population. Recruitment of young sagebrush was not observed.
- **2006 to 2011 - stable (0):** The density for mountain big sagebrush increased two-fold to 40 plants/acre. The population is exceptionally small and the increase in density does not justify a change in trend. Decadence and poor vigor was not observed within the population. Recruitment of young sagebrush was not observed.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 28%. Sandberg bluegrass increased significantly in nested frequency, and contributed to the increase in the sum of nested frequency. Bluebunch wheatgrass was the dominant perennial grass species.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 46%. Sandberg bluegrass decreased significantly in nested frequency, and had a cover of 1%. Bluebunch wheatgrass maintained a stable population, and had a cover of 4%. Bulbous bluegrass was observed for the first time and was a minor component of perennial grass community. Annual grasses were included in the sample for the first time in 1996. The weedy species cheatgrass is the dominant herbaceous species with a cover of 17%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 59%. A significant increase in purple three-awn contributed to the perennial compositional shift. Sandberg bluegrass and bluebunch wheatgrass maintained stable populations, and cover increased to 4% and 5%, respectively. The weedy annual species cheatgrass and rattlesnake brome both had a significant decrease in nested frequency, however, the annual grass species rattail fescue increased significantly in nested frequency, and increased in cover from 1% to 6%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. The weedy species bulbous bluegrass increased significantly in nested frequency, and increased in cover from 1% to 8%. Rattail fescue was not sampled on the site.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. All perennial grass species maintained stable populations; however, bulbous bluegrass increased in cover to 12%. The annual grass species rattail fescue increased significantly in nested frequency, and had a cover of 5%.

Forb:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 40%. The decrease is primarily due to the weedy species western ragweed, which had a significant decrease in nested frequency.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial forbs increased three fold, however, the increase was due to the weedy species western ragweed, which increased significantly in nested frequency, and had a cover of 4%. Utah locoweed (*Astragalus utahensis*) had a significant increase in nested frequency, and had a cover of 1%.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 42%. Western ragweed almost exclusively contributed to the decrease. Ragweed had a significant decrease in nested frequency, and decreased in cover to 2%. The annual species annual sunflower (*Helianthus annuus*), pale alyssum, and jagged chickweed (*Holosteum umbellatum*) all had a significant increase in nested frequency.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 14%. The perennial species western ragweed had no significant increase in nested frequency, but increased in

cover to 5%. The annual species pale alyssum decreased significantly in nested frequency and had a cover of 1%.

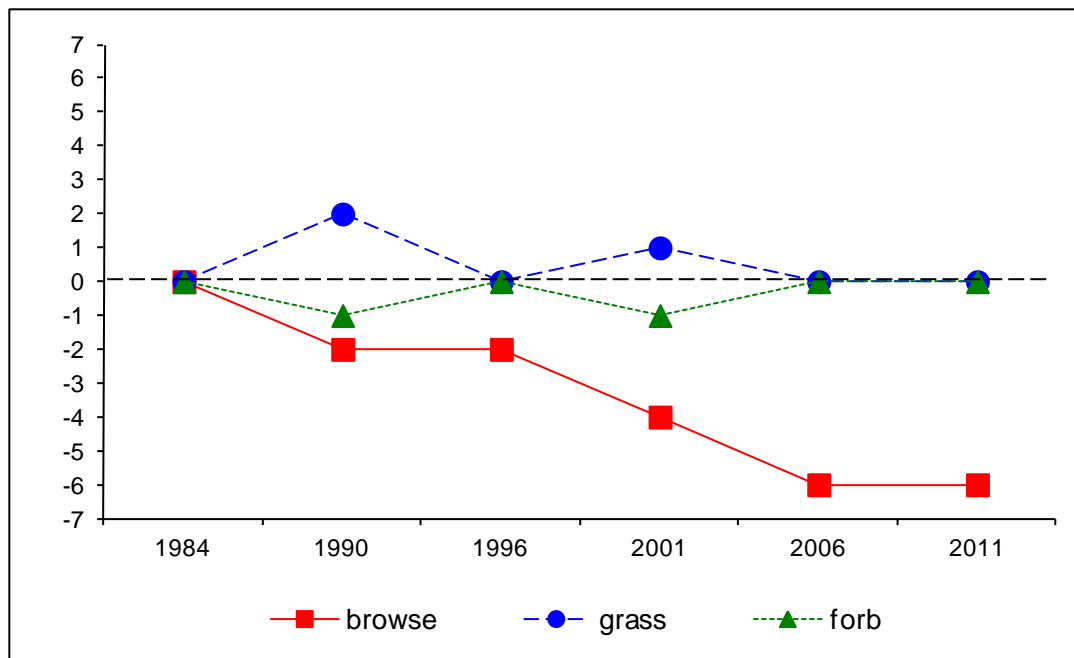
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The perennial forb spring parsley (*Cymopterus sp.*) had a significant increase in nested frequency. The annual species pale alyssum had a significant decrease in nested frequency, and decreased in cover to less than 1%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 23

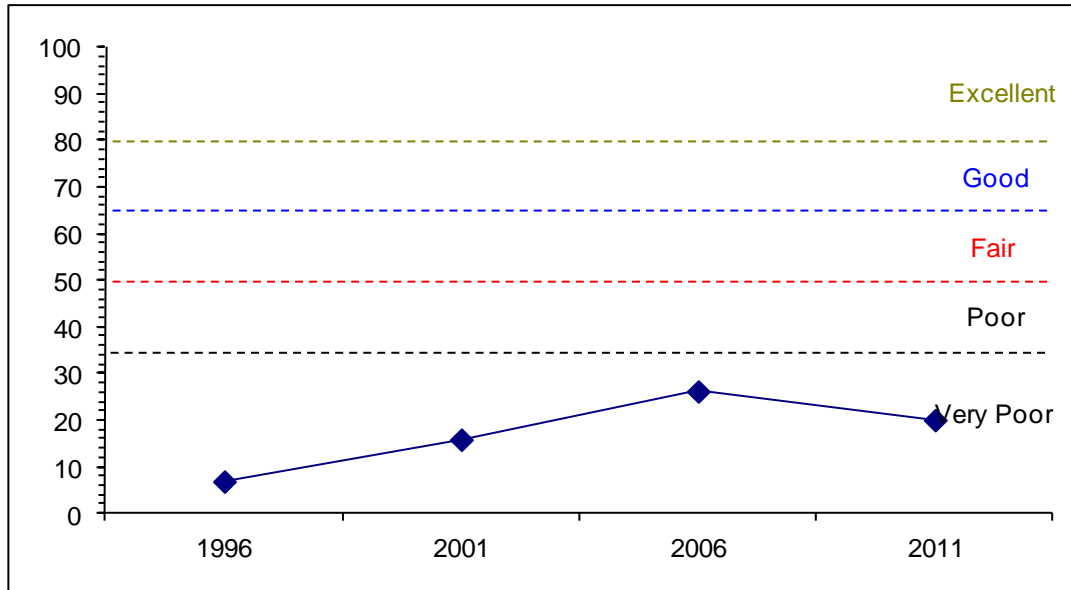
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	0.2	0.0	0.0	12.5	-13.9	10.0	-2.0	6.9	Very Poor
01	0.0	0.0	0.0	22.7	-10.0	5.1	-2.0	15.8	Very Poor
06	0.0	0.0	0.0	24.7	-6.5	10.0	-2.0	26.2	Very Poor
11	0.2	0.0	0.0	27.8	-14.0	8.1	-2.0	20.0	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 23



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 23



HERBACEOUS TRENDS--
 Management unit 02, Study no: 23

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	c184	bc182	ab126	a117	a125	ab127	4.07	4.67	7.17	6.15
G	Aristida purpurea	a9	ab38	b48	c86	c85	c85	1.17	2.61	3.64	3.50
G	Bromus brizaeformis (a)	-	-	c152	b70	a17	a15	1.00	.20	.04	.05
G	Bromus japonicus (a)	-	-	-	4	-	-	-	.01	-	-
G	Bromus tectorum (a)	-	-	b387	a330	a342	a347	16.60	7.41	8.67	13.75
G	Festuca myuros (a)	-	-	b87	d278	a-	c128	.91	5.73	-	4.93
G	Poa bulbosa	-	-	a10	a46	b213	b187	.02	.75	7.60	11.51
G	Poa secunda	a162	c234	a70	a184	a147	a177	1.00	4.06	1.51	4.25
Total for Annual Grasses		0	0	626	682	359	490	18.51	13.36	8.71	18.73
Total for Perennial Grasses		355	454	254	433	570	576	6.28	12.11	19.94	25.42
Total for Grasses		355	454	880	1115	929	1066	24.79	25.48	28.66	44.15
F	Achillea millefolium	-	-	2	11	2	-	.03	.19	.03	-
F	Agoseris glauca	-	6	10	-	1	2	.05	-	.00	.00
F	Allium sp.	a-	a-	a-	a-	b8	a-	-	.00	.01	-
F	Alyssum alyssoides (a)	-	-	a127	c296	b200	a119	.38	1.07	.52	.31
F	Ambrosia psilostachya	b83	a13	d152	b75	bd123	bc96	4.23	1.82	4.83	3.30
F	Artemisia ludoviciana	b39	a10	a9	a5	a10	a6	.22	.06	.07	.18
F	Astragalus convallarius	-	-	-	2	-	-	-	.00	-	-
F	Astragalus utahensis	a2	a1	b21	ab12	a1	ab9	.49	.07	.03	.24
F	Balsamorhiza hookeri	-	4	-	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	-	-	-	2	-	-	-	.00
F	Cymopterus sp.	a-	c33	bc24	bc21	b14	c36	.08	.14	.06	.26
F	Draba sp. (a)	-	-	a-	a37	b165	a3	-	.20	.35	.01
F	Epilobium brachycarpum (a)	-	-	6	-	2	3	.02	-	.00	.00

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Erigeron sp.	-	-	2	-	-	-	.15	-	-	-
F	Eriogonum umbellatum	-	-	4	2	5	-	.09	.03	.21	-
F	Erodium cicutarium (a)	-	-	_b 140	_c 217	_b 151	_a 22	1.21	4.96	2.81	.05
F	Hackelia patens	-	-	-	3	-	-	-	.00	-	-
F	Helianthus annuus (a)	-	2	-	-	-	7	-	-	-	.06
F	Holosteum umbellatum (a)	-	-	_a 21	_b 212	_b 261	_a 5	.04	.86	.89	.01
F	Isatis tinctoria	_{ab} 13	_{ab} 16	_b 25	_{ab} 14	_a 1	_a 10	.13	.20	.00	.02
F	Lactuca serriola (a)	_a -	_a -	_a 3	_a -	_a -	_b 17	.00	-	-	.44
F	Tragopogon dubius (a)	30	18	33	25	-	29	.36	.26	-	.25
F	Unknown forb-perennial	1	-	-	-	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	-	-	3	-	-	-	.00	-
Total for Annual Forbs		30	20	330	787	782	207	2.03	7.37	4.59	1.15
Total for Perennial Forbs		138	83	249	145	165	159	5.50	2.54	5.26	4.03
Total for Forbs		168	103	579	932	947	366	7.53	9.91	9.85	5.19

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	7	5	1	2	.18	.03	.03	.15
B	Chrysothamnus nauseosus hololeucus	3	5	0	0	.53	1.39	-	-
B	Gutierrezia sarothrae	54	69	0	0	1.46	4.40	-	-
B	Opuntia sp.	1	6	2	4	-	.01	-	.06
Total for Browse		65	85	3	6	2.17	5.83	0.03	0.21

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 23

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	.36	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 23

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.6	-	-

BASIC COVER--

Management unit 02, Study no: 23

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	9.50	42.44	47.72	43.59	47.65
Rock	16.50	18.00	18.50	17.84	22.36	21.82
Pavement	18.25	33.25	10.93	19.59	21.03	22.96
Litter	40.00	22.50	41.72	19.67	11.59	14.01
Cryptogams	6.00	4.25	1.90	2.01	4.81	.69
Bare Ground	17.00	12.50	1.45	6.20	8.23	2.55

SOIL ANALYSIS DATA --

Management unit 02, Study no: 23, Study Name: Flat Bottom Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
7.1	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Deer	7	5	8	5	25 (63)	15 (36)	8 (20)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 23

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	43/56
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	37/63
Artemisia tridentata vaseyana									
84	2231	48	31	21	33	24	33	4	6/6
90	565	18	59	24	-	29	12	0	8/10
96	200	70	30	0	-	0	0	0	13/22
01	160	0	88	13	-	63	0	0	13/27
06	20	0	100	0	-	100	0	0	14/22
11	40	0	100	0	-	50	0	0	16/26

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus nauseosus hololeucus</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	60	67	33	0	-	0	0	0	32/54	
01	120	17	67	17	-	0	0	0	31/51	
06	0	0	0	0	-	0	0	0	24/31	
11	0	0	0	0	-	0	0	0	33/46	
<i>Gutierrezia sarothrae</i>										
84	1065	6	81	12	166	0	0	0	9/12	
90	2432	26	73	1	233	1	0	1	7/8	
96	3240	30	62	8	80	0	0	0	9/13	
01	4760	1	93	6	-	0	0	5	8/16	
06	0	0	0	0	-	0	0	0	10/15	
11	0	0	0	0	-	0	0	0	12/22	
<i>Opuntia sp.</i>										
84	66	0	100	0	-	0	0	0	7/11	
90	99	67	0	33	66	0	0	0	-/-	
96	20	0	100	0	-	0	0	0	3/10	
01	160	25	63	13	-	0	0	0	2/8	
06	40	0	100	0	-	0	0	0	4/10	
11	80	0	100	0	-	0	0	0	4/8	

MOUTH OF TWO JUMP CANYON - TREND STUDY NO. 2-25-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Year-long

NRCS Ecological Site Description: [Upland Stony Loam \(Mountain Big Sagebrush\), R028AY334UT](#)

Land Ownership: USFS

Elevation: 5,100 ft (1,555 m)

Aspect: West

Slope: 24%

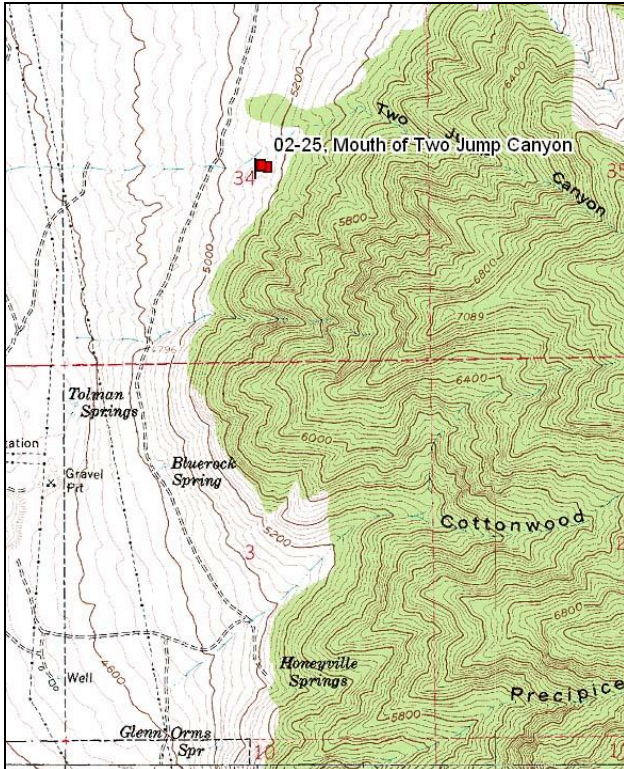
Transect bearing: 165° magnetic

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

Directions:

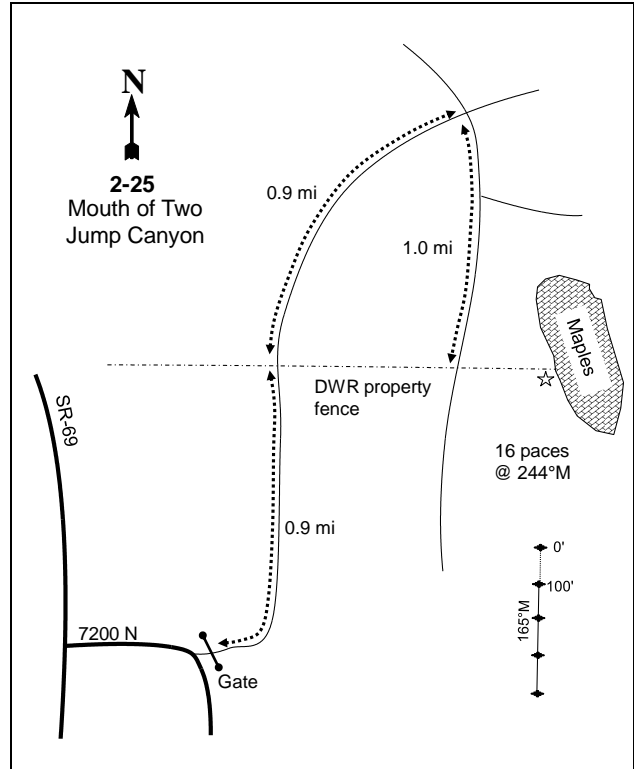
From the junction of 7200 North and U-69 in Honeyville, proceed east and north for 0.55 miles to a gate. Proceed 0.9 miles to the north to a fence. Continue another 0.9 miles and turn right (south) and travel 1.0 mile to a fence running east and west. Walk east along the fence (approximately 200 yards) 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



Township: 11N Range: 2W Section: 34

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 412139 E 4611222 N

MOUTH OF TWO JUMP CANYON - TREND STUDY NO. 2-25

Site Information

Site Description: This study is located east of Honeyville, just south of Two Jump Canyon. It samples one of the better mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) communities in the unit. It was noted that the area received heavy winter use by deer in 1984 and 1990. Deer pellet groups were sampled in high abundance in 2001 and moderate abundance in 2006 and 2011. Elk pellet groups were sampled in low abundance in 2001 and 2011. Cattle pats were sampled in low abundance in 2001 and 2011 (Table - Pellet Group Data).

Browse: The preferred browse species is mountain big sagebrush, which has a moderate population size. The sagebrush is a mature population with fairly good recruitment of young plants to the population over the sample years. Over the course of the study sagebrush have received light to moderate use. Decadence was high between 1990 and 2001. There were elevated numbers of dead sagebrush between the 1996 and 2006 sample years. Young and mature sagebrush have displayed good vigor over the course of the study. Over the duration of the study, decadent sagebrush has had a moderate amount of chlorotic and dying plants within the demographic. The weedy increaser species broom snakeweed (*Gutierrezia sarothrae*) is the most abundant shrub. The density of broom snakeweed has been high over the course of the study, and increased in density from 1984 to 2001. Since 2001, broom snakeweed has decreased substantially in density. A few other shrub species are rare and are patchy. They include slenderbush eriogonum (*Eriogonum microthecum*), bigtooth maple (*Acer grandidentatum*), Rocky Mountain smooth sumac (*Rhus glabra* ssp. *cismontana*), and Utah juniper (*Juniperus osteosperma*) (Table - Browse Characteristics).

Herbaceous Understory: The weedy annual grass species rattlesnake brome (*Bromus brizaeformis*), Japanese chess (*B. japonicus*), and cheatgrass (*B. tectorum*) dominate the herbaceous understory. Perennial grasses are represented in moderate amounts by Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Agropyron spicatum*). Bulbous bluegrass (*Poa bulbosa*) is a weedy, mat-forming grass that has increased significantly in occurrence and increased substantially in cover since 2001. Forbs are diverse and contain some desirable species, which include arrowleaf balsamroot (*Balsamorhiza sagittata*), Wyoming painted-cup (*Castilleja linariaefolia*), Utah locoweed (*Astragalus utahensis*), Gray lomatium (*Lomatium grayi*), and sulfur eriogonum (*Eriogonum umbellatum*) (Table - Herbaceous Trends).

Soil: The soil is part of the Sterling component, which is found on mountain slopes and alluvial fans. The parent material consists of alluvium, colluvium, and lacustrine deposits derived from limestone, dolomite sandstone, and quartzite (Soil Survey Staff 2011). Soil texture is a gravelly loam with a soil reaction that is moderately alkaline (pH 7.9) (Table - Soil Analysis Data). Rock is common on the surface and throughout the soil profile. Bare ground cover is low, while protective ground cover effectively limits erosion by high amounts of vegetation and litter cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for mountain big sagebrush decreased 29% from 2,065 plants/acre to 1,465 plants/acre. Sagebrush decadence increased from 26% to 73%. Poor vigor increased from 6% to 45% of the population.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decadence decreased to 41% and poor vigor decreased to 15% of the population. Decadence is still considered to be very high. Recruitment of young sagebrush plants increased from 5% to 18% of the population.

- **1996 to 2001 - down (-2):** The density for sagebrush decreased 22% from 1,860 plants/acre to 1,460 plants/acre. Sagebrush decadence increased to 52% of the population, and poor vigor increased to 21%. Recruitment of young sagebrush plants remained good at 18% of the population.
- **2001 to 2006 - stable (0):** The density for sagebrush decreased 10% to 1,320 plants/acre. Decadence decreased to 24% of the sagebrush population, while poor vigor decreased to 17% of the population. Recruitment of young sagebrush plants decreased to 6% of the population.
- **2006 to 2011 - up (+2):** The density for sagebrush increased 24% to 1,640 plants/acre. Decadence decreased to 11% of the sagebrush population, and poor vigor decreased to 10% of the total population. Recruitment of young sagebrush plants increased to 12% of the population.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased over two-fold. The increase is directly related to the significant increase in the nested frequency for Sandberg bluegrass, which was the most abundant perennial grass sampled on the site.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 9%. Prairie junegrass (*Koeleria cristata*) and bulbous bluegrass were measured for the first time, but with low nested frequencies. Annual species were included in the sample for the first time. The weedy species cheatgrass and rattlesnake brome dominated the herbaceous understory, and had covers of 20% and 4%, respectively.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 43%. Sandberg bluegrass was directly associated with this increase with a significant increase in nested frequency. Sandberg bluegrass also increased in cover from 4% to 6%. The weedy, annual species cheatgrass and rattlesnake brome decreased significantly in nested frequency, and cover decreased to 15% and 1%, respectively.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 20%. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover from 6% to 2%. The weedy perennial species bulbous bluegrass increased significantly in nested frequency, and increased in cover from less than 1% to 7%. The weedy annual species cheatgrass decreased significantly in nested frequency, and decreased in cover to 7%. The weedy annual species rattlesnake brome increased significantly in nested frequency, and increased in cover to 3%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 19%. However, the weedy perennial species bulbous bluegrass increased significantly in nested frequency, and increased in cover to 13%. The annual species cheatgrass decreased significantly in nested frequency, and decreased in cover to 2%.

Forb:

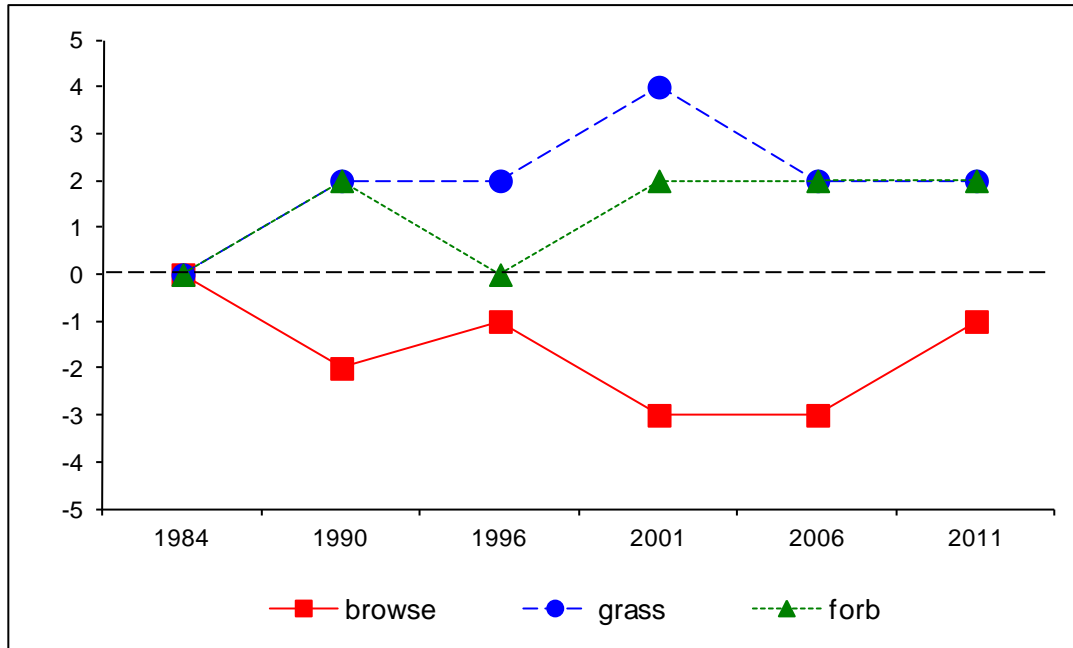
- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial forbs increased two-fold. This increase is directly due to the significant increase in nested frequencies for arrowleaf balsamroot and Gray lomatium.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 25%. Annual forbs were included in the sample for the first time in 1996. Pale alyssum was the most common annual forb.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial forbs increased 56%. The weedy, perennial wild onion (*Allium sp.*) increased significantly in nested frequency, but had a cover of less than 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. However, the weedy species western ragweed increased in cover from less than 1% to 2%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The noxious weed Dyer's woad (*Isatis tinctoria*) was observed for the first time, but with no substantial frequency or cover.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 2, study no: 25

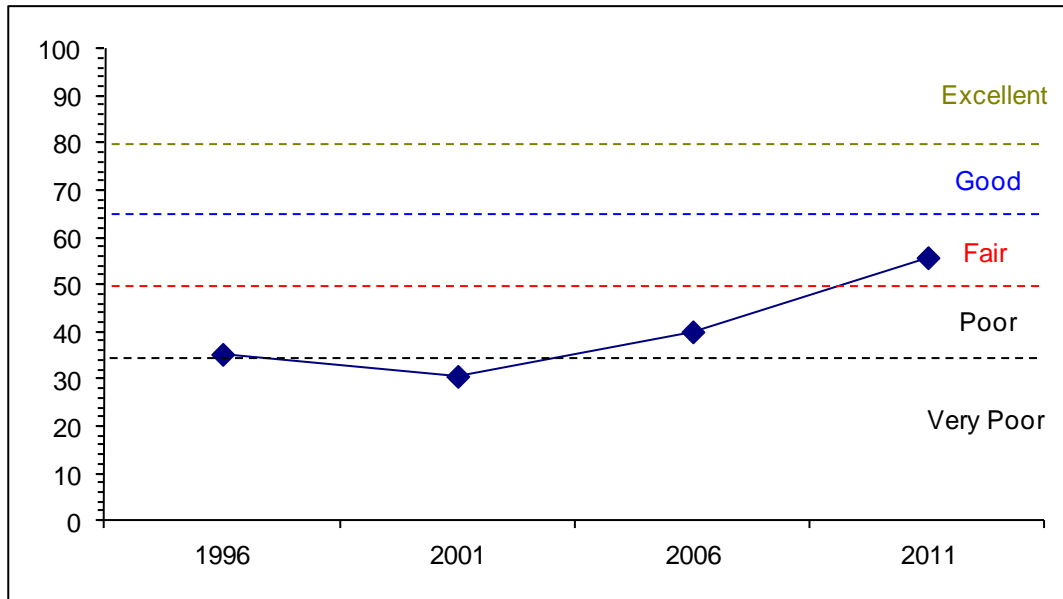
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.9	3.9	8.1	16.4	-20.0	10.0	0.0	35.3	Very Poor-Poor
01	9.4	-0.6	7.5	17.2	-12.9	10.0	0.0	30.6	Very Poor
06	9.4	8.6	2.7	17.2	-7.8	10.0	0.0	40.1	Poor
11	12.7	11.7	6.0	23.1	-5.8	10.0	-2.0	55.8	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 2 Study no: 25



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 25



HERBACEOUS TRENDS--
 Management unit 02, Study no: 25

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron spicatum</i>	a ₄₃	ab ₆₅	a ₃₉	a ₄₃	b ₉₈	b ₈₅	3.73	2.10	6.35	7.26
G	<i>Bromus brizaeformis</i> (a)	-	-	c ₂₆₇	a ₁₇₄	b ₂₁₉	bc ₂₃₄	4.28	1.18	2.80	3.24
G	<i>Bromus japonicus</i> (a)	-	-	a ₆₇	a ₇₂	a ₄₉	b ₁₅₁	1.12	.83	.71	2.82
G	<i>Bromus tectorum</i> (a)	-	-	d ₃₇₃	c ₃₃₄	b ₂₆₃	a ₉₂	20.85	15.16	6.76	1.65
G	<i>Festuca myuros</i> (a)	-	-	b ₄₇	a ₋	a ₈	a ₅	1.13	-	.07	.04
G	<i>Koeleria cristata</i>	-	-	5	6	-	5	.09	.15	-	.30
G	<i>Poa bulbosa</i>	-	-	a ₆	a ₂₆	b ₁₆₁	c ₁₉₈	.04	.24	6.85	12.93
G	<i>Poa fendleriana</i>	a ₋	a ₋	a ₋	a ₋	a ₃	b ₁₀	-	-	.03	.07
G	<i>Poa secunda</i>	a ₂₄	b ₁₀₀	b ₁₃₆	c ₂₀₈	b ₁₀₅	b ₁₄₅	4.36	6.32	2.19	3.92
Total for Annual Grasses		0	0	754	580	539	482	27.40	17.17	10.36	7.76
Total for Perennial Grasses		67	165	186	283	367	443	8.22	8.83	15.43	24.50
Total for Grasses		67	165	940	863	906	925	35.63	26.00	25.80	32.26
F	<i>Achillea millefolium</i>	12	16	11	8	11	5	.33	.06	.24	.21
F	<i>Agoseris glauca</i>	-	-	-	-	3	7	-	-	.00	.04
F	<i>Allium</i> sp.	a ₋	a ₂	a ₇	b ₇₃	a ₁₂	b ₄₅	.07	.20	.06	.33
F	<i>Alyssum alyssoides</i> (a)	-	-	a ₁₅₂	b ₂₆₀	a ₁₇₁	b ₂₃₆	1.00	1.56	.32	4.86
F	<i>Ambrosia psilostachya</i>	27	39	31	33	56	40	.62	.38	1.66	1.43
F	<i>Apocynum androsaemifolium pumilum</i>	a ₋	b ₁₀	a ₋	b ₁₅	b ₁₄	b ₂₇	-	.18	.43	.62
F	<i>Arabis</i> sp.	-	1	1	-	-	-	.00	-	-	-
F	<i>Arenaria fendleri</i>	-	-	-	2	-	3	-	.03	-	.00
F	<i>Artemisia ludoviciana</i>	a ₂₂	ab ₂₄	a ₁₆	ab ₂₉	ab ₂₈	b ₄₃	.52	.38	1.39	3.29
F	<i>Astragalus</i> sp.	1	-	5	3	-	-	.04	.03	-	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Astragalus utahensis</i>	-	-	5	6	6	2	.18	.45	.30	.15
F	<i>Balsamorhiza sagittata</i>	a33	b73	b64	ab67	ab57	ab59	5.22	4.31	6.48	8.42
F	<i>Calochortus nuttallii</i>	-	-	-	5	3	7	-	.01	.00	.02
F	<i>Castilleja linariaefolia</i>	-	-	3	-	-	-	.03	-	-	-
F	<i>Cirsium undulatum</i>	-	1	1	4	11	13	.04	.06	.54	.89
F	<i>Comandra pallida</i>	a-	a2	a6	a6	b29	ab12	.09	.04	.37	.08
F	<i>Cryptantha</i> sp.	-	5	3	3	8	8	.03	.00	.29	.07
F	<i>Cymopterus</i> sp.	-	-	-	-	5	4	-	-	.30	.03
F	<i>Draba</i> sp. (a)	-	-	a-	c48	bc32	b19	-	.14	.05	.04
F	<i>Epilobium brachycarpum</i> (a)	-	-	ab1	ab3	b13	a1	.00	.00	.05	.00
F	<i>Eriogonum umbellatum</i>	a5	a6	ab16	b25	ab16	ab17	.40	.15	.54	.45
F	<i>Erodium cicutarium</i> (a)	-	-	2	-	-	-	.06	-	-	-
F	<i>Gilia</i> sp. (a)	-	-	-	4	-	-	-	.00	-	-
F	<i>Hackelia patens</i>	a-	b18	ab11	a3	a2	a2	.25	.00	.01	.00
F	<i>Hedysarum boreale</i>	a-	b12	a-	ab1	ab8	ab4	.06	.15	.48	.18
F	<i>Holosteum umbellatum</i> (a)	-	-	a17	c113	b65	bc85	.03	.22	.16	1.55
F	<i>Isatis tinctoria</i>	-	-	-	-	-	1	-	-	-	.00
F	<i>Lactuca serriola</i> (a)	-	-	1	-	4	-	.00	-	.01	-
F	<i>Lithospermum ruderales</i>	a4	ab4	ab19	ab22	a4	b24	.64	.70	.36	1.14
F	<i>Lomatium grayi</i>	a-	c64	a8	ab21	bc49	a10	.07	.58	.73	.19
F	<i>Machaeranthera canescens</i>	a-	a-	a-	a2	b12	a3	-	.00	.37	.03
F	<i>Machaeranthera grindelioides</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Melilotus officinalis</i>	-	-	-	-	5	-	-	-	.03	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b12	b18	a-	-	.04	.04	-
F	<i>Penstemon</i> sp.	b7	ab1	a-	ab3	a-	a-	.00	.00	-	-
F	<i>Petrorhiza pumila</i>	-	-	-	-	2	-	-	-	.00	-
F	<i>Phacelia</i> sp.	c32	b3	b7	a-	a-	a-	.12	-	-	-
F	<i>Phlox longifolia</i>	-	6	2	4	4	3	.03	.06	.04	.00
F	<i>Polygonum douglasii</i> (a)	-	-	2	-	3	-	.00	-	.00	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	2	-	-	-	.00	-	-
F	<i>Tragopogon dubius</i> (a)	a1	a7	a7	b34	bc51	c59	.10	.49	.62	.76
F	<i>Veronica biloba</i> (a)	-	-	-	-	8	-	-	-	.01	-
F	<i>Zigadenus paniculatus</i>	a-	a-	a-	a-	a1	b9	-	-	.00	.08
Total for Annual Forbs		1	7	182	476	365	400	1.21	2.48	1.27	7.22
Total for Perennial Forbs		143	287	216	337	346	348	8.80	7.84	14.69	17.73
Total for Forbs		144	294	398	813	711	748	10.01	10.32	15.97	24.95

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	63	55	49	51	12.42	7.53	6.60	10.19
B	Eriogonum microthecum	1	0	0	1	-	-	-	-
B	Gutierrezia sarothrae	75	83	57	48	3.33	4.02	1.79	1.84
B	Purshia tridentata	0	0	3	0	-	-	.78	-
B	Rhus glabra cismontana	0	0	0	0	1.37	-	-	-
Total for Browse		139	138	109	100	17.13	11.56	9.18	12.03

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 25

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	10.26	13.28
Gutierrezia sarothrae	2.65	3.59

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 25

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.3	1.8	1.8

BASIC COVER--

Management unit 02, Study no: 25

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.50	7.00	56.31	56.03	50.77	57.59
Rock	18.00	16.75	14.04	12.02	12.39	13.68
Pavement	21.25	13.75	3.66	3.74	4.63	7.71
Litter	57.50	55.75	65.69	49.71	43.88	48.75
Cryptogams	.50	.25	.70	.48	.93	3.03
Bare Ground	1.25	6.50	.44	.28	4.53	2.54

SOIL ANALYSIS DATA --

Management unit 02, Study no: 25, Study Name: Mouth of Two Jump Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
14.8	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	'11
Rabbit	1	6	18	16
Elk	-	-	4	-
Deer	7	14	12	6
Cattle	2	-	1	-

Days use per acre (ha)		
'01	'06	'11
-	-	-
1 (3)	-	3 (7)
45 (111)	29 (71)	24 (60)
3 (70)	-	1 (2)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 25

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Acer grandidentatum</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	20	0	0	0	-/-
<i>Artemisia tridentata vaseyana</i>									
84	2065	3	71	26	266	23	77	6	42/43
90	1465	5	23	73	66	41	23	45	27/33
96	1860	18	41	41	200	32	2	15	27/41
01	1460	15	33	52	100	12	0	21	26/35
06	1320	6	70	24	840	5	0	17	28/41
11	1640	12	77	11	120	5	0	10	24/41
<i>Chrysothamnus nauseosus albicaulis</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	32/53
<i>Eriogonum microthecum</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	40	0	100	-	-	0	0	0	18/22
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	9/20
11	20	0	100	-	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
84	3066	0	100	0	-	0	0	0	13/10	
90	9665	55	40	5	66	0	0	2	11/12	
96	5580	25	75	0	3820	0	0	0	11/14	
01	7460	1	88	11	20	0	0	16	11/13	
06	3120	8	83	9	100	10	6	3	9/12	
11	2040	11	89	0	-	0	0	0	14/15	
<i>Purshia tridentata</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	80	0	100	-	-	100	0	0	32/72	
11	0	0	0	-	-	0	0	0	-/-	
<i>Rhus glabra cismontana</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	420	0	0	0	70/107	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	

LAKETOWN CANYON - TREND STUDY NO. 2-27-11

Vegetation Type: Mountain Mahogany

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Upland Shallow Loam \(Utah Juniper\), R025XY324UT](#)

Land Ownership: BLM

Elevation: 6,300 ft (1,920 m)

Aspect: West

Slope: 40%

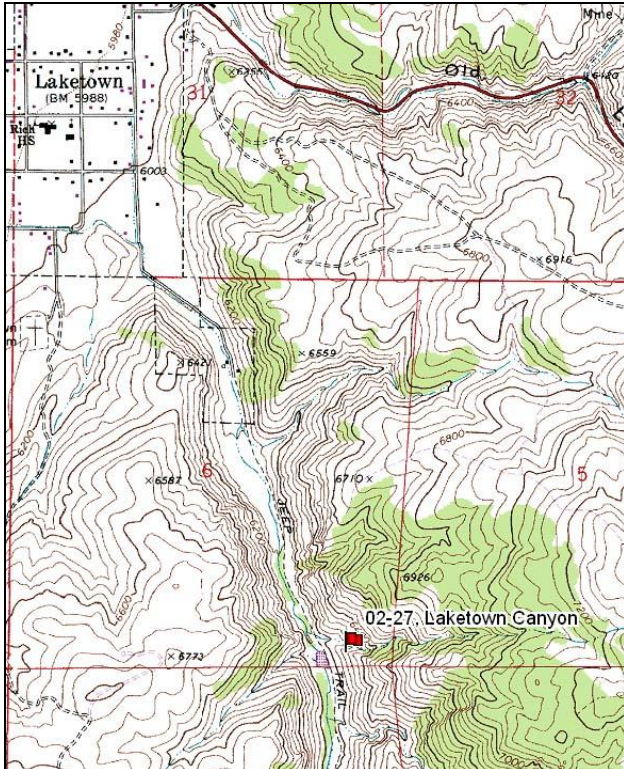
Transect bearing: 162° magnetic

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

Directions:

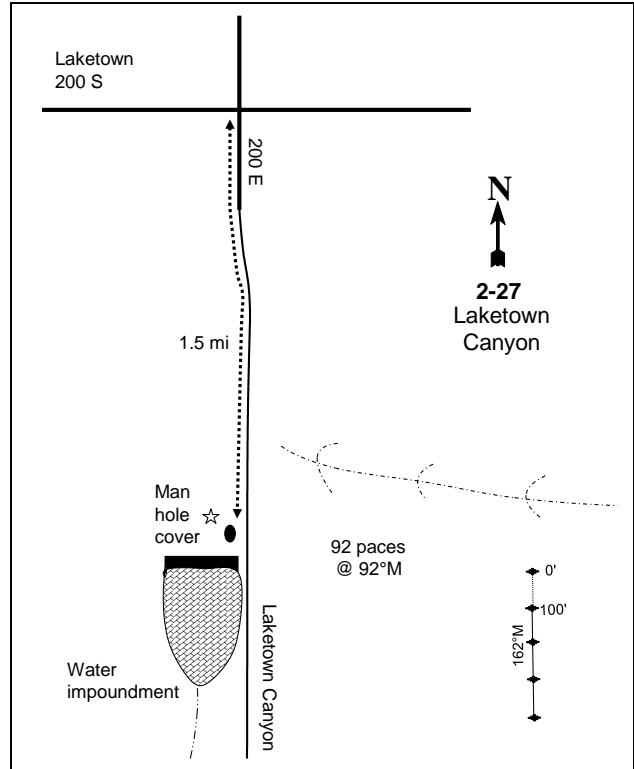
From 200 East 200 South in Laketown, proceed south into Laketown Canyon 1.5 miles stopping at a stockpond dam. Walk to the manhole cover on the northeast corner of the dam. Take an azimuth of 92 degrees magnetic and walk 92 paces up the ridge to the 0-foot baseline stake. The 0-foot stake is marked with browse tag #7937.

Map Name: Laketown



Township: 12N Range: 6E Section: 7

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 474591 E 4627863 N

LAKETOWN CANYON - TREND STUDY NO. 2-27

Site Information

Site Description: This study is located south of Bear Lake in Laketown Canyon. The land is administered by the Bureau of Land Management (BLM) as part of the Laketown allotment. It samples a true mountain mahogany (*Cercocarpus montanus*) stand within crucial deer winter range. In 1984, deer and domestic sheep pellet groups, tracks, and other signs were very common. Deer pellet group quadrat frequency was low in 1996. Deer pellet groups were sampled in high abundance in 2001, but low abundance in 2006 and 2011. Elk are known to occupy this general area, but elk pellet groups have been sampled in low abundance since 2001. Cattle sign occurs primarily at the bottom of the slope around a nearby stock pond, but not on the steep slopes where the study is located. Cattle pats were sampled in low abundance in 2006. Moose pellet groups were low in abundance in 2006 (Table - Pellet Group Data). A few moose pellet groups were also seen near the study in other sample years, but were not encountered within the pellet group transect.

Browse: Browse composition includes several co-dominant shrubs true mountain mahogany and black sagebrush (*Artemisia nova*). True mountain mahogany is a highly preferred browse species with a sparse, mature population, but dominates the upper browse canopy. Utilization has been moderate to heavy, and has produced clubbed and armored plants. Despite the heavy utilization, the mountain mahogany population has had good vigor and low decadence over the course of the study years. Recruitment of mountain mahogany has minimal over the course of the study. Black sagebrush is a preferred browse species with a sparse, mature population. Density has slowly declined over the duration of the study. Utilization within the black sagebrush population has been light to moderate. The black sagebrush has had high decadence and moderate amounts of poor vigor over the course of the study. Recruitment of young black sagebrush has been poor over the sample years, though recruitment was good in 2006. Other less common preferred browse species found on the site are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), curleaf mountain mahogany (*Cercocarpus ledifolius*), and mountain snowberry (*Symphoricarpos oreophilus*). Less desirable shrubs include green rubber rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), threadleaf rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *consimilis*), broom snakeweed (*Gutierrezia sarothrae*), gray horsebrush (*Tetradymia canescens*), and Utah juniper (*Juniperus osteosperma*) (Table - Browse Characteristics).

Herbaceous Understory: Herbaceous understory plants are composed of the weedy annual species cheatgrass (*Bromus tectorum*) intermixed with the perennial species Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Agropyron spicatum*), and Indian ricegrass (*Oryzopsis hymenoides*). Forbs occur infrequently and only provide a minor component of the herbaceous understory.

Soil: The soil is in the Lundy, dry-rock outcrop complex, likely as part of the Lundy dry component. This component is on mountainsides and canyons. The parent material consists of colluvium over residuum weathered from limestone (Soil Survey Staff 2011). The soil texture is a loam that is strongly calcareous and moderately alkaline (pH 7.6). Phosphorous may have limited availability for plant growth and development at 5.6 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Some bare ground is exposed mainly along trails that follow the contour of the hillside. Adequate protective ground cover is provided by high amounts of rock, vegetation, and litter (Table - Basic Cover). Some soil erosion and pedestalling has occurred, therefore, the soil erosion condition was determined to be slight in 2001 and 2006, but stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for true mountain mahogany decreased 31% from 432 plants/acre to 299 plants/acre. Decadence increased from 0% to 44% of the true mountain mahogany population. Poor vigor was not observed within the true mountain mahogany population. The density of black sagebrush decreased 54% from 1,298 plants/acre to 599 plants/acre. Decadence within the

black sagebrush population increased from 67% to 94%. Poor vigor within the black sagebrush population increased from 0% to 17%.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence for true mountain mahogany decreased to 0%. Vigor of true mountain mahogany remained good within the population. Decadence within the black sagebrush population decreased to 34%, but is still considered to be high. Poor vigor for black sagebrush decreased slightly to 16% of the population.
- **1996 to 2001 - stable (0):** The density for true mountain mahogany increased 20% from 200 plants/acre to 240 plants/acre. Decadence and poor vigor were not observed within the true mountain mahogany population. Black sagebrush decreased in density by 21% from 1,460 plants/acre to 1,160 plants/acre. Black sagebrush decadence decreased to 19%, and poor vigor for black sagebrush decreased to 5% of the total population.
- **2001 to 2006 - down (-2):** The density for true mountain mahogany decreased 25% to 180 plants/acre. Decadence and poor vigor were not observed within the mountain mahogany population. Black sagebrush decreased in density 24% to 880 plants/acre. Decadence in the black sagebrush population increased to 36%, and poor vigor increased to 14% of the black sagebrush population.
- **2006 to 2011 - up (+2):** The density for true mountain mahogany increased 33% to 240 plants/acre. Decadence and poor vigor were not observed within the true mountain mahogany population. Black sagebrush increased in density 16% to 1,020 plants/acre. Decadence for black sagebrush decreased to 25%, and poor vigor decreased to 10% in the black sagebrush population.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 62%. The perennial species Sandberg bluegrass (*Poa secunda*) increased significantly in nested frequency, and was directly related to the increase in the sum of nested frequencies.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 20%. The increase is directly associated with the significant increase in nested frequency for bluebunch wheatgrass (*Agropyron spicatum*), which had a cover of 6%. Sandberg bluegrass remained the most common perennial grass, and had a cover of 7%. Annual grasses were included in the sample for the first time in 1996. The weedy species cheatgrass was the most abundant grass, and had a cover of 9%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to 2%. Bluebunch wheatgrass increased in occurrence, and increased in cover to 8%. The weedy annual species cheatgrass decreased significantly in nested frequency, and decreased in cover to 5%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. The perennial species Sandberg bluegrass increased significantly in nested frequency, and increased in cover to 6%. The population of bluebunch wheatgrass remained stable. The weedy annual species cheatgrass increased significantly in nested frequency, and maintained cover at 5%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 17%. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to 2%. Bluebunch wheatgrass was the most dominant perennial grass, and increased in cover to 9%. The weedy annual cheatgrass occurred most frequently out of all the grasses, and had a cover of 7%.

Forb:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 49%, but perennial forbs were already rare on the site. The decrease is not due to any one specific species, and is likely due to small, accumulative decreases in nested frequency across the perennial forb community.
- **1990 to 1996 - up (+2):** The sum of nested frequency for perennial forbs increased over three-fold. Cryptantha (*Cryptantha sp.*) and lobeleaf groundsel (*Senecio multilobatus*) both had a significant increase in nested frequency, and had covers of 1% and less than 1%, respectively.

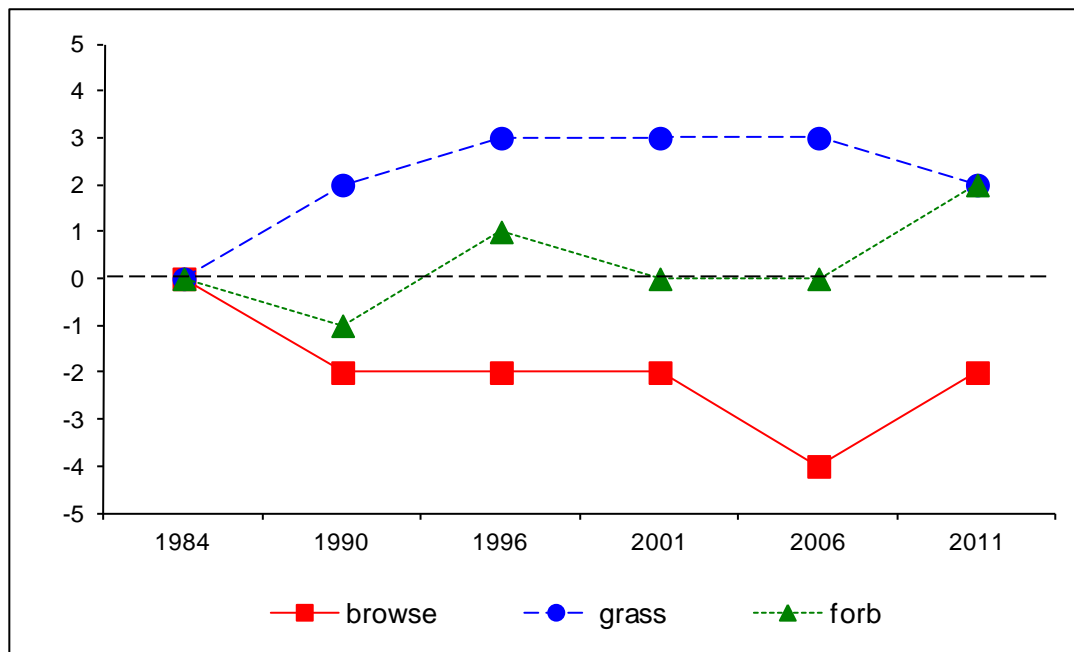
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 30%, but cover remained similar at 2%. Cryptantha increased in cover to 2%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs increased 12%, but cover remained similar at 2%. The forb community remains a minor component. Pale alyssum (*Alyssum alyssoides*) was the most frequently occurring forb, while Cryptantha maintained the highest cover of the forb community.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 43%, though cover remained similar at 2%. Lobeleaf groundsel increased significantly in nested frequency.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 2, study no: 27

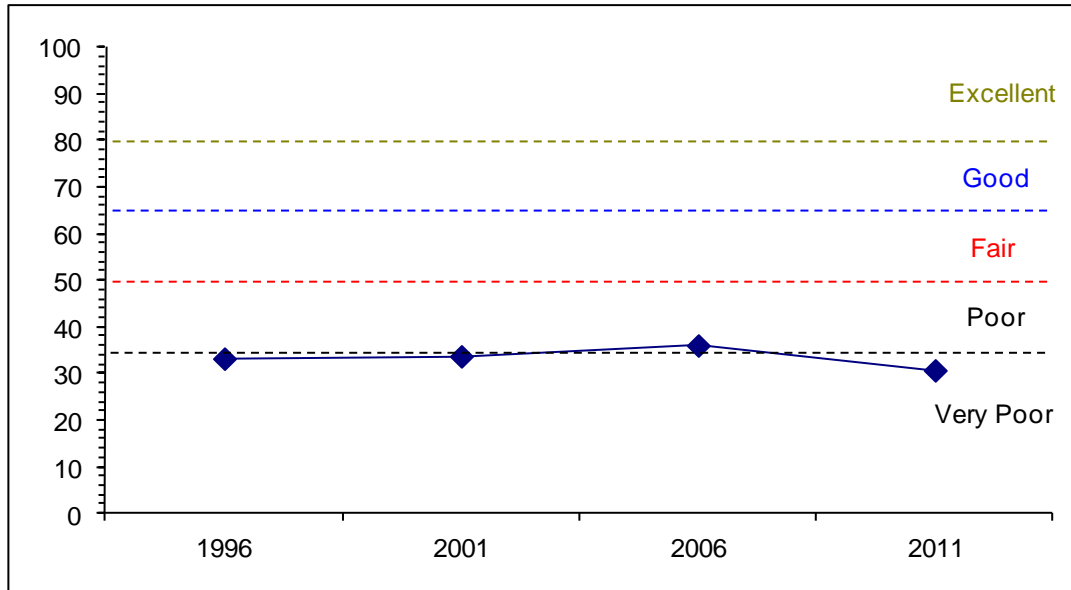
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	6.2	0.0	0.0	30.0	-6.4	3.6	0.0	33.5	Very Poor-Poor
01	4.8	0.0	0.0	29.6	-4.3	3.6	0.0	33.7	Very Poor-Poor
06	6.0	0.0	0.0	29.5	-3.7	4.2	0.0	36.1	Very Poor-Poor
11	6.0	0.0	0.0	28.6	-8.4	4.5	0.0	30.7	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 2 Study no: 27



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 27



HERBACEOUS TRENDS--
 Management unit 02, Study no: 27

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a30	a37	b80	bc111	c122	c131	6.01	7.86	6.53	8.76
G	Bromus brizaeformis (a)	-	-	a9	ab32	b36	c111	.04	.67	.20	3.40
G	Bromus japonicus (a)	-	-	a3	a4	c31	c56	.00	.00	.06	.88
G	Bromus tectorum (a)	-	-	c315	a163	b245	b257	8.50	5.09	4.66	6.89
G	Carex sp.	-	-	-	4	-	-	-	.03	-	-
G	Koeleria cristata	-	-	2	4	1	-	.06	.03	.15	-
G	Oryzopsis hymenoides	37	40	40	56	28	34	2.66	3.91	2.05	1.81
G	Poa secunda	ab136	c270	c276	b182	c243	a133	6.79	1.93	5.61	1.95
G	Stipa comata	ab13	a3	ab21	bc30	ab15	c43	.85	1.02	.42	1.75
Total for Annual Grasses		0	0	327	199	312	424	8.54	5.77	4.92	11.17
Total for Perennial Grasses		216	350	419	387	409	341	16.38	14.81	14.77	14.28
Total for Grasses		216	350	746	586	721	765	24.93	20.58	19.70	25.46
F	Agoseris glauca	-	-	-	-	2	3	-	-	.01	.00
F	Alyssum alyssoides (a)	-	-	a28	a49	b88	c174	.10	.11	.19	.66
F	Arabis sp.	4	-	4	6	11	12	.01	.01	.02	.02
F	Artemisia ludoviciana	-	-	-	-	4	6	-	-	.00	.30
F	Astragalus convallarius	-	-	3	-	-	2	.01	-	.06	.03
F	Astragalus utahensis	-	-	-	-	-	4	-	-	-	.03
F	Balsamorhiza sagittata	-	-	-	-	-	-	-	-	.03	.03
F	Calochortus nuttallii	-	-	-	1	-	-	-	.00	-	-
F	Camelina microcarpa (a)	-	-	1	4	2	-	.00	.07	.00	-
F	Chaenactis douglasii	3	3	4	-	1	3	.01	-	.00	.03
F	Cirsium undulatum	b19	ab5	a4	a-	a2	a1	.06	-	.03	.00
F	Crepis acuminata	-	-	-	6	2	1	-	.06	.18	.09

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cryptantha sp.	a4	ab15	c44	bc49	bc41	bc38	.93	1.55	.50	.47
F	Descurainia pinnata (a)	-	-	a-	a8	a13	b32	-	.02	.02	.10
F	Draba sp. (a)	-	-	-	3	5	27	-	.01	.01	.06
F	Epilobium brachycarpum (a)	-	-	8	-	11	11	.02	-	.17	.07
F	Eriogonum umbellatum	-	-	-	2	-	10	-	.00	-	.05
F	Hackelia patens	-	17	12	10	11	4	.14	.02	.43	.03
F	Holosteum umbellatum (a)	-	-	-	-	1	-	-	-	.00	-
F	Lappula occidentalis (a)	-	-	-	9	3	-	-	.04	.00	-
F	Machaeranthera grindelioides	-	-	3	3	-	1	.03	.03	-	.00
F	Microsteris gracilis (a)	-	-	a-	a1	b21	a-	-	.00	.05	-
F	Penstemon humilis	-	-	15	8	6	12	.27	.01	.27	.48
F	Phlox hoodii	-	-	4	7	9	15	.04	.06	.19	.25
F	Phlox longifolia	-	-	-	-	-	2	-	-	-	.00
F	Ranunculus testiculatus (a)	-	-	-	-	3	2	-	-	.00	.00
F	Senecio multilobatus	ab12	a-	b28	a-	a4	b32	.18	-	.06	.41
F	Tragopogon dubius (a)	14	-	1	-	4	-	.00	-	.07	-
F	Verbascum thapsus	8	-	10	1	3	3	.10	.03	.15	.00
Total for Annual Forbs		14	0	38	74	151	246	0.13	0.26	0.55	0.90
Total for Perennial Forbs		50	40	131	93	96	149	1.81	1.80	1.96	2.27
Total for Forbs		64	40	169	167	247	395	1.94	2.06	2.51	3.17

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	0	0	0	0	-	-	-	.38
B	Artemisia nova	30	28	21	25	3.37	2.23	1.68	1.76
B	Artemisia tridentata vaseyana	9	5	3	1	.18	-	.63	.38
B	Cercocarpus ledifolius	0	0	0	1	-	-	-	.15
B	Cercocarpus montanus	8	8	9	8	1.20	1.36	2.07	1.68
B	Chrysothamnus nauseosus consimilis	19	14	19	15	3.09	3.56	3.62	2.79
B	Chrysothamnus viscidiflorus viscidiflorus	12	12	10	13	.72	.49	.73	.57
B	Eriogonum microthecum	0	1	2	0	.00	-	.03	-
B	Gutierrezia sarothrae	57	53	45	36	1.58	2.03	1.24	1.06
B	Juniperus osteosperma	1	1	1	1	.00	-	-	-
B	Symphoricarpos oreophilus	2	2	2	2	-	.06	.53	.15
B	Tetradymia canescens	10	8	9	13	.39	.48	1.37	.45
B	Yucca sp.	0	0	0	0	-	-	-	.15
Total for Browse		148	132	121	115	10.56	10.23	11.92	9.55

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 27

Species	Percent Cover	
	'06	'11
Artemisia nova	3.79	2.26
Artemisia tridentata vaseyana	.38	.41
Cercocarpus montanus	3.68	6.25
Chrysothamnus nauseosus consimilis	3.93	4.18
Chrysothamnus viscidiflorus viscidiflorus	.85	.60
Gutierrezia sarothrae	1.23	.46
Juniperus osteosperma	.20	-
Purshia tridentata	-	.31
Symphoricarpos oreophilus	1.41	.40
Tetradymia canescens	.26	1.29

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 27

Species	Average leader growth (in)		
	'01	'06	'11
Cercocarpus montanus	2.2	3.6	3.1

BASIC COVER--

Management unit 02, Study no: 27

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.75	9.50	37.45	34.99	39.90	34.52
Rock	33.25	30.75	26.56	24.75	25.67	24.74
Pavement	7.00	11.25	6.03	8.76	8.51	3.76
Litter	38.00	25.25	30.82	32.23	24.31	29.63
Cryptogams	13.75	10.75	2.84	2.50	2.57	3.51
Bare Ground	5.25	12.50	7.39	14.36	14.98	13.55

SOIL ANALYSIS DATA --

Management unit 02, Study no: 27, Study Name: Laketown Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.8	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	'11
Rabbit	6	-	4	-
Moose	-	-	2	-
Elk	1	-	-	2
Deer	9	5	4	4
Cattle	-	-	2	-

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	2 (4)	-
-	-	3 (7)
42 (103)	5 (12)	19 (46)
-	5 (13)	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 27

		Age class distribution			Utilization				
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	21/22
<i>Artemisia nova</i>									
84	1298	8	26	67	233	5	95	0	7/8
90	599	0	6	94	33	44	0	17	10/16
96	1460	3	63	34	20	3	0	16	15/28
01	1160	5	76	19	20	16	2	5	11/19
06	880	2	61	36	60	30	0	14	15/29
11	1020	0	75	25	20	4	0	10	15/29
<i>Artemisia tridentata vaseyana</i>									
84	299	0	11	89	-	22	78	33	16/18
90	33	0	0	100	-	0	0	0	-/-
96	200	0	30	70	-	50	20	80	18/31
01	100	20	60	20	-	0	0	20	31/37
06	60	0	100	0	20	0	0	33	27/39
11	20	0	100	0	-	0	0	0	22/36
<i>Cercocarpus ledifolius</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	40/43
06	0	0	0	-	-	0	0	0	40/56
11	20	100	0	-	-	0	0	0	34/33

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Cercocarpus montanus										
84	432	23	77	0	333	8	92	0	48/59	
90	299	0	56	44	-	71	0	0	40/45	
96	200	20	80	0	-	80	20	0	38/56	
01	240	0	100	0	-	67	0	0	51/72	
06	180	0	100	0	20	22	44	0	45/68	
11	240	8	92	0	-	8	83	0	47/59	
Chrysothamnus nauseosus consimilis										
84	332	20	0	80	-	70	0	0	-/-	
90	399	0	83	17	-	0	0	0	32/26	
96	620	3	81	16	-	0	0	23	26/41	
01	420	0	62	38	-	0	0	0	31/44	
06	520	8	42	50	-	23	0	19	25/43	
11	400	0	60	40	-	0	0	10	27/45	
Chrysothamnus viscidiflorus viscidiflorus										
84	498	40	60	0	-	0	0	0	13/27	
90	199	0	100	0	-	0	0	0	10/14	
96	400	5	80	15	-	0	0	15	14/22	
01	340	0	59	41	-	6	0	0	15/20	
06	220	9	64	27	-	9	0	36	13/24	
11	440	5	95	0	-	0	0	0	16/17	
Eriogonum microthecum										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	20	0	0	100	-	0	0	0	-/-	
06	40	0	100	0	-	50	50	0	13/24	
11	0	0	0	0	-	0	0	0	-/-	
Gutierrezia sarothrae										
84	4765	44	56	0	-	0	0	0	8/9	
90	1998	58	25	17	733	0	0	4	13/12	
96	3420	20	80	0	100	0	0	0	10/11	
01	3180	1	99	1	-	0	0	0	8/12	
06	1520	9	74	17	20	1	0	7	8/12	
11	1640	2	95	2	80	0	0	0	9/11	
Juniperus osteosperma										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	100	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	100	0	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	0	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Leptodactylon pungens										
84	66	0	100	-	-	0	0	0	4/4	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Ribes sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	30/35	
11	0	0	0	-	-	0	0	0	23/34	
Symphoricarpos oreophilus										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	80	50	50	0	-	50	0	100	17/28	
01	40	0	50	50	-	0	0	0	11/13	
06	140	14	71	14	-	0	0	0	35/50	
11	120	0	100	0	-	0	0	0	25/41	
Tetradymia canescens										
84	66	50	50	0	-	0	0	0	9/10	
90	99	0	100	0	-	0	0	0	7/7	
96	280	7	79	14	-	0	0	50	11/20	
01	300	0	33	67	20	0	0	0	10/17	
06	300	20	53	27	-	33	7	7	10/17	
11	420	10	90	0	20	0	0	0	11/20	

NORTH EDEN - TREND STUDY NO. 2-28-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Deer Winter

NRCS Ecological Site Description: [Upland Stony Loam \(Wyoming Big Sagebrush\), R047XA338UT](#)

Land Ownership: UDP & R

Elevation: 6,140 ft (1,872 m)

Aspect: West

Slope: 20-25%

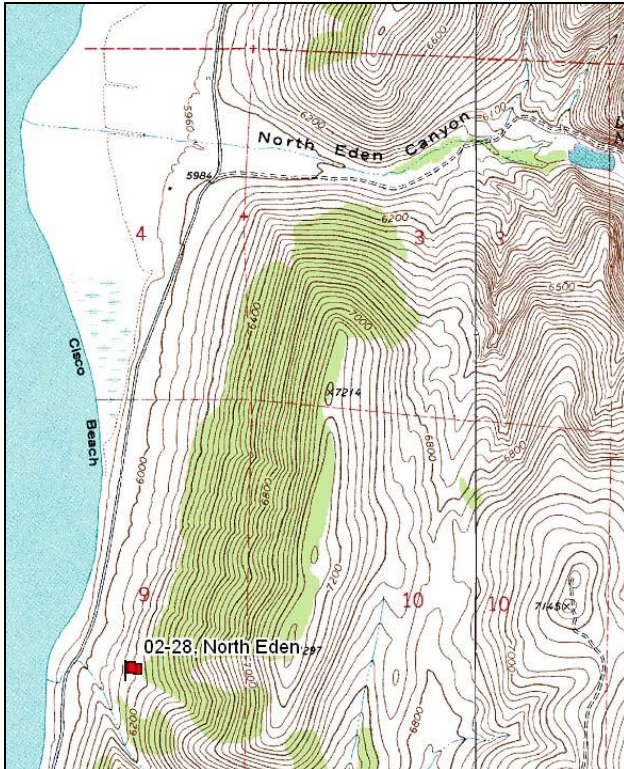
Transect bearing: 160° magnetic

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

Directions:

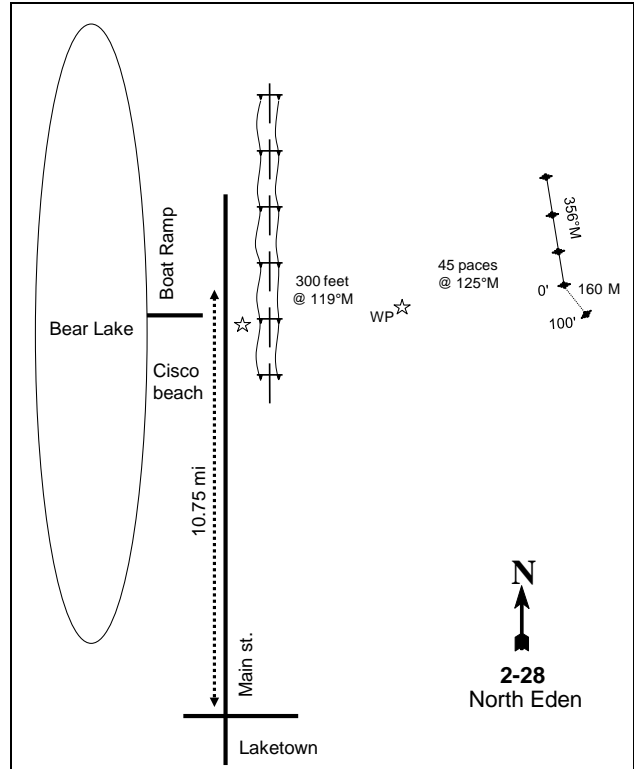
From Bear Lake road and Main Street in Laketown, proceed north on Main Street 10.75 miles along the east shore. Turn right onto a dirt road proceeding to a power line. From the power line, walk up the slope on a bearing of 119 degrees magnetic for 300 feet to a witness post. From the witness post, walk 45 paces at 119 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #9157. 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



Township: 14N Range: 6E Section: 9

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 477684 E 4646044 N

Site Information

Site Description: This study is located on the east side of Bear Lake between North and South Eden Canyons. This study is located on the border of private land and land administered by the State Institutional Trust Land Administration (SITLA). The vegetation is a mixture of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and black sagebrush (*Artemisia nova*) interspersed with Utah juniper (*Juniperus osteosperma*) trees. Deer pellet groups have been sampled in high abundance since 2001. Elk pellet groups were detected in quadrat frequency in 2006, but have been minimal on the site. Sampled cattle sign was minimal in 2001 (Table - Pellet Group Data).

Browse: The key browse species are Wyoming big sagebrush and black sagebrush. Wyoming big sagebrush density has decreased every reading since 1984. Wyoming big sagebrush has been a moderately dense, mature population with high decadence throughout the duration of the study. Utilization of Wyoming big sagebrush has been light to moderate over the course of the study. Poor vigor has been high within the population over the sample years. Recruitment of young sagebrush plants to the population has been mostly poor over the sample year, though recruitment was good in 1990 and 2006. Density of black sagebrush is diffuse, with a mostly mature population. There was a steep decline in density between 1990 and 1996, this change in density is likely the result of the larger sample used in 1996. Regardless of the change in sample method, the population has steadily decreased in density over the duration of the study. Utilization has been light to moderate over the course of the study. Poor vigor has increased over the sample years. Recruitment of young black sagebrush has been poor since the outset of the study, though recruitment was good in 1990 and 2011. Other shrub species include stickleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), rubber rabbitbrush (*Chrysothamnus nauseosus*), plains pricklypear (*Opuntia polyacantha*), and Utah juniper; and none occur frequently or sustain much browsing use (Table - Browse Characteristics).

Herbaceous Understory: Herbaceous cover consists primarily of perennial grasses, namely bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*), both of which have maintained stable populations over the duration of the study. The weedy annual species cheatgrass (*Bromus tectorum*) is also abundant and has high cover. Forbs are uncommon and provide a minor component of the herbaceous understory (Table - Herbaceous Trends).

Soil: The soil is within the Dagan-Rubble land complex series, likely as part of Dagan component, which occurs on canyons and escarpments. The parent material consists of colluvium derived from conglomerate and/or sandstone. This is a moderately calcareous soil with low water holding capability. All the Dagan soils are subject to rapid runoff and have high erosion hazards (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 7.2). Bare ground cover is moderate with a large amount of vegetation and litter providing protective ground cover (Table - Basic Cover). There is some erosion occurring in the form of pedestalling, flow patterns, rills, and soil movement, but is localized and not severe. Thus, the soil erosion condition was determined to be slight in 2001 and 2006, but stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for Wyoming big sagebrush decreased 35% from 5,331 plants to 3,465 plants/acre. Decadence within the Wyoming big sagebrush population increased from 53% to 60%. Poor vigor within the Wyoming big sagebrush population increased from 10% to 33%. The density for black sagebrush decreased 38 % from 3,332 plants/acre to 2,065 plants/acre. Black sagebrush decreased in decadence from 70% to 32%. Poor vigor within the black sagebrush population decreased from 12% to 3%.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence for Wyoming big sagebrush decreased to 46%, but is still considered to be very high. Poor vigor within the Wyoming big sagebrush population decreased to 26%, but is still considered to be high. Decadence for black sagebrush decreased to 14%. Poor vigor within the black sagebrush population increased to 9%.
- **1996 to 2001 - slightly down (-1):** %. The density for Wyoming big sagebrush decreased by 9% from 2,800 plants/acre to 2,560 plants/acre. Cover for Wyoming big sagebrush decreased from 14% to 11%. Health of the Wyoming big sagebrush population is mixed with an increase in decadence to 56%, while poor vigor within the population decreased to 16%. The density for black sagebrush decreased 45% from 440 plants/acre to 240 plants/acre. Black sagebrush increased in decadence to 25%, and poor vigor within the black sagebrush population increased to 17
- **2001 to 2006 - slightly down (-1):** The density for Wyoming big sagebrush decreased 11% to 2,280 plants/acre. Cover for Wyoming big sagebrush decreased to 7%. Decadence within the Wyoming big sagebrush population increased to 62%. Poor vigor within the Wyoming big sagebrush population increased to 40%. The density for black sagebrush increased 17% to 280 plants/acre. Both decadence and poor vigor within the black sagebrush population increased to 29%.
- **2006 to 2011 - slightly down (-1):** The density for Wyoming big sagebrush increased 2% to 2,330 plants/acre. Cover for Wyoming big sagebrush decreased to 5%. Wyoming big sagebrush increased in decadence to 68%. Poor vigor within the Wyoming big sagebrush population increased to 59%. The density for black sagebrush decreased 36% to 180 plants/acre. Decadence within the black sagebrush population increased to 56%. Poor vigor within the black sagebrush population increased to 67%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 30%. The preferred perennial grass species bluebunch wheatgrass and Sandberg bluegrass both increased significantly in nested frequency.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 10%. Bluebunch wheatgrass decreased significantly in nested frequency, and had a cover of 7%. Sandberg bluegrass remained the dominant grass on the site, and had a cover of 8%. Annual grasses were included in the sample for the first time in 1996. The weedy annual grass cheatgrass was common on the site, and had a cover of 4%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses decreased 9%. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to 7%. Although a minor component of the perennial grass composition, bottlebrush squirreltail (*Sitanion hystrix*) decreased significantly in nested frequency, and cover remained similar at 1%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial grasses increased 28%. Bluebunch wheatgrass increased significantly in nested frequency, and increased in cover from 10% to 18%. Sandberg bluegrass increased in cover to 14%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 13%. The preferred species bluebunch wheatgrass decreased significantly in nested frequency, and decreased in cover to 14%. The weedy annual species cheatgrass increased significantly in nested frequency, and increased in cover from 3% to 7%.

Forb:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial forbs increased over eight-fold. Tapertip hawksbeard (*Crepis acuminata*), Hoods phlox (*Phlox hoodii*), and longleaf phlox (*P. longifolia*) all had a significant increase in nested frequency.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 64%. Longleaf phlox had a significant decrease in nested frequency, and had a cover of less than 1%.

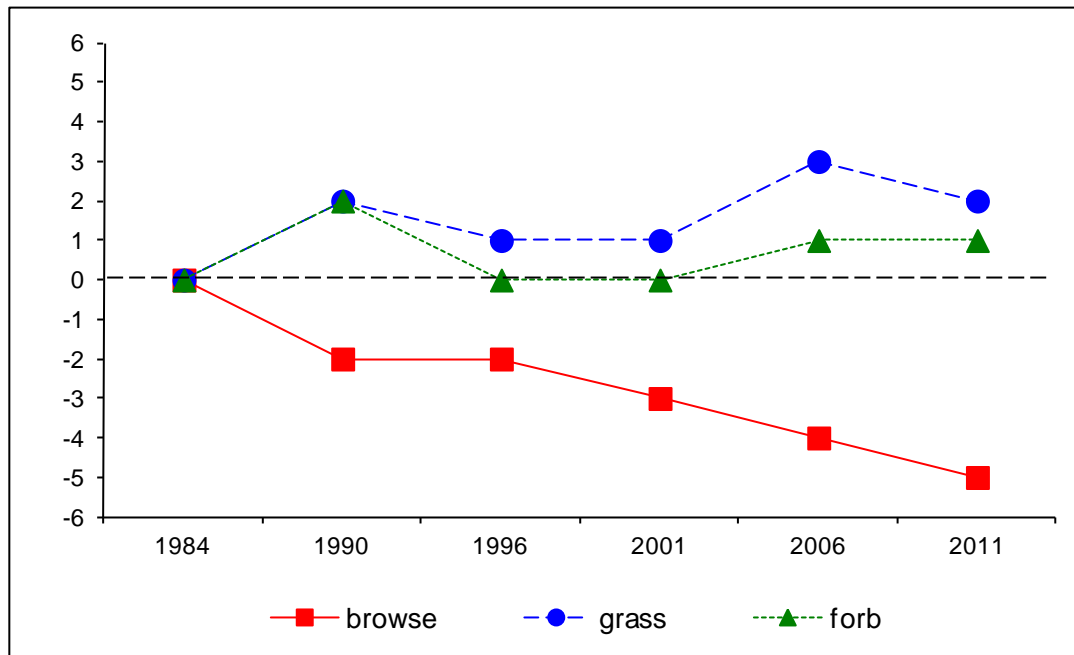
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs decreased 23%, but perennial forbs were already rare. Longleaf phlox decreased significantly in nested frequency. The annual species bush birdbeak (*Cordylanthus ramosus*) dominated the forb community in cover at 8%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 83%, but remain fairly rare on the site. Cover of perennial forbs increased from 1% to 2%. Pale agoseris (*Agoseris glauca*) had a significant increase in nested frequency. The annual species bush bird beak decreased in cover to less than 1%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar, but cover increased to 4%. The annual species bush birdbeak increased significantly in nested frequency, and increased in cover to 3%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 2, study no: 28

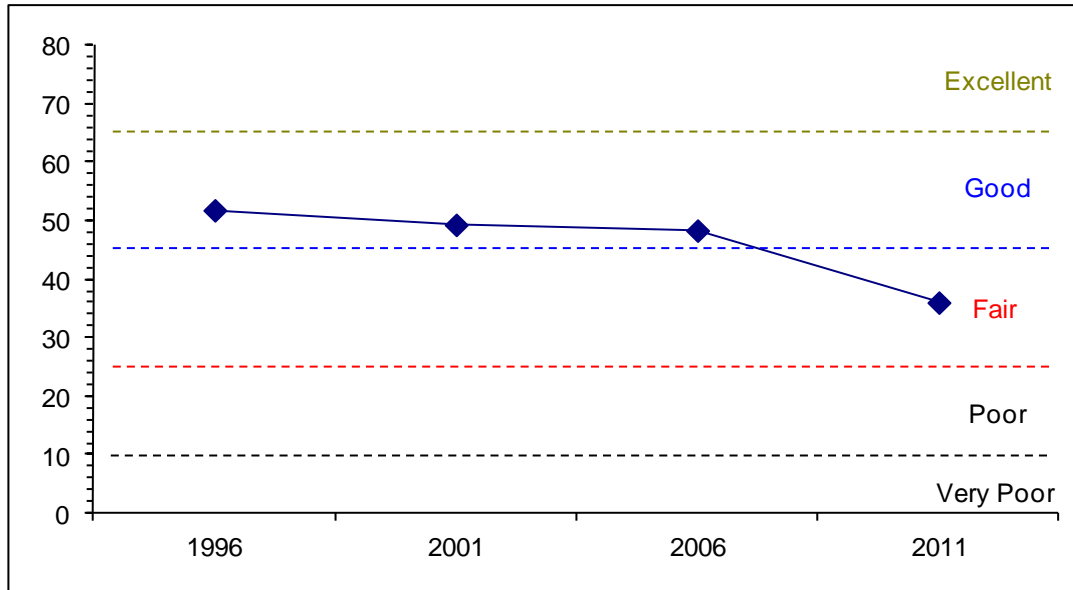
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.5	2.2	1.6	30.0	-3.2	1.8	0.0	51.8	Good
01	16.9	0.0	1.4	30.0	-1.6	2.7	0.0	49.3	Good
06	10.2	-2.3	8.7	30.0	-2.6	4.3	0.0	48.3	Good
11	5.9	-5.4	2.1	30.0	-4.9	8.4	0.0	36.0	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 28



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 2, Study no: 28



HERBACEOUS TRENDS--
 Management unit 02, Study no: 28

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a161	bc210	a137	ab155	c222	ab174	7.19	10.05	17.88	13.67
G	Bromus tectorum (a)	-	-	a152	a173	a168	b239	4.32	2.15	3.40	6.58
G	Oryzopsis hymenoides	ab3	a-	a-	ab14	ab7	b15	.03	.86	.77	.69
G	Poa secunda	a210	c303	c284	b239	bc280	ab237	8.09	7.41	14.00	7.99
G	Sitanion hystrix	abc26	a5	c47	ab20	bc39	c50	1.29	.75	1.85	1.80
G	Stipa comata	-	-	-	-	-	-	-	-	-	.00
Total for Annual Grasses		0	0	152	173	168	239	4.32	2.15	3.40	6.58
Total for Perennial Grasses		400	518	468	428	548	476	16.61	19.08	34.50	24.16
Total for Grasses		400	518	620	601	716	715	20.94	21.24	37.91	30.75
F	Agoseris glauca	a-	a-	a-	a-	b10	a-	-	-	.05	-
F	Arabis sp.	-	-	-	1	3	5	-	.00	.00	.01
F	Astragalus convallarius	9	-	-	9	11	1	-	.02	.11	.00
F	Astragalus sp.	2	-	-	-	3	-	-	-	.00	.00
F	Balsamorhiza sagittata	-	-	1	4	5	4	.30	.21	.24	.68
F	Calochortus nuttallii	-	3	-	-	2	-	-	-	.00	-
F	Chaenactis douglasii	-	-	3	-	-	-	.00	-	-	-
F	Collinsia parviflora (a)	-	-	7	5	3	12	.18	.01	.00	.02
F	Collomia linearis (a)	-	-	-	-	8	-	-	-	.02	-
F	Cordylanthus ramosus (a)	-	-	ab30	b55	a16	b47	.48	7.51	.09	2.45
F	Crepis acuminata	a9	bc33	ab16	abc25	c35	c41	.14	.56	1.00	1.70
F	Cryptantha sp.	1	2	-	-	7	2	-	-	.02	.03
F	Descurainia pinnata (a)	-	-	-	3	6	47	-	.00	.04	.30
F	Draba sp. (a)	-	-	-	-	3	6	-	-	.00	.01
F	Erigeron sp.	a-	a5	a6	a11	ab21	b34	.09	.48	.52	1.55

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Gayophytum ramosissimum(a)	-	-	-	-	-	7	-	-	-	.01
F	Hackelia patens	-	-	-	1	-	1	-	.00	-	.00
F	Holosteum umbellatum (a)	-	-	a1	a-	a12	b85	.00	-	.03	3.00
F	Lithophragma sp.	-	-	-	-	-	2	-	-	-	.00
F	Penstemon sp.	-	-	-	5	-	3	-	.01	.03	.04
F	Phlox hoodii	a6	b26	a-	a6	ab12	a6	-	.03	.08	.06
F	Phlox longifolia	a-	c149	b53	a1	a6	a15	.19	.00	.04	.09
F	Sphaeralcea grossulariifolia	-	-	3	-	-	-	.15	-	-	-
F	Tragopogon dubius (a)	b10	a-	a-	a-	a1	a-	-	-	.03	-
F	Unknown forb-perennial	a-	b12	a-	a-	a-	a-	-	-	-	-
Total for Annual Forbs		10	0	38	63	49	204	0.67	7.53	0.23	5.81
Total for Perennial Forbs		27	230	82	63	115	114	0.88	1.34	2.14	4.19
Total for Forbs		37	230	120	126	164	318	1.55	8.88	2.37	10.01

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	'11	'96	'01	'06	'11
B	Artemisia nova	10	8	7	4	1.60	1.92	1.06	.03
B	Artemisia tridentata wyomingensis	80	72	70	68	14.01	11.19	7.11	4.67
B	Atriplex canescens	0	0	0	0	-	.38	-	-
B	Chrysothamnus nauseosus	0	0	1	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	13	17	13	19	1.30	2.28	.86	.99
B	Eriogonum microthecum	2	0	2	1	-	-	-	-
B	Gutierrezia sarothrae	0	1	0	0	-	-	-	-
B	Juniperus osteosperma	3	3	5	5	3.94	5.14	5.63	2.87
B	Opuntia polyacantha	3	3	3	4	.03	-	.18	.38
Total for Browse		111	104	101	101	20.89	20.92	14.85	8.94

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 28

Species	Percent Cover		
	'01	'06	'11
Artemisia nova	-	1.41	.76
Artemisia tridentata wyomingensis	-	9.60	6.46
Chrysothamnus viscidiflorus viscidiflorus	-	.96	1.29
Juniperus osteosperma	9.00	8.88	9.31

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 28

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.0	1.5	2.1

POINT-QUARTER TREE DATA--

Management unit 02, Study no: 28

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	40	72	40	50	4.1	3.1	8.3	6.3

BASIC COVER--

Management unit 02, Study no: 28

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	10.00	43.52	45.41	57.80	46.74
Rock	1.00	1.00	.74	.28	1.01	.77
Pavement	0	0	.75	1.60	1.26	.27
Litter	54.25	43.25	44.15	61.11	39.27	40.31
Cryptogams	20.50	16.00	11.19	6.84	12.67	7.21
Bare Ground	22.00	29.75	12.75	12.17	11.55	19.13

SOIL ANALYSIS DATA --

Management unit 02, Study no: 28, Study Name: North Eden

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.8	7.2	34.9	36.1	29.0	1.8	9.7	134.4	0.6

PELLET GROUP DATA--

Management unit 02, Study no: 28

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	25	41	46	33	-	-	-
Elk	-	-	1	9	-	-	-
Deer	39	36	60	37	108 (266)	169 (417)	60 (149)
Cattle	7	1	-	-	3 (7)	-	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 28

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia nova</i>									
84	3332	2	28	70	-	40	60	12	13/14
90	2065	16	52	32	66	0	0	3	15/19
96	440	5	82	14	-	82	0	9	13/21
01	240	8	67	25	-	17	0	17	15/29
06	280	7	64	29	-	0	0	29	19/31
11	180	33	11	56	-	0	0	67	10/24
<i>Artemisia tridentata wyomingensis</i>									
84	5331	5	43	53	533	30	65	10	24/25
90	3465	10	31	60	66	23	17	33	22/20
96	2800	3	51	46	-	40	10	26	29/38
01	2560	2	41	56	40	43	12	16	27/39
06	2280	19	18	62	80	23	5	40	26/38
11	2320	4	28	68	80	43	4	59	20/28
<i>Ceratoides lanata</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	14/17
<i>Chrysothamnus nauseosus</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	20	100	0	-	-	0	0	0	28/31
11	0	0	0	-	-	0	0	0	28/56
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	199	0	33	67	-	0	0	67	21/11
90	199	0	33	67	-	33	33	33	6/7
96	400	5	85	10	-	20	0	45	15/23
01	360	0	61	39	-	0	0	11	15/26
06	360	11	44	44	20	22	0	17	14/24
11	500	16	84	0	-	0	0	0	13/18

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Eriogonum microthecum</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	40	0	100	0	-	0	0	0	8/9	
01	0	0	0	0	-	0	0	0	-/-	
06	40	0	50	50	-	0	0	50	9/11	
11	20	0	100	0	-	0	0	0	6/8	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	6/4	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Juniperus osteosperma</i>										
84	133	0	100	-	66	0	0	0	69/49	
90	132	50	50	-	-	0	0	0	93/63	
96	60	33	67	-	-	0	0	0	-/-	
01	60	33	67	-	-	0	0	0	-/-	
06	100	40	60	-	20	0	0	0	-/-	
11	100	40	60	-	-	0	0	0	-/-	
<i>Opuntia polyacantha</i>										
84	199	0	100	-	-	0	0	0	6/7	
90	399	0	100	-	66	0	0	0	4/7	
96	80	0	100	-	-	0	0	0	6/20	
01	60	0	100	-	-	0	0	0	6/15	
06	100	20	80	-	-	0	0	0	6/12	
11	120	0	100	-	-	0	0	0	5/10	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	26/57	
11	0	0	0	-	-	0	0	0	20/36	

WOODRUFF CREEK - TREND STUDY NO. 2-29-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Upland Stony Loam \(Wyoming Big Sagebrush\), R047XA338UT](#)

Land Ownership: BLM

Elevation: 6,699 ft (2,042 m)

Aspect: Northeast

Slope: 3%

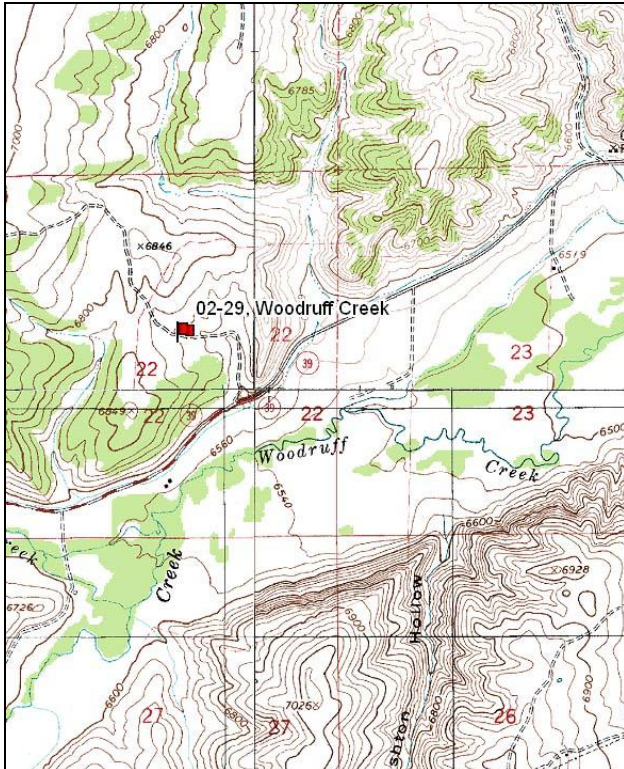
Transect bearing: 162° magnetic

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

Directions:

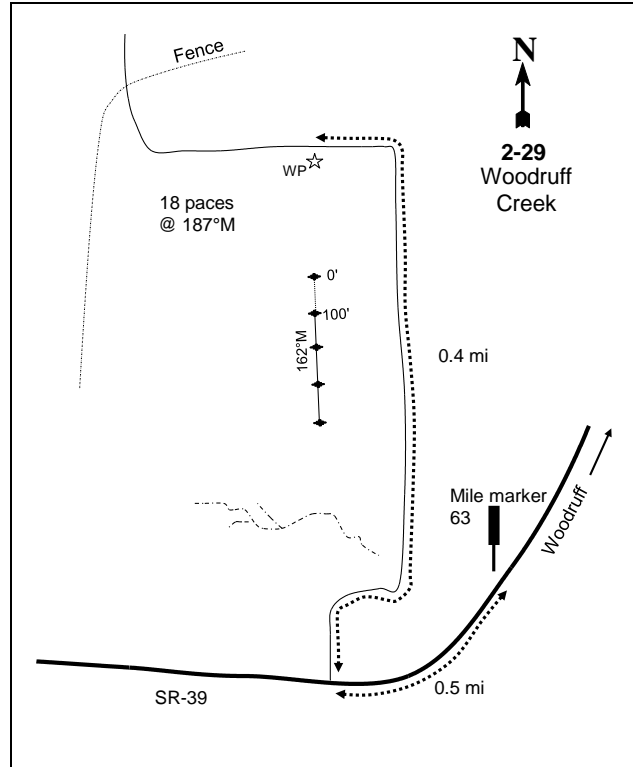
From the junction of SR-39 and SR-16 in Woodruff, proceed west on SR-39 for 5.05 miles, and turn right onto a dirt road. This road should be 0.05 miles past marker 63. Proceed north on this road stopping after 0.4 miles at a witness post on the left (south). From the witness post, walk 18 paces at 187 degrees magnetic to the 0-foot stake of the baseline marked by browse tag #7989.

Map Name: Birch Creek Reservoir



Township: 9N Range: 6E Section: 22

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 478732 E 4594493 N

WOODRUFF CREEK - TREND STUDY NO. 2-29

Site Information

Site Description: This study is located north of Woodruff Creek on crucial winter range in a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and scattered Utah juniper (*Juniperus osteosperma*) woodland. Prior to the establishment of the study in 1984, the surrounding habitat was chained and seeded; however, 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. Because of the lack of browse species in the chained area, wildlife occupancy may have increased on the unchained study plot. Cattle presence appeared most abundant in the chained area. Deer pellet groups were sampled in high abundance in 2001 and 2006, but moderate abundance in 2011. Three deer carcasses were found near the study in 2006. Elk pellet groups were sampled in low abundance in 2011. Cattle pats have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: Available browse forage comes primarily from Wyoming big sagebrush, which has a moderately dense population. The Wyoming big sagebrush has been a highly decadent, mature population, and recruitment of young to the population has been poor over the course of the study. The sagebrush plants have been lightly to moderately hedged throughout the length of the study; however, utilization was heavy in 1984 and 1990. Other browse species include Saskatoon serviceberry (*Amelanchier alnifolia*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), mountain snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tetradymia canescens*). Except for stickyleaf low rabbitbrush, all occur in small numbers (Table - Browse Characteristics). Thick juniper encroachment may be limiting available resources for sagebrush (Table - Point Quarter Tree Data).

Herbaceous Understory: The herbaceous understory is diverse, but not particularly abundant. The most common perennial grass species are thickspike wheatgrass (*Agropyron dasystachyum*), mutton bluegrass (*Poa fendleriana*), and Sandberg bluegrass (*P. secunda*). The weedy annual grass species cheatgrass (*Bromus tectorum*) is present, but occurs in low abundance. Forbs are fairly diverse, but comprise a minor part of the herbaceous understory. However, in 2011, total forb cover equaled that of total grass cover (Table - Herbaceous Trends).

Soil: Soil is within the Cutoff component, which occurs on hilltops. The parent material consists of colluvium and/or residuum weathered from sandstone (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 7.3) (Table - Soil Analysis Data). Bare ground cover is moderate, with a moderate amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The interspaces are mostly unprotected and have a higher amount of bare ground. Soil pedestalling is evident and sheet erosion has occurred, thus the soil erosion condition was determined to be slight in 2001, moderate in 2006, but stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** The density for Wyoming big sagebrush displayed no change and maintained a density of 6,465 plants/acre. Decadence within the sagebrush population was sustained at 57%. Sagebrush increased in poor vigor from 6% to 28%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. The sagebrush population decreased in decadence to 41%, but is still considered to be very high. Poor vigor within the sagebrush population decreased to 25%, and is also considered to be high.

- **1996 to 2001 - slightly up (+1):** The density for Wyoming big sagebrush increased 12% from 2,260 plants/acre to 2,540 plants/acre. Decadence within the sagebrush population increased to 57%. The sagebrush population decreased in poor vigor to 9%.
- **2001 to 2006 - down (-2):** The density for Wyoming big sagebrush decreased 27% to 1,860 plants/acre. The sagebrush population increased in decadence to 66%. Poor vigor within the sagebrush population increased to 68%.
- **2006 to 2011 - up (+2):** The density for Wyoming big sagebrush increased 25% to 2,320 plants/acre. Decadence within the sagebrush population decreased to 52%, but is still considered to be very high. Poor vigor within the sagebrush population decreased to 35%, and is considered to be very high.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 42%. The increase is primarily due to the significant increase in nested frequency for mutton bluegrass.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses decreased 28%. Thickspike wheatgrass and Sandberg bluegrass decreased significantly in nested frequency, and had covers of 1% and 3%, respectively.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Thickspike wheatgrass decreased significantly in nested frequency, and decreased in cover from 2% to less than 1%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial grasses increased 34%. Thickspike wheatgrass and Sandberg bluegrass increased significantly in nested frequency, and increased in cover from less than 1% to 2%, and 2% to 3%, respectively.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased 37%. Lobedleaf groundsel (*Senecio multilobatus*), Douglas chaenactis (*Chaenactis douglasii*), and Utah locoweed (*Astragalus utahensis*) decreased significantly in nested frequency.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 13%. Lobedleaf groundsel increased significantly in nested frequency, and had a cover of 1%. The weedy perennial species showy milkweed (*Asclepias speciosa*) was observed for the first time, and had a cover of less than 1%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Lobedleaf groundsel decreased significantly in nested frequency, and had a cover of less than 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Beckwith milkvetch (*Astragalus beckwithii*) and scarlet gilia (*Ipomopsis aggregata*) increased significantly in nested frequency, and each species provided less than 1% cover.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 42%. Timber poisonvetch (*Astragalus convallarius*), longleaf phlox, and low penstemon (*Penstemon humilis*) increased significantly in nested frequency. Low penstemon increased in cover from less than 1% to 2%.

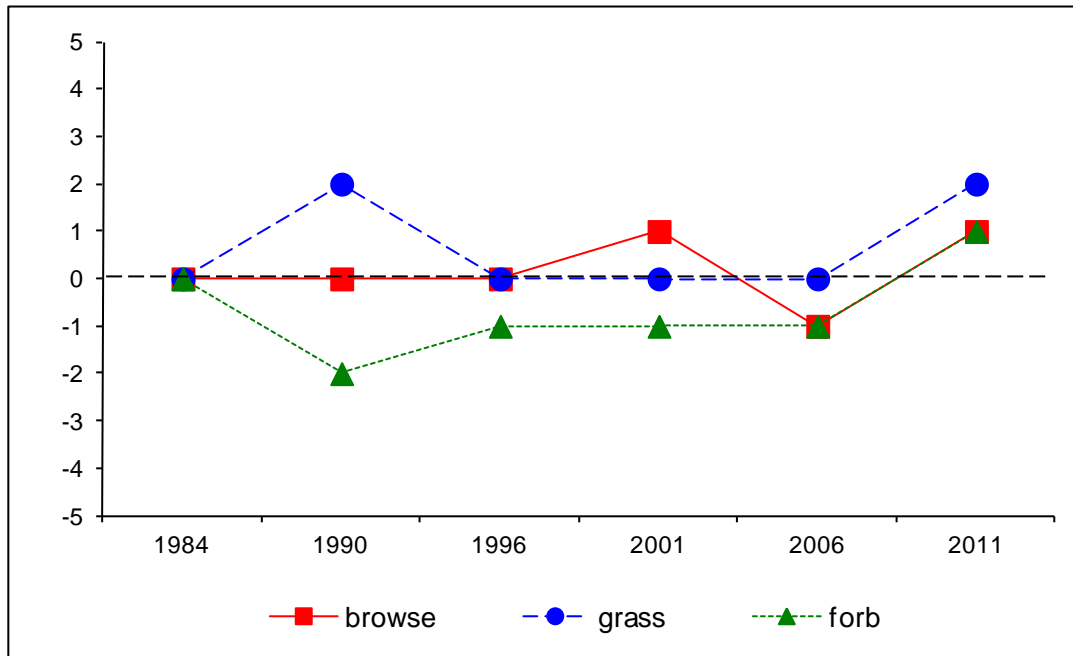
DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
 Management unit 2, study no: 29

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	6.9	2.7	0.0	19.9	-0.1	8.2	0.0	37.6	Fair
01	6.6	-2.1	3.5	21.5	0.0	6.7	0.0	36.2	Fair
06	5.7	-4.8	3.0	24.1	0.0	10.0	0.0	38.0	Fair
11	4.6	-0.6	4.5	23.5	0.0	10.0	0.0	41.9	Fair

Trend Summary

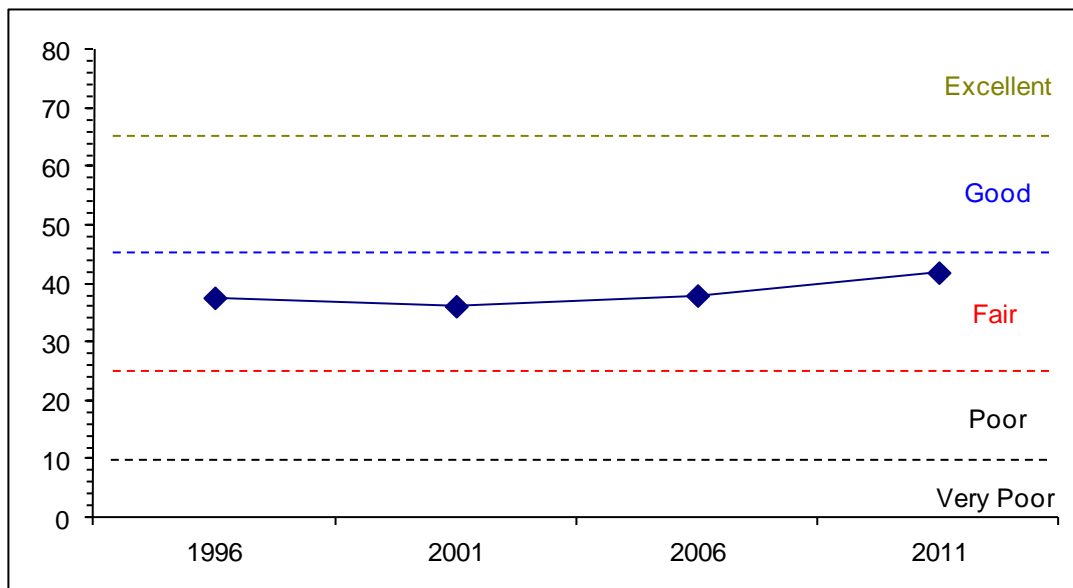
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 29



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--

Management unit 2, Study no: 29



HERBACEOUS TRENDS--
Management unit 02, Study no: 29

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a-	a-	a1	ab12	b22	b32	.03	.51	1.08	1.22
G	Agropyron dasystachyum	d195	d201	b101	bc142	a10	bd176	.54	1.97	.27	2.06
G	Agropyron smithii	-	-	a-	a-	b114	a2	-	-	2.20	.00
G	Agropyron spicatum	a1	a7	b24	a8	a11	a8	.36	.41	.45	.18
G	Bromus tectorum (a)	-	-	11	6	3	5	.16	.01	.01	.04
G	Oryzopsis hymenoides	a1	ab20	ab11	b24	ab14	ab17	.61	1.22	.74	.59
G	Poa fendleriana	a46	d141	cd133	bc102	ab86	abc85	5.24	4.10	3.74	2.06
G	Poa pratensis	a-	a-	a1	a-	b23	a-	.03	-	.63	-
G	Poa secunda	bc123	c161	ab102	abc111	a77	bc121	2.53	2.26	2.50	2.90
G	Sitanion hystrix	a22	a22	a27	a9	a17	b72	.57	.24	.30	2.66
G	Stipa comata	-	-	-	-	10	1	-	-	.12	.03
Total for Annual Grasses		0	0	11	6	3	5	0.16	0.01	0.01	0.03
Total for Perennial Grasses		388	552	400	408	384	514	9.94	10.73	12.07	11.73
Total for Grasses		388	552	411	414	387	519	10.10	10.75	12.09	11.77
F	Achillea millefolium	-	-	1	-	3	2	.00	-	.03	.03
F	Allium acuminatum	ab14	a-	a-	a-	a7	b25	-	-	.04	.15
F	Alyssum alyssoides (a)	-	-	-	1	-	2	-	.00	-	.01
F	Antennaria rosea	7	10	3	2	10	7	.00	.03	.07	.07
F	Arabis holboellii	a2	a-	ab4	a-	ab11	b12	.01	-	.04	.03
F	Asclepias speciosa	a-	a-	b12	a-	a-	a-	.36	-	-	-
F	Astragalus beckwithii	ab13	a-	a-	a3	b29	ab12	-	.03	.52	.05
F	Astragalus convallarius	a13	a-	ab12	bc34	ab14	c41	.05	.33	.06	.44
F	Astragalus utahensis	b18	a6	a2	ab12	a1	a4	.00	.12	.03	.01
F	Calochortus nuttallii	1	-	-	-	-	2	-	-	-	.00
F	Chaenactis douglasii	b34	a2	a6	a7	a5	a16	.01	.02	.10	.06
F	Chenopodium fremontii (a)	-	-	a-	a-	a-	b8	-	-	-	.03
F	Collinsia parviflora (a)	-	-	-	-	-	3	-	-	-	.00
F	Comandra pallida	35	21	23	24	25	24	.13	.17	.33	.33
F	Cordylanthus ramosus (a)	-	-	a12	a20	a21	b125	.07	.09	.25	4.29
F	Crepis acuminata	3	-	4	3	-	4	.00	.03	-	.01
F	Cryptantha sp.	26	22	26	32	27	50	.46	1.08	.50	1.35
F	Cymopterus sp.	-	-	10	-	-	-	.02	-	-	-
F	Descurainia pinnata (a)	-	-	a3	a-	a-	b10	.00	-	-	.03
F	Draba sp. (a)	-	-	-	-	2	-	-	-	.00	-
F	Erigeron pumilus	b11	a-	a-	a2	a3	a2	-	.00	.03	.03
F	Eriogonum racemosum	-	-	-	-	1	2	-	-	.03	.00
F	Eriogonum umbellatum	4	-	5	-	11	-	.04	-	.10	-
F	Halogeton glomeratus (a)	-	-	1	-	-	-	.00	-	-	-
F	Ipomopsis aggregata	a7	a-	a4	a-	b18	a13	.01	-	.14	.06
F	Lappula occidentalis (a)	-	-	-	-	2	2	-	-	.00	.03
F	Lithospermum ruderales	3	-	-	4	-	-	-	.15	.03	-
F	Microsteris gracilis (a)	-	-	-	4	-	-	-	.01	-	-
F	Penstemon humilis	c86	c85	a46	ab53	a43	bc81	.58	.40	.31	1.78

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Phlox hoodii	88	103	80	80	72	71	1.41	.74	2.25	2.01
F	Phlox longifolia	_{ab} 62	_a 48	_a 33	_a 58	_a 51	_b 92	.08	.15	.24	.49
F	Polygonum douglasii (a)	-	-	-	-	-	4	-	-	-	.00
F	Ranunculus testiculatus (a)	-	-	_a 1	_a -	_a 3	_b 37	.00	-	.00	.11
F	Senecio multilobatus	_b 61	_a 10	_b 75	_a 20	_a 13	_a 28	.89	.07	.11	.29
Total for Annual Forbs		0	0	17	25	28	191	0.08	0.11	0.26	4.52
Total for Perennial Forbs		488	307	346	334	344	488	4.11	3.37	5.00	7.25
Total for Forbs		488	307	363	359	372	679	4.19	3.48	5.26	11.78

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	60	60	57	58	5.53	5.25	4.52	3.65
B	Chrysothamnus viscidiflorus viscidiflorus	77	74	80	84	4.97	4.13	7.97	8.74
B	Juniperus osteosperma	8	8	11	11	4.42	4.32	3.76	5.65
B	Symphoricarpos oreophilus	3	1	1	3	.15	.30	.06	.03
B	Tetradymia canescens	19	18	18	24	1.01	.85	1.47	1.04
Total for Browse		167	161	167	180	16.11	14.86	17.79	19.13

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 29

Species	Percent Cover		
	'01	'06	'11
Artemisia tridentata wyomingensis	-	4.09	4.71
Chrysothamnus viscidiflorus viscidiflorus	-	6.61	7.91
Juniperus osteosperma	9.80	15.96	16.58
Tetradymia canescens	-	.60	1.03

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 29

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.0	0.7	1.6

POINT-QUARTER TREE DATA--

Management unit 02, Study no: 29

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	206	218	226	230	5.5	7.1	6.4	1.6

BASIC COVER--

Management unit 02, Study no: 29

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	4.75	7.50	30.55	31.23	36.56	39.02
Rock	1.75	2.50	1.46	.78	.95	.96
Pavement	10.50	21.75	9.37	9.81	13.93	9.84
Litter	47.25	33.50	38.38	42.15	28.74	30.59
Cryptogams	3.00	13.75	2.05	3.30	3.23	2.99
Bare Ground	32.75	21.00	27.75	31.45	26.09	29.25

SOIL ANALYSIS DATA --

Management unit 02, Study no: 29, Study Name: Woodruff Creek

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.2	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	21	15	28	30	-	-	-
Elk	6	2	6	18	-	-	5 (13)
Deer	38	42	32	32	103 (255)	88 (218)	37 (91)
Cattle	-	-	2	1	2 (5)	4 (11)	6 (14)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 29

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Amelanchier alnifolia										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	16/24	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	20/27	
11	0	0	0	-	-	0	0	0	17/26	
Artemisia tridentata wyomingensis										
84	6465	5	38	57	-	11	78	6	13/16	
90	6465	4	39	57	-	51	41	28	19/21	
96	2260	0	59	41	60	41	11	25	16/27	
01	2540	7	36	57	100	57	2	9	16/25	
06	1860	6	28	66	80	16	1	68	14/26	
11	2320	9	40	52	20	51	13	35	14/21	

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Chrysothamnus viscidiflorus viscidiflorus									
84	2998	4	80	16	-	0	0	2	7/10
90	3598	28	54	19	-	43	2	0	7/12
96	4900	3	95	2	-	0	0	.81	9/15
01	4720	2	89	9	-	.42	0	3	9/13
06	5240	8	85	7	40	.38	0	5	9/15
11	6920	8	92	0	80	0	0	0	10/15
Juniperus osteosperma									
84	266	50	50	0	66	0	25	0	57/22
90	332	80	20	0	-	40	20	0	89/51
96	160	0	100	0	-	25	0	0	-/-
01	160	38	63	0	40	0	0	0	-/-
06	220	27	73	0	20	0	0	0	51/51
11	240	17	58	25	40	0	0	0	-/-
Symphoricarpos oreophilus									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	80	0	100	-	-	0	0	25	11/21
01	20	0	100	-	-	0	0	0	10/29
06	20	0	100	-	-	0	0	0	14/30
11	120	50	50	-	-	83	17	0	15/30
Tetradymia canescens									
84	133	0	100	0	-	50	50	0	9/16
90	199	0	0	100	-	67	33	0	-/-
96	440	0	91	9	-	9	0	5	12/20
01	400	0	80	20	-	0	0	0	12/21
06	440	14	68	18	40	9	0	23	11/18
11	600	3	97	0	-	23	0	0	12/21

STATE LINE - TREND STUDY NO. 2-30-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: BLM

Elevation: 6,500 ft (1,981 m)

Aspect: Level

Slope: 3%

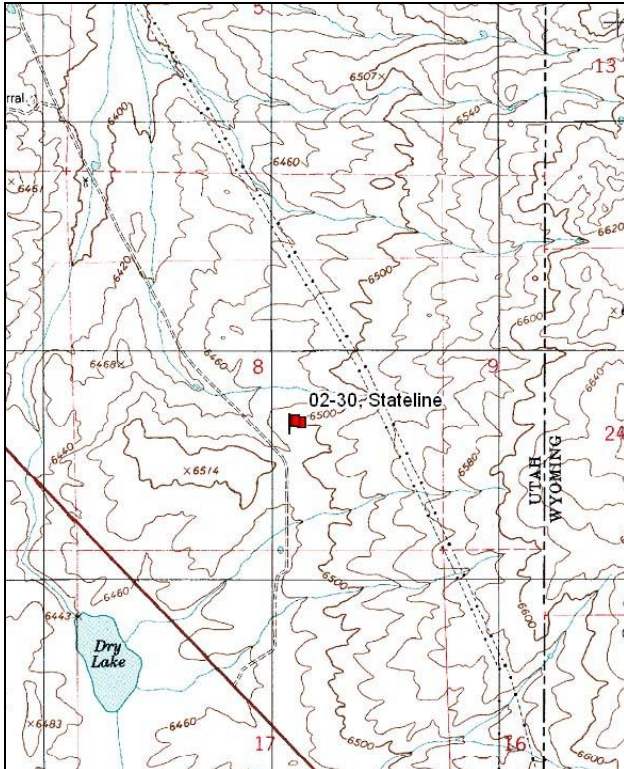
Transect bearing: 170° magnetic

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

Directions:

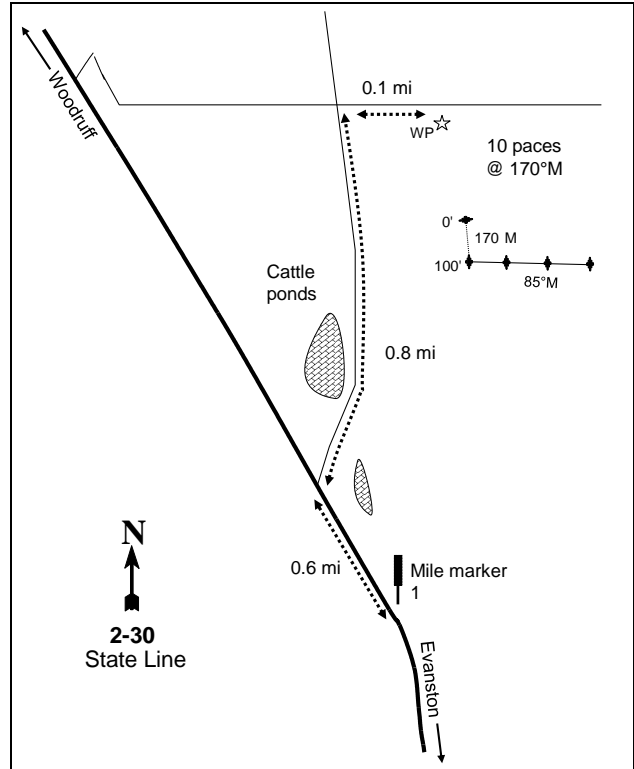
From the Utah/Wyoming border, proceed north on Highway 16 for 0.6 miles past mile marker 1. Turn right proceeding through gate, and travel 0.8 miles north to an intersection in a wash. Turn right, and drive 0.1 miles east to a witness post. Walk ten paces at a bearing of 170 degrees magnetic. From 0' to 100' at 170 degrees magnetic, and from 100' to 400' at 85 degrees magnetic. The 0-foot stake is wired with a browse tag # 7991.

Map Name: Neponset Reservoir NE



Township: 8N Range: 8E Section: 8

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 495018 E 4587837 N

STATE LINE - TREND STUDY NO. 2-30

Site Information

Site Description: This study is located near the Utah-Wyoming border southeast of Woodruff. The area is administered by the Bureau of Land Management (BLM) as part of the East Woodruff allotment. This area is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and has very few species in the herbaceous understory. The area is used by deer, elk, and pronghorn. Due to their similarity in pellet appearance, deer and pronghorn pellet groups were combined. Deer/pronghorn pellet groups were sampled in moderate abundance in 2001 and 2006, but high abundance in 2011. Elk and cattle sign has been minimal since 2001. Cattle were in the area during the spring and early summer of 2001 and 2006. Sage-grouse are also present in the area, and some sage-grouse droppings were encountered in 2001 (Table - Pellet Group Data).

Browse: The landscape is dominated by the preferred browse species Wyoming big sagebrush. Wyoming big sagebrush is a dense, mature population that has been fairly stable over the course of the study. Decadence within the sagebrush population has been high since the outset of the study. Sagebrush plants have been moderately to heavily utilized over the duration of the study. Sagebrush plants displaying poor vigor within the population have fluctuated over the course of the study, but since 2001 the population has had a steady increase of plants displaying poor vigor within the population. Recruitment of young Wyoming big sagebrush plants has been nominal since 1990. Other fairly common browse species include Gardner saltbush (*Atriplex gardneri* ssp. *falcate*) and stickleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). Gardner saltbush is a very small, low-growing saltbush that is strongly rhizomatous and sprouts profusely. Stickleaf low rabbitbrush is a vigorous, mature population that has been lightly hedged over the duration of the study (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous community lacks diversity and produces little forage. The most common perennial grass species is Sandberg bluegrass (*Poa secunda*). Annual grass species are not yet present on the study, and have been absent since 1984. Perennial forbs species are infrequent and produce very little cover. Common species found on the site include Hoods phlox (*Phlox hoodii*) and stemless goldenweed (*Haplopappus acaulis*) (Table - Herbaceous Trends).

Soil: Soil is in the Neponset component, which occurs on upland slopes. The parent material consists of residuum weathered from sandstone and siltstone (Soil Survey Staff 2011). The soil has a clay loam texture and a soil reaction that is slightly alkaline (pH 7.8). Bare ground cover is high and is found primarily in the interspaces of Wyoming big sagebrush. Protective ground cover is provided by a high amount of vegetation, and a moderate amount of litter (Table - Basic Cover). Vegetation and litter is concentrated near sagebrush. 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 cryptogam crusts under sagebrush crowns. The presence of flow patterns, rills, and soil movement indicate continual erosion is occurring; therefore, the soil erosion condition has been determined to be slight since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** The density for Wyoming big sagebrush increased slightly from 7,532 plants/acre to 8,064 plants/acre. Decadence within the sagebrush population decreased from 39% to 38%. The sagebrush population increased in poor vigor from 3% to 19%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. The Wyoming big sagebrush population decreased in decadence to 32%. Poor vigor within the sagebrush population decreased to

8%. Recruitment of young sagebrush plants decreased from 17% to 2% of the population. Sagebrush had a cover of 23%.

- **1996 to 2001 - stable (0):** The density for Wyoming big sagebrush remained similar increasing from 6,500 plants/acre to 6,700 plants/acre. Decadence within the sagebrush population decreased to 21%. The sagebrush population displayed no change in vigor. Sagebrush increased in cover to 25%.
- **2001 to 2006 - stable (0):** The density for Wyoming big sagebrush remained similar at 6,600 plants/acre. Decadence within the sagebrush population increased to 30%. Poor vigor within the sagebrush population increased to 19%. Cover for sagebrush decreased to 22%.
- **2006 to 2011 - stable (0):** The density for Wyoming big sagebrush remained similar at 6,380 plants/acre. Decadence for the sagebrush population increased to 32%. Poor vigor increased to 34% of the sagebrush population. Cover for sagebrush decreased to 20%.

Grass:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 14%. Sandberg bluegrass was the most dominant perennial grass. Western wheatgrass (*Agropyron smithii*) decreased significantly in nested frequency.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 13%. Sandberg bluegrass was the most dominant grass, and had a cover of 4%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 12%. The increase is not due to any one specific species, and is likely due to small, accumulative increases in nested frequency across the perennial grass community. However, Sandberg bluegrass increased in cover to 5%, and western wheatgrass increased in cover from less than 1% to 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass decreased in cover to 3%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial grasses increased 27%. Sandberg bluegrass had a significant increase in nested frequency, and increased in cover from 4% to 8%. Bottlebrush squirreltail (*Sitanion hystrix*) had a significant increased in nested frequency, and had a cover of less than 1%.

Forb:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial forb remained similar. Timber poisonvetch (*Astragalus convallarius*) had a significant decrease in nested frequency.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 16%. Hoods phlox was the most dominant forb found on the site, and had a cover of 2%
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial forbs decreased 27%. Hoods phlox decreased significantly in nested frequency, but maintained cover near 2%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 37%. Longleaf phlox increased significantly in nested frequency and had a cover of less than 1%. Hoods phlox decreased in cover to 1%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 11%. Rockcress (*Arabis sp.*) had a significant increase in nested frequency, but had very little cover. The annual species pale alyssum (*Alyssum alyssoides*) was the most abundant forb of the community, and had a cover of 3%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

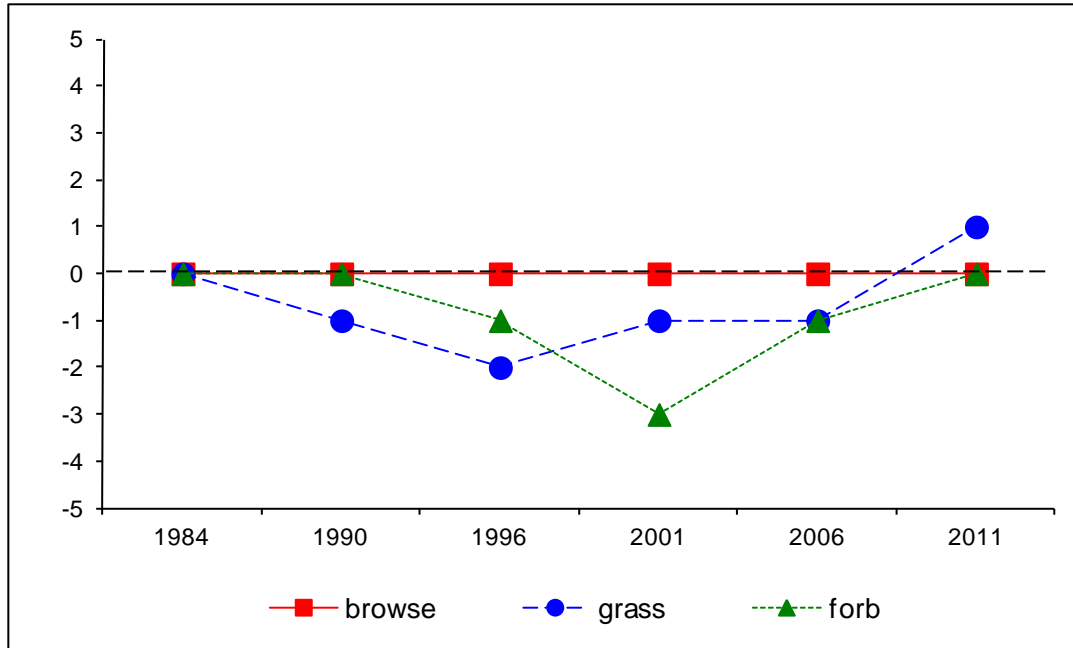
Management unit 2, study no: 30

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	29.2	5.4	1.0	9.5	0.0	6.2	0.0	51.3	Good
01	30.0	8.7	0.0	12.6	0.0	5.3	0.0	56.6	Good
06	27.5	6.0	2.0	10.1	0.0	0.0	0.0	45.6	Fair-Good
11	25.1	5.4	4.0	17.8	0.0	0.0	0.0	52.2	Good

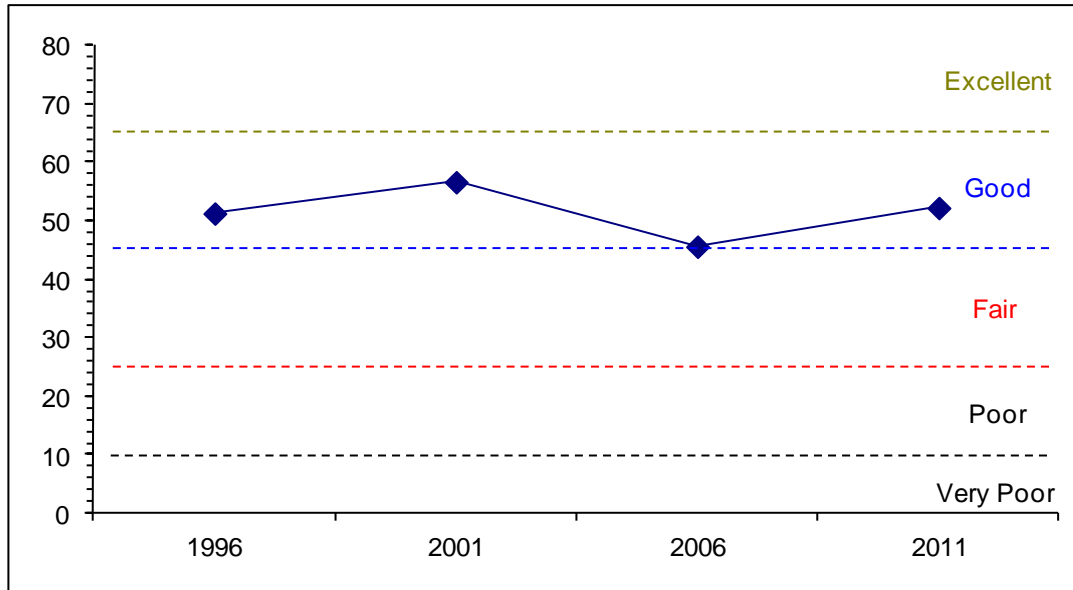
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 30



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 2, Study no: 30



HERBACEOUS TRENDS--
 Management unit 02, Study no: 30

Type	Species	Nestled Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	-	-	-	-	-	4	-	-	-	.00
G	Agropyron smithii	c140	ab94	a51	abc96	bc108	bc129	.36	.87	1.23	1.03
G	Oryzopsis hymenoides	5	9	8	10	12	8	.19	.51	.08	.07
G	Poa secunda	ab235	b248	ab232	ab245	a212	b253	4.11	4.94	3.68	7.52
G	Sitanion hystrix	a-	a9	a23	a-	a17	b45	.07	-	.07	.23
G	Stipa comata	b39	a-	a-	a-	a-	a3	-	-	-	.01
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		419	360	314	351	349	442	4.73	6.32	5.07	8.88
Total for Grasses		419	360	314	351	349	442	4.73	6.32	5.07	8.88
F	Allium sp.	-	-	-	-	-	3	-	-	-	.00
F	Alyssum alyssoides (a)	-	-	a2	c211	b147	d331	.00	.69	.57	2.59
F	Antennaria rosea	6	9	2	1	3	2	.15	.00	.00	.03
F	Arabis sp.	b19	a-	a-	a3	a1	b16	-	.00	.00	.04
F	Astragalus convallarius	b20	ab6	a2	ab9	a-	ab19	.00	.07	-	.28
F	Astragalus sp.	-	-	-	-	-	3	-	-	-	.03
F	Astragalus utahensis	-	2	1	1	-	8	.00	.00	-	.07
F	Cordylanthus ramosus (a)	-	-	-	-	-	11	-	-	-	.09
F	Cryptantha sp.	-	-	-	-	-	1	-	-	-	.00
F	Cymopterus sp.	a-	a-	a-	a3	b15	ab2	-	.00	.05	.01
F	Draba sp. (a)	-	-	3	3	-	-	.00	.03	-	-
F	Erigeron pumilus	3	5	-	-	-	-	-	-	-	-
F	Eriogonum caespitosum	-	2	-	-	-	-	-	-	-	-
F	Eriogonum cernuum (a)	-	-	-	1	-	-	-	.00	-	-
F	Gayophytum ramosissimum(a)	-	-	-	-	-	5	-	-	-	.03

Type	Species	Nestled Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Haplopappus acaulis	_b 69	_b 64	_a 30	_a 15	_a 16	_a 13	.74	.54	.42	.84
F	Phlox hoodii	_b 125	_{ab} 128	_b 133	_{ab} 89	_{ab} 102	_a 84	2.08	1.88	1.34	1.48
F	Phlox longifolia	_a 3	_{abc} 25	_{bcd} 39	_{ab} 29	_d 70	_{cd} 60	.11	.12	.32	.34
F	Ranunculus testiculatus (a)	-	-	_a -	_a -	_a 4	_b 71	-	-	.00	.25
F	Trifolium sp.	_{ab} 7	_a 4	_a -	_a 2	_a 1	_b 20	-	.00	.00	.04
F	Unknown forb-perennial	1	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	5	215	151	418	0.00	0.73	0.57	2.97
Total for Perennial Forbs		253	245	207	152	208	231	3.09	2.64	2.16	3.19
Total for Forbs		253	245	212	367	359	649	3.10	3.37	2.74	6.17

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	98	96	94	97	23.38	25.17	21.96	20.04
B	Atriplex gardneri falcata	14	15	14	17	.56	.27	.28	.67
B	Ceratoides lanata	0	0	0	1	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	56	51	47	52	1.41	1.91	1.71	1.33
B	Leptodactylon pungens	0	3	4	7	-	.53	.30	.03
B	Opuntia sp.	9	12	17	17	.21	.21	.16	.36
B	Tetradymia canescens	6	4	5	5	.01	.00	.01	.16
Total for Browse		183	181	181	196	25.57	28.10	24.44	22.61

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 30

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	24.26	24.58
Atriplex gardneri falcata	.21	1.06
Chrysothamnus viscidiflorus viscidiflorus	1.58	2.66
Leptodactylon pungens	.25	.05
Opuntia sp.	.28	.58
Tetradymia canescens	.08	.13

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 30

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.0	0.5	2.8

BASIC COVER--

Management unit 02, Study no: 30

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	6.25	12.00	31.88	39.17	31.01	37.00
Rock	.75	.25	.33	.11	.41	.03
Pavement	7.00	7.00	1.16	1.01	.74	.19
Litter	42.75	24.00	26.83	28.42	31.02	28.21
Cryptogams	5.50	14.00	8.70	12.45	11.36	7.52
Bare Ground	37.75	42.75	39.54	42.63	43.56	37.40

SOIL ANALYSIS DATA --

Management unit 02, Study no: 30, Study Name: State Line

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.4	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	4	1	27	21	-	-	-
Grouse	-	5	-	2	-	-	-
Elk	-	-	4	10	7 (17)	5 (12)	4 (10)
Deer/Pronghorn	27	14	21	36	31 (26)	25 (63)	64 (159)
Cattle	-	1	2	-	12 (29)	14 (34)	2 (4)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 30

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Artemisia tridentata wyomingensis									
84	7532	15	46	39	1533	45	27	3	14/19
90	8064	17	45	38	66	42	37	19	15/16
96	6500	2	66	32	40	46	11	8	15/31
01	6700	0	79	21	40	58	15	8	18/30
06	6600	4	66	30	17180	14	0	19	16/28
11	6380	8	60	32	220	29	39	34	17/28
Atriplex gardneri falcate									
84	3865	57	43	0	5399	38	0	0	7/11
90	5532	81	19	0	3599	5	5	0	5/7
96	1840	0	98	2	-	0	0	0	3/7
01	1060	6	94	0	-	23	38	0	4/7
06	1100	29	67	4	40	2	0	2	4/7
11	1260	22	78	0	20	0	0	0	11/14

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Ceratoides lanata										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	5/11	
11	20	0	100	-	-	0	0	0	9/11	
Chrysothamnus viscidiflorus viscidiflorus										
84	1731	4	92	4	66	0	0	4	11/14	
90	2065	6	52	42	-	39	3	6	6/10	
96	2020	0	82	18	-	0	0	10	8/13	
01	2000	1	92	7	-	0	0	4	8/12	
06	1880	3	64	33	200	11	0	24	7/12	
11	2260	0	100	0	-	6	2	5	8/12	
Eriogonum microthecum										
84	66	0	100	-	-	0	0	0	1/2	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Leptodactylon pungens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	220	9	91	-	-	0	0	0	4/9	
06	180	0	100	-	-	0	0	0	5/12	
11	260	8	92	-	-	0	0	0	3/7	
Opuntia sp.										
84	599	0	100	0	-	0	0	0	5/13	
90	932	57	14	29	133	0	0	14	4/6	
96	500	20	68	12	-	0	0	4	3/11	
01	440	5	77	18	20	0	0	5	3/7	
06	540	15	81	4	60	0	0	0	3/10	
11	500	0	100	0	-	0	0	0	4/11	
Tetradymia canescens										
84	66	0	100	0	-	100	0	0	4/5	
90	0	0	0	0	-	0	0	0	-/-	
96	360	0	56	44	-	0	17	11	4/9	
01	80	0	100	0	-	25	0	0	7/12	
06	120	17	33	50	-	17	0	33	6/10	
11	120	17	83	0	-	0	0	33	7/14	

SOUTH CRAWFORD MOUNTAINS - TREND STUDY NO. 2-31-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: BLM

Elevation: 6,450 ft (1,966 m)

Aspect: South

Slope: 4%

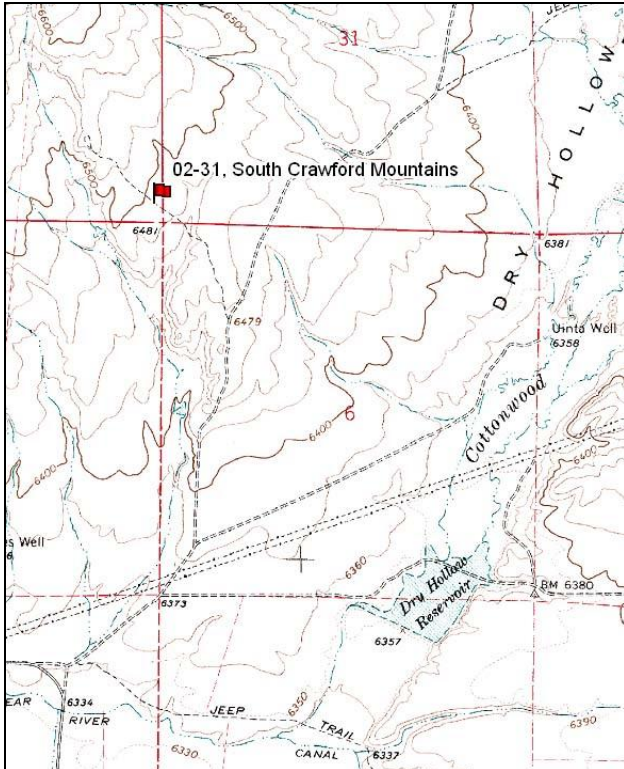
Transect bearing: 65° magnetic

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

Directions:

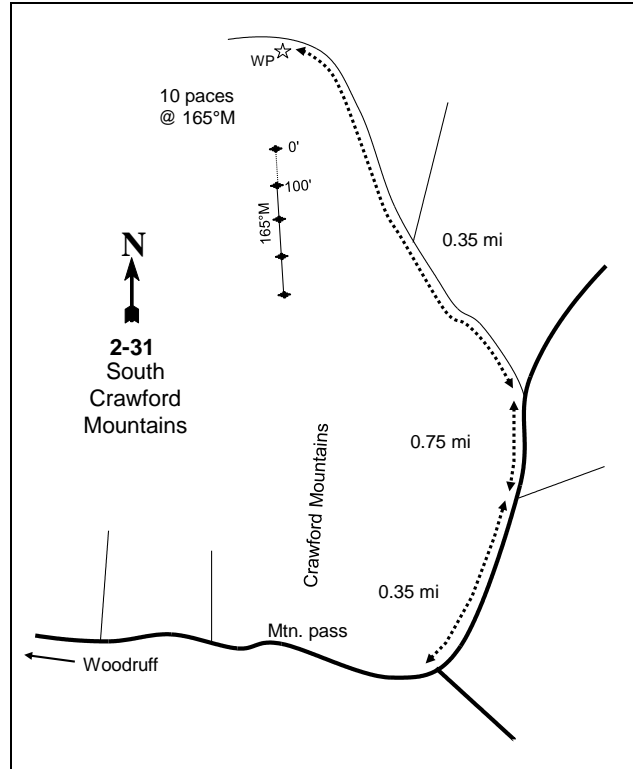
From the intersection of Wilson Lane and Little Crawford Road east of Woodruff proceed east 1.6 miles through the small pass to the east side of the mountains. Take the left fork and travel northeast for 0.35 miles. Turn left here and proceed northeast for 0.75 miles. At this point, turn left onto a 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



Township: 10N Range: 7E Section: 36

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 492346. E 4600430 N

SOUTH CRAWFORD MOUNTAINS - TREND STUDY NO. 2-31

Site Information

Site Description: This study is located on the southeastern foothills of the Crawford Mountains, just northeast of Woodruff. The area is administered by the Bureau of Land Management (BLM) as part of the Cumberland/Uinta allotment. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community 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 in 1996. Due to their similarity in pellet appearance, deer and pronghorn pellet groups were combined. Deer/pronghorn pellet groups were sampled in moderate abundance in 2001 and 2011, but low abundance in 2006. Sampled elk and cattle sign has been minimal since 2001. Three sage grouse pellet groups were also sampled in 2001 and 2006. Pellet groups for sage grouse were seen, but not sampled in 2011 (Table - Pellet Group Data).

Browse: The dominant preferred browse species is a fairly dense stand of Wyoming big sagebrush. The Wyoming big sagebrush population is mostly mature, but was classified as mostly decadent in 1990. The Wyoming big sagebrush population has varied slightly in density throughout the course of the study. Wyoming big sagebrush has received light to moderate use over the course of the study. Recruitment of young Wyoming big sagebrush plants to the population has been mostly poor over the sample years, though 1990 and 2011 had good recruitment within the population. Other shrubs of secondary importance that appear to have relatively stable populations include black sagebrush (*Artemisia nova*), narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), slenderbush eriogonum (*Eriogonum microthecum*), prickly phlox (*Leptodactylon pungens*), pricklypear cactus (*Opuntia* sp.), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: Grasses and forbs are sparsely distributed and include a mix of species common in a Wyoming big sagebrush type. The two perennial grass species that provide the bulk of the herbaceous forage include Sandberg bluegrass (*Poa secunda*) and needle-and-thread (*Stipa comata*). Other common perennial grass species include western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion Hystrix*). The weedy annual grass species cheatgrass (*Bromus tectorum*) is found on the site, but is rare. Forbs are rare, but fairly diverse for a Wyoming big sagebrush community. Hoods phlox (*Phlox hoodii*) is the most abundant perennial forb (Table - Herbaceous Trends).

Soil: The soil is classified in the Woodpass series, a widely distributed series in this area. The parent material consists of alluvial deposits derived from sandstone and limestone (Soil Survey Staff 2011). Soil texture is a sandy clay loam with a neutral soil reaction (pH 7.1). Potassium may have limited availability for plant growth and development at 51 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Exposed bare ground cover is common and is found primarily between the interspaces of browse cover. Adequate protective ground cover is provided by high amounts of vegetation and litter (Table - Basic Cover). Wind and water erosion are not severe due to the gentle terrain, but are apparent. The soil erosion condition was classified as slight in 2006, but stable in 2001 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density for Wyoming big sagebrush decreased slightly from 8,265 plants/acre to 7,798 plants/acre. Decadence for big sagebrush increased from 21% to 72%. The big sagebrush population increased in poor vigor from 5% to 50%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. The Wyoming big sagebrush

population decreased in decadence to 30%, but is still considered to be high. Poor vigor within the big sagebrush population decreased to 11%

- **1996 to 2001 - slightly up (+1):** The density for Wyoming big sagebrush increased 16% from 6,420 plants/acre to 7,420 plants/acre. The big sagebrush population decreased in decadence to 20%, but is still considered to be moderately high. Poor vigor within the big sagebrush population decreased to 7%.
- **2001 to 2006 - slightly down (-1):** The density for Wyoming big sagebrush decreased 16% to 6,260 plants/acre. The big sagebrush population increased in decadence to 23%, and poor vigor within the big sagebrush population increased to 19%.
- **2006 to 2011 - slightly up (+1):** The density for Wyoming big sagebrush increased 19% to 7,480 plants/acre. The sagebrush population decreased in decadence to 18%. Poor vigor within the big sagebrush population increased to 24%.

Grass:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 14%. The perennial species Sandberg bluegrass increased significantly in nested frequency; however, bluebunch wheatgrass and bottlebrush squirreltail decreased significantly in nested frequency.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses remained similar. The perennial grass species mutton bluegrass (*Poa fendleriana*) increased significantly in nested frequency and had a cover of 1%. The perennial species Sandberg bluegrass had a cover of 5%, and was the most dominant grass on the study site. Annual grasses were included in the sample for the first time in 1996. The weedy annual species cheatgrass had minimal cover.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass increased in cover to 6%. Bluebunch wheatgrass maintained cover near 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass maintained cover near 6%, and needle-and-thread increased significantly in nested frequency, and increased in cover from 1% to 3%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial grasses increased 31%. Western wheatgrass, bottlebrush squirreltail, and needle-and-thread increased significantly in nested frequency, and had covers of 1%, 6%, and 4%, respectively.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased 41%. Drummond rockcress (*Arabis drummondi*), timber poisonvetch (*Astragalus convallarius*), cryptantha (*Cryptantha sp.*), and clover (*Trifolium sp.*) decreased significantly in nested frequency.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 15%. Hoods phlox had a significant decrease in nested frequency, and had a cover of 3%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 10%. Hoods phlox increased in cover to 4%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 16%. Rose pussytoes (*Antennaria rosea*) increased significantly in nested frequency, and increased in cover from 0% to near 1%. Hoods phlox increased in cover to 5%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 19%. Low fleabane (*Erigeron pumilus*) increased significantly in nested frequency, but had minimal cover. The annual forb species pale alyssum (*Alyssum alyssoides*) and bush birdbeak (*Cordylanthus ramosus*) were common on the site and had covers of 2% and 5%, respectively.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

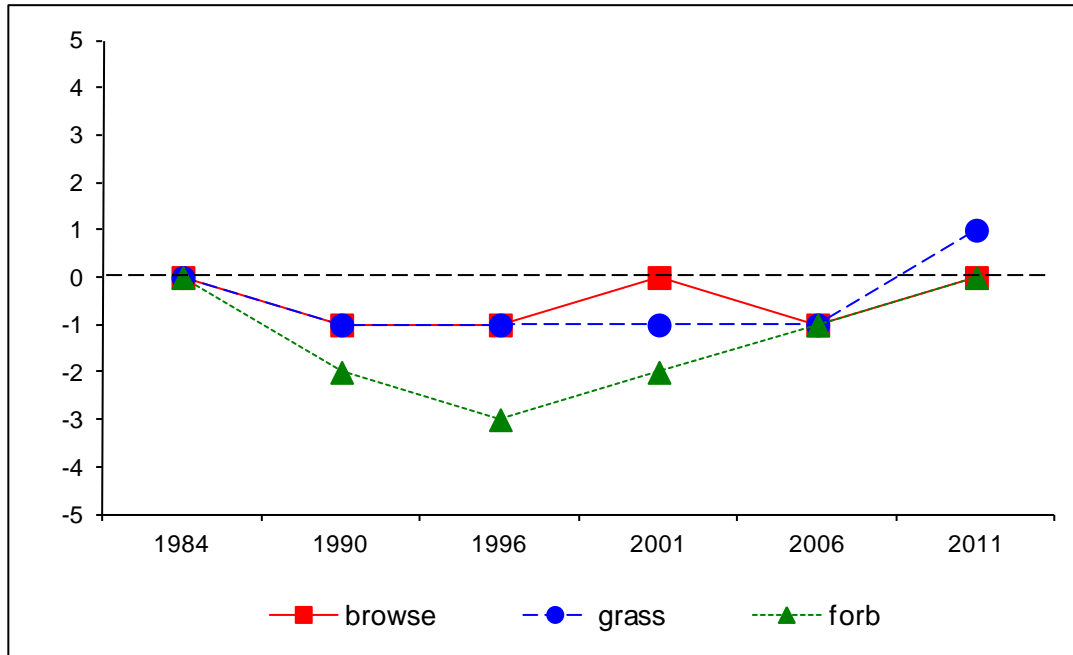
Management unit 2, study no: 31

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	21.0	6.2	2.9	16.1	0.0	7.2	0.0	53.4	Good
01	27.9	9.3	1.5	17.4	0.0	8.3	0.0	64.5	Good-Excellent
06	24.9	8.4	1.9	22.7	0.0	10.0	0.0	67.9	Excellent
11	29.1	9.4	9.0	24.0	0.0	10.0	0.0	81.4	Excellent

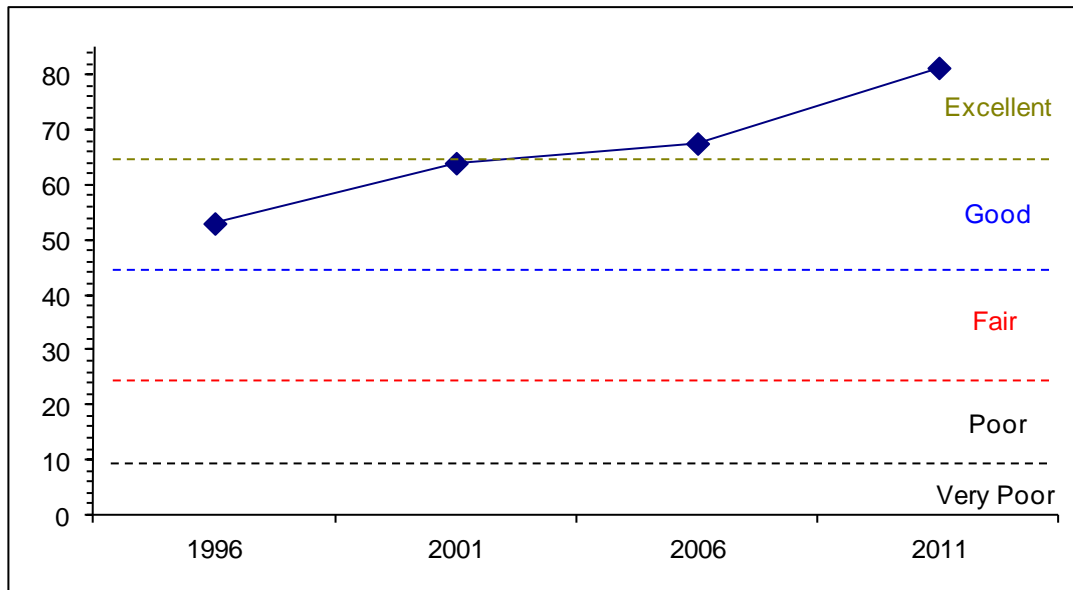
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 31



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
Management unit 2, Study no: 31



HERBACEOUS TRENDS--
Management unit 02, Study no: 31

Type	Species	Nestled Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron smithii	a-	a-	a-	a ⁴	a ¹⁶	d ⁷⁷	-	.06	.03	.65
G	Agropyron spicatum	c ¹⁴⁰	a ⁵³	ab ⁸¹	b ⁹⁷	ab ⁷³	a ⁴⁶	.84	1.12	1.32	.34
G	Bromus tectorum (a)	-	-	1	-	1	5	.00	-	.00	.04
G	Carex sp.	a-	a-	a-	b ¹²	bc ³⁰	c ³⁹	-	.07	.18	.39
G	Oryzopsis hymenoides	b ⁶⁰	ab ⁴⁵	a ²¹	ab ³⁰	a ³⁴	ab ³⁶	.21	.64	.68	.54
G	Poa fendleriana	a-	a-	b ³⁰	a ²	a ³	a ⁷	.50	.00	.03	.05
G	Poa secunda	a ²³¹	b ²⁷⁵	ab ²⁴⁶	b ²⁷²	a ²²⁶	ab ²⁵⁴	5.18	6.03	6.13	5.53
G	Sitanion hystrix	c ¹⁰⁷	a ³	ab ²⁹	a ¹⁷	a ¹⁰	b ⁴⁷	.22	.13	.07	.52
G	Stipa comata	a ¹⁶	c ⁹⁸	bc ⁷⁹	ab ⁵⁶	c ¹¹⁶	d ¹⁵⁹	1.06	.64	2.90	3.95
Total for Annual Grasses		0	0	1	0	1	5	0.00	0	0.00	0.03
Total for Perennial Grasses		554	474	486	490	508	665	8.03	8.72	11.35	11.98
Total for Grasses		554	474	487	490	509	670	8.03	8.72	11.36	12.02
F	Agoseris glauca	1	-	-	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	a-	b ¹⁵	c ⁷⁴	d ²⁸⁶	-	.04	.16	1.47
F	Antennaria rosea	a-	ab ¹²	a ³	a-	b ²⁰	ab ¹⁷	.04	-	.52	.19
F	Arabis drummondii	b ³¹	a-	a ⁶	a ⁴	a ⁴	a ¹²	.07	.01	.01	.03
F	Astragalus convallarius	c ⁶⁰	a ¹	ab ⁸	ab ¹⁹	b ²⁸	b ³³	.04	.12	.15	.69
F	Astragalus sp.	-	-	-	-	10	8	-	-	.05	.19
F	Astragalus utahensis	10	8	13	10	9	15	.19	.09	.05	.13
F	Cordylanthus ramosus (a)	-	-	a ²	b ²⁹	ab ¹⁰	c ¹⁶⁶	.01	.27	.15	5.19
F	Cryptantha sp.	c ⁸⁰	b ⁴⁰	ab ²⁴	a ¹¹	ab ¹⁹	ab ²⁵	.19	.02	.28	.09
F	Draba sp. (a)	-	-	-	2	3	2	-	.00	.00	.00
F	Epilobium brachycarpum (a)	-	-	-	-	1	-	-	-	.00	-
F	Erigeron pumilus	a ⁸	a-	a ⁶	a ²	a ³	b ¹⁹	.01	.00	.03	.16

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Erigeron sp.	-	-	-	-	-	4	-	-	-	.06
F	Eriogonum umbellatum	-	-	1	1	2	7	.00	.00	.15	.59
F	Haplopappus acaulis	3	-	1	1	1	1	.03	.03	.03	.03
F	Lappula occidentalis (a)	-	-	a-	b31	a4	a-	-	.08	.01	-
F	Melilotus officinalis	-	-	-	-	2	-	-	-	.00	-
F	Microsteris gracilis (a)	-	-	-	-	1	-	-	-	.00	-
F	Phlox hoodii	c220	bc200	a153	abc180	abc183	ab168	3.00	3.80	5.26	3.43
F	Phlox longifolia	-	-	8	2	3	10	.01	.01	.01	.02
F	Tragopogon dubius (a)	4	-	-	-	-	-	-	-	-	-
F	Trifolium sp.	b26	a2	a-	ab15	a-	b19	-	.06	-	.07
Total for Annual Forbs		4	0	2	77	93	454	0.00	0.39	0.33	6.67
Total for Perennial Forbs		439	263	223	245	284	338	3.61	4.17	6.57	5.70
Total for Forbs		443	263	225	322	377	792	3.62	4.57	6.91	12.38

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	'11	'96	'01	'06	'11
B	Artemisia nova	7	7	10	11	.19	1.24	1.50	1.08
B	Artemisia tridentata wyomingensis	98	98	98	98	16.34	20.70	18.17	22.07
B	Chrysothamnus viscidiflorus stenophyllus	70	62	76	75	1.77	1.83	2.78	3.44
B	Eriogonum microthecum	23	15	23	14	.29	.34	.24	.12
B	Gutierrezia sarothrae	0	0	3	0	-	-	.03	-
B	Leptodactylon pungens	14	11	15	11	.24	.19	.31	.72
B	Opuntia sp.	4	5	7	6	.03	-	.04	-
B	Tetradymia canescens	1	1	1	1				
Total for Browse		217	199	233	216	18.87	24.31	23.08	27.44

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 31

Species	Percent Cover	
	'06	'11
Artemisia nova	1.79	1.91
Artemisia tridentata wyomingensis	24.85	27.00
Chrysothamnus viscidiflorus stenophyllus	2.59	4.63
Eriogonum microthecum	.16	.55
Leptodactylon pungens	.30	.38
Opuntia sp.	-	.06

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 31

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	0.7	0.7	1.6

BASIC COVER--

Management unit 02, Study no: 31

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	9.25	9.75	29.03	37.43	40.09	42.79
Rock	.25	.75	1.10	.13	.10	.13
Pavement	8.00	3.00	7.37	2.61	5.19	3.65
Litter	52.25	26.00	30.34	34.68	30.29	33.19
Cryptogams	5.00	25.25	9.66	7.50	5.74	3.36
Bare Ground	25.25	35.25	32.97	37.84	39.94	33.54

SOIL ANALYSIS DATA --

Management unit 02, Study no: 31, Study Name: South Crawford Mountains

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.5	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	'11
Rabbit	3	7	16	9
Grouse	-	2	1	1
Elk	2	-	4	5
Deer/Pronghorn	31	13	15	24
Cattle	1	1	7	3

Days use per acre (ha)		
'01	'06	'11
-	-	-
26 groups/acre	26 groups/acre	-
1 (2)	9 (22)	5 (13)
23 (56)	8 (20)	36 (89)
13 (32)	10 (25)	2 (5)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 31

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia nova</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	320	6	88	6	-	6	0	6	9/14
01	440	5	91	5	-	86	0	0	12/16
06	660	0	91	9	340	0	0	9	10/16
11	460	0	65	35	-	13	48	9	8/17
<i>Artemisia tridentata wyomingensis</i>									
84	8265	16	63	21	2333	68	26	5	14/21
90	7798	2	26	72	66	50	40	50	12/19
96	6420	6	65	30	40	63	4	11	15/27
01	7420	3	77	20	-	23	3	7	16/25
06	6260	4	73	23	2160	18	3	19	16/26
11	7480	19	64	18	160	11	34	24	17/32
<i>Ceratoides lanata</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	4/6
<i>Chrysothamnus viscidiflorus stenophyllus</i>									
84	6998	11	87	2	-	42	0	0	9/12
90	6465	10	39	51	-	36	14	21	6/6
96	2880	5	83	12	-	3	7	9	9/11
01	2940	1	88	10	-	5	2	4	8/10
06	3840	4	93	4	-	.52	0	2	8/12
11	3940	1	97	3	-	0	0	2	12/13
<i>Eriogonum microthecum</i>									
84	333	0	100	0	-	60	0	0	5/8
90	732	18	82	0	-	27	9	0	5/7
96	700	0	97	3	-	0	0	0	6/9
01	540	0	93	7	-	4	0	0	4/7
06	680	6	79	15	-	12	3	3	5/8
11	320	0	100	0	-	0	0	6	6/10

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	80	0	100	-	20	0	0	0	6/13	
11	0	0	0	-	-	0	0	0	-/-	
<i>Leptodactylon pungens</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	133	0	0	100	-	0	0	100	-/-	
96	400	0	95	5	-	0	0	0	6/12	
01	440	0	91	9	-	0	0	0	4/9	
06	420	10	86	5	-	0	0	10	5/11	
11	460	0	100	0	-	0	0	0	5/8	
<i>Opuntia sp.</i>										
84	266	0	100	0	-	0	0	0	4/5	
90	532	88	12	0	-	0	0	0	3/6	
96	80	0	75	25	-	0	0	0	4/12	
01	100	0	100	0	-	0	0	0	3/10	
06	160	13	75	13	-	0	0	13	4/9	
11	140	0	100	0	-	0	0	0	4/11	
<i>Tetradymia canescens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	4/9	
01	20	0	100	-	-	0	0	0	3/13	
06	20	0	100	-	-	0	0	0	4/7	
11	20	100	0	-	-	0	0	0	4/13	

WOOD PASS - TREND STUDY NO. 2-32-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Semidesert Shallow Loam \(Utah Juniper-Pinyon\), R034XY233UT](#)

Land Ownership: BLM

Elevation: 6,800 ft (2,073 m)

Aspect: Southeast

Slope: 1%

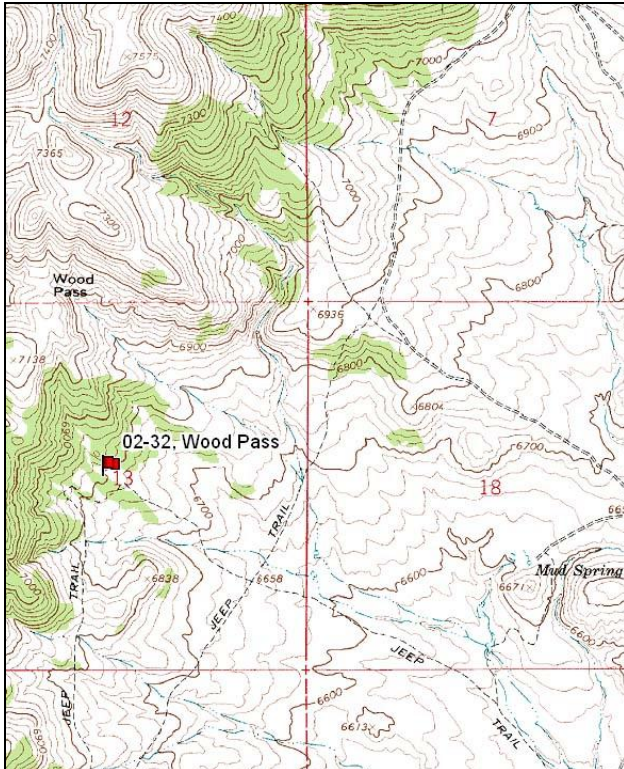
Transect bearing: 165° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (71ft), line 3 (59ft), line 4 (71ft), line 5 (34 ft)

Directions:

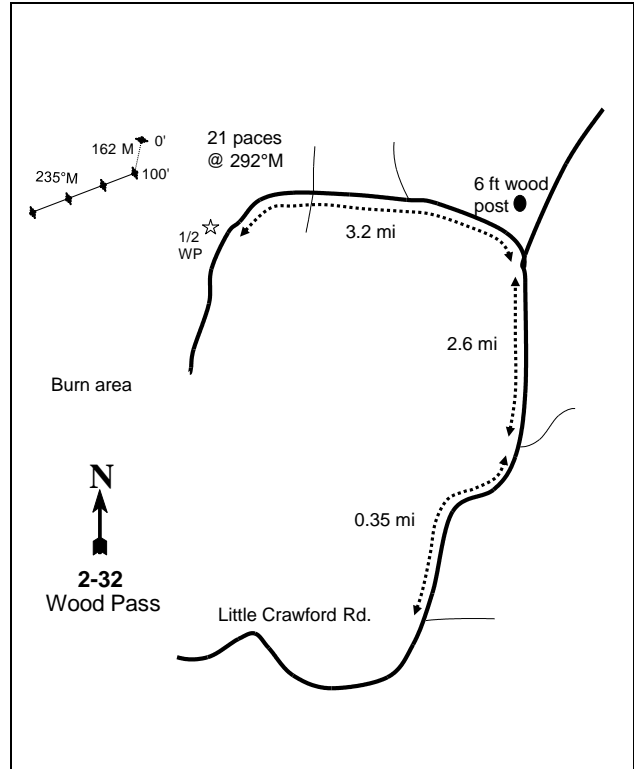
From the intersection of Wilson Lane and Little Crawford Road east of Woodruff proceed northeast for 1.35 miles to a fork. Turn left and travel 0.35 mile to another fork. Turn left and proceed 2.6 miles to a third fork marked by a six-foot tall wooden post. Turn left and proceed 3.2 miles staying on 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



Township: 10N Range: 7E Section: 13

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 491501 E 4606053 N

Site Information

Site Description: This study is located on the east side of the Crawford Mountains approximately a half mile south of Wood Pass. The area is administered by the Bureau of Land Management (BLM) as part of the Cumberland/Uinta allotment. The vegetation is comprised of an open Utah juniper (*Juniperus osteosperma*) woodland with an abundant association of low-growing black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Animal presence includes cattle in spring and summer, and deer and elk in winter. Pronghorn and sage-grouse occupy the area continuously. Depending on the winter, snow depth could limit mid-winter utilization of the sagebrush. Deer/pronghorn pellet groups were sampled in low abundance in 2001, but moderate abundance in 2006 and 2011. A deer carcass was seen near the site in 2011. Elk pellet groups were sampled in moderate abundance in 2006, but low abundance in 2011. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The preferred browse species include black sagebrush and Wyoming big sagebrush. Black sagebrush has a moderately dense population that occurs within the more shallow soils of the study site. The black sagebrush population has had a high amount of decadence within the population over the sample years. The black sagebrush has displayed light to moderate utilization over the course of the study. The sagebrush population has had good vigor within the population since the outset of the study, though vigor was poor in 1990 and 2006. Recruitment of young Wyoming sagebrush has been fairly poor within the population, though recruitment was good in 1984 and 2011. There is most likely some hybridization between the black sagebrush and the Wyoming big sagebrush. However, Wyoming big sagebrush occurs on the deeper soil on the site, and has a moderately dense population. The Wyoming big sagebrush population has had high decadence within the population since the outset of the study, though decadence has decreased steadily. The majority of Wyoming big sagebrush has displayed light to moderate utilization. Recruitment of young Wyoming big sagebrush plants has been good over the sample years (Table - Browse Characteristics). The Utah juniper population is moderately dense and has varied in density since 1996 (Table - Point Quarter Tree Data), but cover has steadily increased since 2001 (Table - Canopy Cover, Line Intercept). A few of the more mature juniper trees on the site have been highlined.

Herbaceous Understory: The herbaceous understory is comprised of diverse communities of grasses and forbs, but are not abundant. Sandberg bluegrass (*Poa secunda*) is the most abundant perennial grass species. The most common forb is Hoods phlox (*Phlox hoodii*), and it accounts for over half of the forb cover (Table - Herbaceous Trends).

Soil: The soil is classified in the Solak series. The parent material consists of residuum and colluvium weathered from conglomerate composed of sandstone, quartzite, and limestone. Soils have a clay loam texture with a soil reaction that is slightly alkaline (pH 7.4). Phosphorus may have limited availability for plant growth and development at 4.5 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Exposed bare ground cover is common and is found between the interspaces of browse cover. Adequate protective ground cover is provided by high amounts of vegetation and litter, but is mainly found within the shelter of browse species (Table - Basic Cover). Due to the formation of an active gully and soil movement the soil erosion condition was classified to be slight in 2006, but stable in 2001 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly up (+1):** The density for black sagebrush increased 28% from 1,198 plants/acre to 1,531 plants/acre. Decadence within the black sagebrush population increased from 50% to 65%. The black sagebrush population increased in poor vigor from 0% to 26%. The density for Wyoming big sagebrush remained similar. Decadence within the Wyoming big sagebrush

population decreased from 56% to 41%, but is still considered to be very high. The Wyoming big sagebrush population increased in poor vigor from 14% to 15%.

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the black sagebrush population decreased to 25%, but is still considered to be high. The black sagebrush population decreased in poor vigor to 2%. Decadence within the Wyoming big sagebrush population decreased to 30%, but is still considered to be high. Poor vigor was not observed within the Wyoming big sagebrush population.
- **1996 to 2001 - slightly down (-1):** The density for black sagebrush remained similar decreasing from 3,800 plants/acre to 3,760 plants/acre. Decadence within the black sagebrush population increased to 31%. The black sagebrush population increased in poor vigor to 6%. The density for Wyoming big sagebrush decreased 18% from 2,440 plants/acre to 2,000 plants/acre. Decadence within the Wyoming big sagebrush population decreased to 21%. The Wyoming big sagebrush population increased in poor vigor to 7%.
- **2001 to 2006 - stable (0):** The density for black sagebrush decreased 5% to 3,560 plants/acre. Decadence within the black sagebrush population increased to 37%. The black sagebrush population increased in poor vigor to 30%. The density for Wyoming big sagebrush decreased 3% to 1,940 plants/acre. Decadence within the Wyoming big sagebrush population increased to 42%. Plants displaying poor vigor within the Wyoming big sagebrush population increased to 69%.
- **2006 to 2011 - slightly down (-1):** The density for black sagebrush population decreased 22% to 2,760 plants/acre. Decadence within the black sagebrush population decreased to 19%. The black sagebrush population decreased in poor vigor to 9%. The density for Wyoming big sagebrush increased 9% to 2,120 plants/acre. Decadence within the Wyoming big sagebrush population decreased to 20%, and poor vigor decreased to 16%.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 15%. Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass increased significantly in nested frequency. Sandburg bluegrass was the most common perennial grass species on the site.
- **1990 to 1996 - up (+2):** The sum of nested frequency for perennial grasses increased 27%. Western wheatgrass (*Agropyron smithii*) increased significantly in nested frequency, and had a cover of 1%. Sandberg bluegrass maintained dominance within the perennial grass community, and had a cover of 3%. Annual grasses were included in the sample for the first time in 1996. Cheatgrass (*Bromus tectorum*) was a minor component within the herbaceous understory.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Needle-and-thread (*Stipa comata*) increased in nested frequency, and increased in cover from less than 1% to 1%. The perennial grass Sandberg bluegrass maintained dominance and increased in cover from 3% to 4%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 18%. Western wheatgrass and Indian ricegrass (*Oryzopsis hymenoides*) increased significantly in nested frequency. Both species increased in cover to 1%. Bluebunch wheatgrass decreased significantly in nested frequency, and decreased in cover from 2% to less than 1%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Western wheatgrass and Sandberg bluegrass decreased significantly in nested frequency, and cover remained similar at less than 1% and 5%, respectively. Bottlebrush squirreltail (*Sitanion hystrix*) increased significantly in nested frequency, and had a cover of less than 1%.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased 38%. Lobeleaf groundsel (*Senecio multilobatus*) and clover (*Trifolium sp.*) decreased significantly in nested frequency.

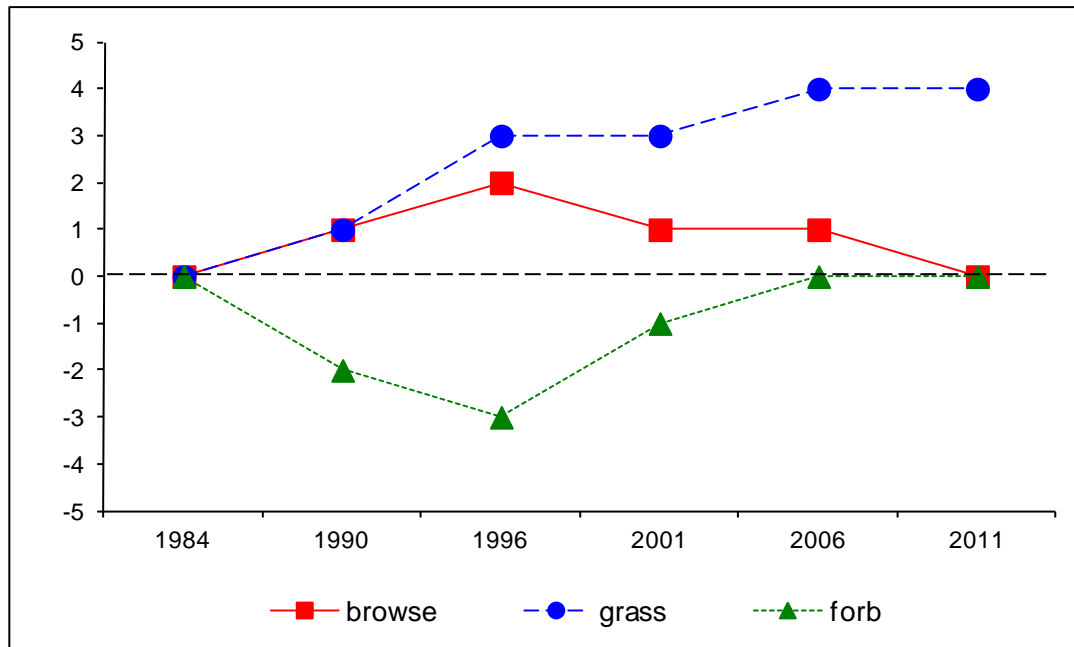
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 10%. Low penstemon (*Penstemon humilis*) decreased significantly in nested frequency.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial forbs increased 50%. *Cryptantha* (*Cryptantha* sp.), low penstemon, and clover increased significantly in nested frequency. *Cryptantha* had a cover of 1%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 10%. Tapertip hawksbeard (*Crepis acuminata*) decreased significantly in nested frequency. However, the increase in the sum of nested frequency is not due to any one specific species, and is likely due to small, accumulative increases in nested frequency across the perennial forb community.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Low fleabane (*Erigeron pumilus*) increased significantly in nested frequency, and maintained cover less than 1%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 2, study no: 32

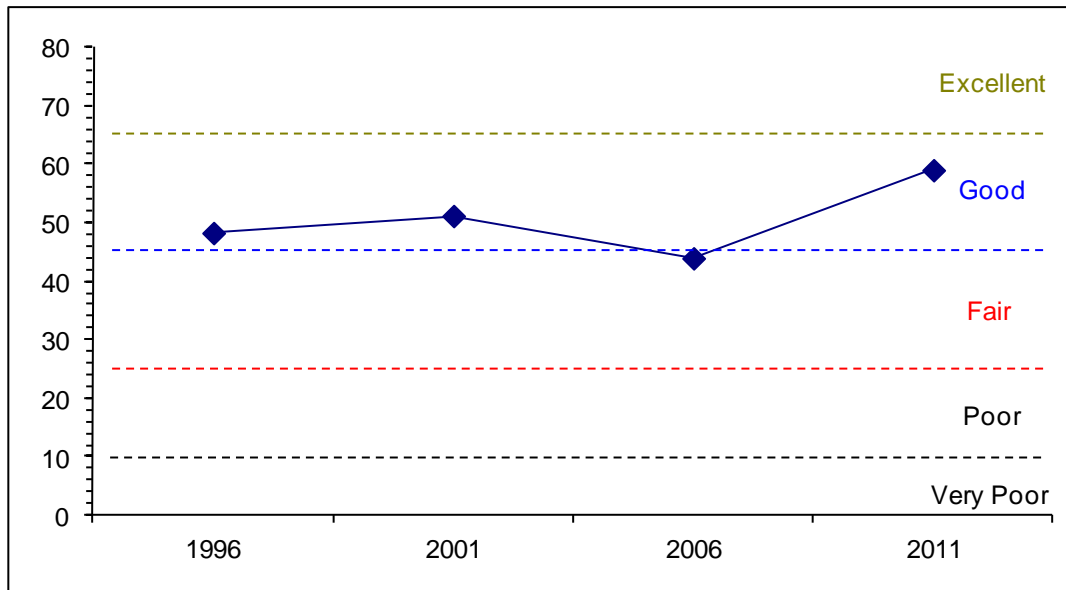
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.8	6.8	7.1	11.7	-0.1	6.0	0.0	48.3	Good
01	17.3	7.1	3.9	16.9	-0.3	8.3	-2.0	51.2	Good
06	14.4	3.4	2.0	15.2	0.0	8.9	0.0	43.9	Fair-Good
11	16.1	9.2	13.5	14.0	0.0	6.2	0.0	59.0	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 32



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 2, Study no: 32



HERBACEOUS TRENDS--
 Management unit 02, Study no: 32

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron smithii	b31	a-	bc88	b58	c98	b66	.97	.49	.89	.42
G	Agropyron spicatum	bc47	c79	ab34	bc64	a8	bc51	.65	2.08	.10	.41
G	Bromus tectorum (a)	-	-	ab25	b30	a4	ab20	.10	.45	.01	.06
G	Carex sp.	-	-	-	-	6	10	-	-	.06	.05
G	Oryzopsis hymenoides	a8	a17	ab32	a19	bc47	c64	.52	.63	.86	.65
G	Poa fendleriana	-	-	13	10	21	7	.07	.10	.21	.04
G	Poa secunda	a145	bc206	bc191	bc198	c233	ab181	3.28	3.77	4.71	4.83
G	Sitanion hystrix	b36	a9	ab26	ab16	a9	b35	.11	.57	.06	.42
G	Stipa comata	ab7	ab5	a17	b25	b28	ab16	.21	.78	.53	.09
G	Stipa lettermani	a-	a-	a-	a-	b11	b13	-	-	.15	.08
Total for Annual Grasses		0	0	25	30	4	20	0.10	0.45	0.00	0.06
Total for Perennial Grasses		274	316	401	390	461	443	5.84	8.43	7.60	7.02
Total for Grasses		274	316	426	420	465	463	5.94	8.89	7.61	7.09
F	Agoseris glauca	-	-	3	3	11	4	.00	.03	.05	.01
F	Alyssum alyssoides (a)	-	-	a-	a6	a5	b43	-	.01	.01	.08
F	Antennaria rosea	-	4	8	15	12	6	.31	.25	.36	.18
F	Arabis sp.	a-	a-	ab10	a1	a-	b13	.02	.00	-	.04
F	Arenaria sp.	1	-	-	-	-	3	-	-	-	.00
F	Astragalus convallarius	a8	a-	ab10	ab7	b22	ab12	.02	.10	.20	.07
F	Astragalus utahensis	29	14	21	14	20	20	.12	.11	.13	.24
F	Calochortus nuttallii	4	-	-	-	-	1	-	-	-	.00
F	Camelina microcarpa (a)	-	-	-	-	2	-	-	-	.00	-
F	Chaenactis douglasii	7	-	-	-	-	4	-	-	-	.01
F	Chenopodium fremontii (a)	-	-	-	-	-	6	-	-	-	.02

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Cirsium undulatum</i>	-	-	-	3	-	4	-	.00	-	.01
F	<i>Collinsia parviflora</i> (a)	-	-	-	-	11	11	-	-	.02	.16
F	<i>Collomia linearis</i> (a)	-	-	-	3	-	-	-	.03	-	-
F	<i>Comandra pallida</i>	6	5	-	-	3	5	-	-	.00	.03
F	<i>Cordylanthus ramosus</i> (a)	-	-	a15	ab36	b51	c120	.10	.18	.88	4.66
F	<i>Crepis acuminata</i>	11	2	3	1	5	11	.06	.00	.01	.07
F	<i>Cryptantha</i> sp.	a25	a-	a8	b47	a11	a9	.09	.58	.10	.13
F	<i>Cymopterus</i> sp.	-	-	-	2	1	-	-	.03	.00	-
F	<i>Cynoglossum officinale</i>	-	-	-	3	-	-	-	.00	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	6	8	-	5	.01	.03	.00	.01
F	<i>Draba</i> sp. (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Erigeron pumilus</i>	a-	a-	a-	a-	a8	b20	-	-	.02	.12
F	<i>Eriogonum umbellatum</i>	-	-	-	-	1	3	-	-	.00	.03
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	-	-	1	-	-	-	.00
F	<i>Haplopappus acaulis</i>	-	4	-	-	-	-	-	-	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	-	-	9	-	-	-	.02
F	<i>Ipomopsis aggregata</i>	5	-	-	-	-	-	-	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	3	9	3	15	.00	.02	.01	.05
F	<i>Microsteris gracilis</i> (a)	-	-	-	2	-	-	-	.01	-	-
F	<i>Penstemon humilis</i>	b49	b36	a3	b24	b25	ab24	.01	.22	.51	.24
F	<i>Phlox hoodii</i>	ab115	b133	ab104	ab111	ab100	a78	2.30	2.45	2.47	1.02
F	<i>Phlox longifolia</i>	ab11	a6	ab13	ab5	b22	ab26	.03	.04	.13	.05
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	-	-	7	-	-	-	.01
F	<i>Senecio multilobatus</i>	b21	a-	a3	a4	ab5	ab10	.00	.03	.01	.13
F	<i>Trifolium</i> sp.	b45	a6	a3	b43	b66	b48	.00	.27	.39	.64
Total for Annual Forbs		0	0	24	65	72	217	0.12	0.29	0.93	5.03
Total for Perennial Forbs		337	210	189	283	312	301	3.00	4.16	4.43	3.08
Total for Forbs		337	210	213	348	384	518	3.12	4.45	5.36	8.11

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	'11	'96	'01	'06	'11
B	Artemisia nova	55	52	54	46	6.93	7.48	7.47	6.80
B	Artemisia tridentata wyomingensis	50	41	40	42	6.50	6.23	4.05	5.90
B	Chrysothamnus nauseosus consimilis	0	2	0	2	-	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	13	11	10	12	.10	.53	.31	.16
B	Eriogonum microthecum	1	2	2	1	.03	.15	.03	.18
B	Juniperus osteosperma	23	20	20	21	7.63	11.09	12.79	14.11
B	Leptodactylon pungens	0	1	1	1	-	.03	.03	.00
B	Opuntia sp.	1	0	0	0	-	-	-	-
B	Tetradymia canescens	0	1	1	2	-	-	.03	.03
Total for Browse		143	130	128	127	21.20	25.53	24.72	27.20

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 32

Species	Percent Cover		
	'01	'06	'11
Artemisia nova	-	8.93	9.23
Artemisia tridentata wyomingensis	-	5.11	6.09
Chrysothamnus viscidiflorus stenophyllus	-	.40	.06
Eriogonum microthecum	-	-	.11
Juniperus osteosperma	12.60	18.11	20.11

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 32

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	0.5	0.6	1.3
Artemisia tridentata wyomingensis	0.9	0.8	2.4

POINT-QUARTER TREE DATA--

Management unit 02, Study no: 32

Species	Trees per Acre			
	'96	'01	'06	'11
Juniperus osteosperma	236	216	309	284

Average diameter (in)			
'96	'01	'06	'11
5.2	6.0	5.0	5.3

BASIC COVER--

Management unit 02, Study no: 32

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.75	6.00	29.52	36.61	33.29	36.42
Rock	2.00	3.25	1.21	1.04	2.42	.76
Pavement	14.75	18.00	4.10	3.92	11.23	7.20
Litter	55.50	41.00	39.92	40.78	40.39	38.04
Cryptogams	3.00	8.75	4.83	3.94	3.76	5.57
Bare Ground	23.00	23.00	21.77	37.10	28.82	36.95

SOIL ANALYSIS DATA --

Management unit 02, Study no: 32, Study Name: Wood Pass

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.7	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	15	20	21	13	-	-	-
Elk	2	-	4	1	-	33 (81)	13 (33)
Deer/Pronghorn	38	17	29	16	19 (46)	21 (51)	27 (68)
Cattle	1	4	6	3	9 (23)	17 (43)	4 (9)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 32

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Artemisia nova									
84	1198	11	39	50	-	78	0	0	9/16
90	1531	9	26	65	66	39	0	26	10/13
96	3800	3	73	25	-	20	2	2	11/21
01	3760	1	68	31	-	4	0	6	12/22
06	3560	2	62	37	2060	.56	.56	30	12/19
11	2760	33	49	19	520	20	4	9	11/19
Artemisia tridentata wyomingensis									
84	4664	14	30	56	199	71	6	14	18/24
90	4532	38	21	41	-	53	15	15	18/20
96	2440	26	44	30	100	28	2	0	17/31
01	2000	16	63	21	-	12	0	7	16/28
06	1940	8	49	42	1360	27	8	69	15/23
11	2120	21	59	20	320	12	.94	16	14/21

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Atriplex canescens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	6/10	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Chrysothamnus nauseosus consimilis										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	24/28	
01	40	0	100	0	-	0	0	0	31/45	
06	0	0	0	0	-	0	0	0	29/40	
11	40	0	0	100	-	0	0	0	30/39	
Chrysothamnus viscidiflorus stenophyllus										
84	466	0	71	29	-	0	0	0	10/12	
90	1398	29	71	0	-	38	24	0	7/11	
96	500	16	32	52	-	12	0	36	8/11	
01	380	21	79	0	-	0	0	0	9/17	
06	360	0	44	56	60	0	0	17	10/16	
11	420	33	57	10	20	5	0	14	9/11	
Eriogonum microthecum										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	6/9	
01	60	0	100	-	-	0	0	0	5/10	
06	40	0	100	-	-	0	0	0	5/11	
11	20	0	100	-	-	0	0	0	6/8	
Juniperus osteosperma										
84	266	50	50	0	-	0	0	0	69/43	
90	399	33	67	0	-	33	33	0	84/49	
96	500	28	72	0	-	0	0	0	-/-	
01	460	26	70	4	20	4	0	0	-/-	
06	460	22	70	9	60	0	0	9	16/17	
11	500	16	60	24	40	0	0	4	-/-	
Leptodactylon pungens										
84	0	0	0	-	-	0	0	0	-/-	
90	66	0	100	-	266	0	0	0	2/3	
96	0	0	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	6/11	
11	20	0	100	-	-	0	0	0	3/6	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Opuntia</i> sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	66	0	100	-	-	0	0	0	3/9	
96	60	0	100	-	-	0	0	0	4/8	
01	0	0	0	-	-	0	0	0	4/8	
06	0	0	0	-	-	0	0	0	5/21	
11	0	0	0	-	-	0	0	0	6/18	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	14/27	
01	0	0	0	-	-	0	0	0	15/29	
06	0	0	0	-	-	0	0	0	10/23	
11	0	0	0	-	-	0	0	0	5/19	
<i>Tetradymia canescens</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	132	50	0	50	-	50	50	0	-/-	
96	0	0	0	0	-	0	0	0	6/8	
01	20	0	100	0	-	0	0	0	11/19	
06	40	0	100	0	-	0	0	0	11/21	
11	60	67	33	0	-	0	0	0	10/19	

BRAZIER CANYON - TREND STUDY NO. 2-33-11

Vegetation Type: Black Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Upland Shallow Loam \(Utah Juniper\), R025XY324UT](#)

Land Ownership: BLM

Elevation: 6,800 ft (2,073 m)

Aspect: West

Slope: 52%

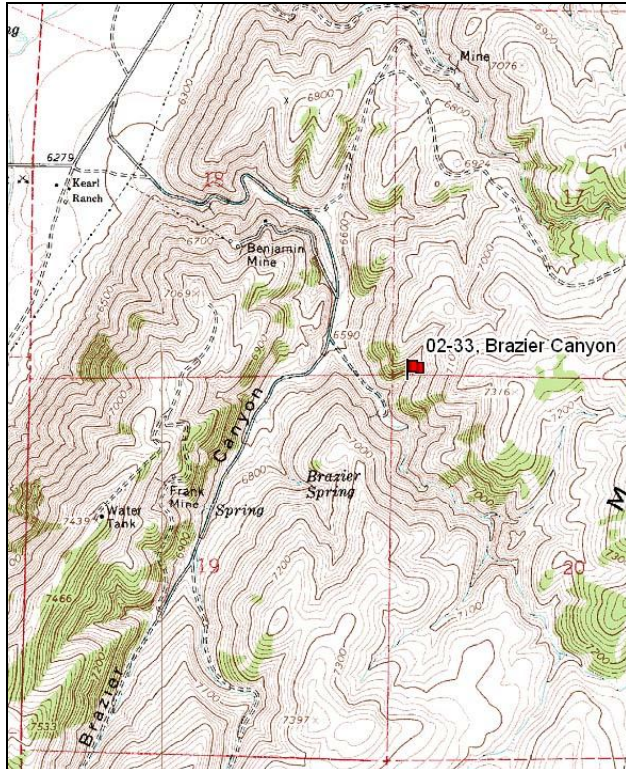
Transect bearing: 162° magnetic

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

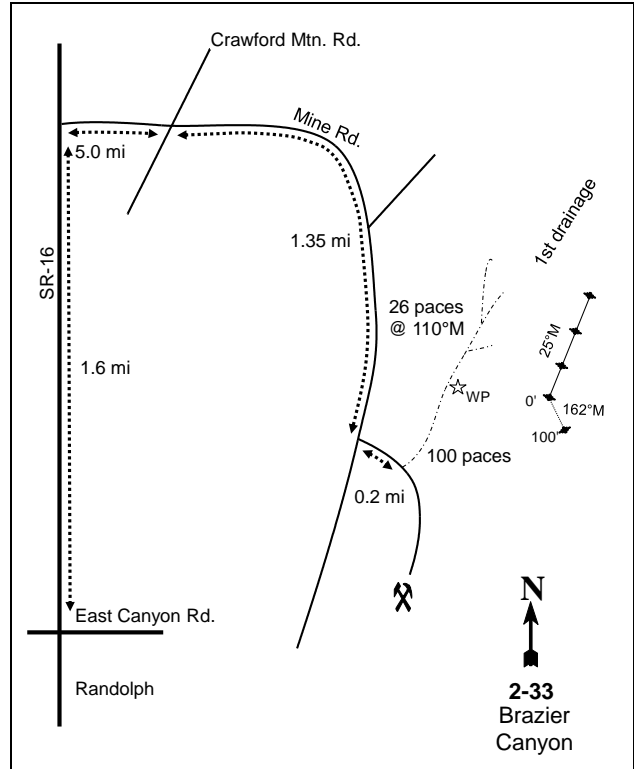
Directions:

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 Mountain 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

GPS: NAD 83, UTM 12S 494084 E 4615031 N

BRAZIER CANYON - TREND STUDY NO. 2-33

Site Information

Site Description: This study is located on the northeastern side of the Crawford Mountain and is located in a tributary of Brazier Canyon. The area is administered by the Bureau of Land Management (BLM) as part of the Cumberland/Uinta allotment. The vegetation is comprised of a black sagebrush (*Artemisia nova*) and perennial grass community with scattered Utah juniper (*Juniperus osteosperma*) trees. This area is considered crucial winter range for deer. Cattle graze the area in the spring, but typically do not use the steep slopes where the study is located. Deer pellet groups have been sampled in high abundance since 2001. Deer carcasses were found near the study in 1984 and 2011, and two deer antler sheds were found in 1996. Elk and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The preferred browse species is black sagebrush, which forms a moderately dense and uniform stand. The black sagebrush population is mostly mature, but was mostly decadent in 1984. Utilization of black sagebrush has been generally light to moderate, except in 1990 when it was mostly moderate. Recruitment of young black sagebrush has been nominal over the sample years, though recruitment was good in 2011. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is far less abundant and is hybridizing with black sagebrush. The Wyoming big sagebrush population is mostly mature, with moderate decadence throughout the duration of the study. Utilization of Wyoming big sagebrush has been mostly moderate over the sample years. Recruitment of young Wyoming big sagebrush has been minimal throughout the sample years, though recruitment was good in 2011. The sagebrush population decreased substantially between the 2001 and 2006 sample years, likely partially due to drought. Other preferred shrubs include winterfat (*Ceratoides lanata*) and Saskatoon serviceberry (*Amelanchier alnifolia*), which have occurred in relatively small numbers. Winterfat displayed good, vigorous growth in 2011. Serviceberry received moderate to heavy use in 2011 (Table - Browse Characteristics). There is a sparse population of Utah juniper that has remained relatively stable since 1996 (Table - Point-Quarter Tree Data), but cover has steadily increased since 1996 (Table - Browse Trends).

Herbaceous Understory: Perennial grasses are the most abundant herbaceous component. Within that category, bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) are the most productive. Forb composition is moderately diverse, but not very abundant. Hoods phlox (*Phlox hoodii*) is the most abundant perennial forb on the study site (Table - Herbaceous Trends).

Soil: The soil is part of the Rexmount-Rock outcrop complex in the Rexmont component, which occurs on mountainsides. The parent material consists of residuum weathered from limestone (Soil Survey Staff 2011). The soil is a loam texture with a soil reaction that is slightly alkaline (pH 7.7) (Table - Soil Analysis Data). Bare ground cover is low with a high amount of pavement, vegetation, and litter providing protective ground cover (Table - Basic cover). There is some localized soil movement, which is inevitable due to the steep slope. The soil erosion condition was classified to be slight in 2001, but stable in 2006 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density for black sagebrush decreased 17% from 14,131 plants/acre to 11,665 plants/acre. Decadence within the black sagebrush population decreased from 57% to 46%. The black sagebrush population increased in poor vigor from 2% to 4%. Young black sagebrush recruitment increased from 4% to 9%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the black sagebrush population decreased to 14%. Poor vigor in the black sagebrush population decreased to 2%.

- **1996 to 2001 - stable (0):** The density for black sagebrush increased 8% from 5,340 plants/acre to 5,760 plants/acre. Decadence within the black sagebrush population decreased to 13%. The black sagebrush population increased in poor vigor to 6%.
- **2001 to 2006 - slightly down (-1):** The density for black sagebrush remained similar at 5,680 plants/acre. Decadence within the black sagebrush population increased to 30%. The black sagebrush population increased in poor vigor to 20%.
- **2006 to 2011 - slightly down (-1):** The density for black sagebrush decreased 15% to 4,840 plants/acre. Decadence within the black sagebrush population decreased to 23%, and poor vigor decreased to 19%. Young black sagebrush recruitment increased from 5% to 15%.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass increased significantly in nested frequency, and became the dominant perennial grass species. Bluebunch wheatgrass had a significant decrease in nested frequency.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 17%. Mutton bluegrass (*Poa fendleriana*) had a significant increase in nested frequency. Sandberg bluegrass maintained dominance within the perennial grass community, and had a cover of 9%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Bluebunch wheatgrass became the most abundant perennial grass species, and increased significantly in nested frequency. Bluebunch wheatgrass increased in cover from 7% to 11%. Sandberg bluegrass had a significant decrease in nested frequency, and decreased in cover to 4%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Bluebunch wheatgrass increased in cover to 12%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Indian ricegrass (*Oryzopsis hymenoides*) was sampled for the first time and provided 1% cover. Bluebunch wheatgrass occurred frequently and increased in cover to 16%. The weedy annual species cheatgrass (*Bromus tectorum*) increased significantly in nested frequency, and increased in cover from 1% to 3%.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased 31%. Longleaf phlox (*Phlox longifolia*), cryptantha (*Cryptantha sp.*), low penstemon (*Penstemon humilis*), timber poisonvetch (*Astragalus convallarius*), and milkvetch (*Astragalus sp.*) decreased significantly in nested frequency.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Hoods phlox and timber poisonvetch increased significantly in nested frequency, and had cover of 1% and less than 1%, respectively. Spreading fleabane (*Erigeron divergens*) decreased significantly in nested frequency. Fendler sandwort (*Arenaria fendleri*) had a cover of 2%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 13%. The increase is not due to any one specific species, and is likely due to small, accumulative increases in nested frequency across the perennial forb community. However, Hoods phlox increased in cover to 3%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Milkvetch (*Astragalus sp.*) increased significantly in nested frequency, and increased in cover to near 1%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Longleaf phlox had a significant decrease in nested frequency, and decreased in cover from 1% to less than 1%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

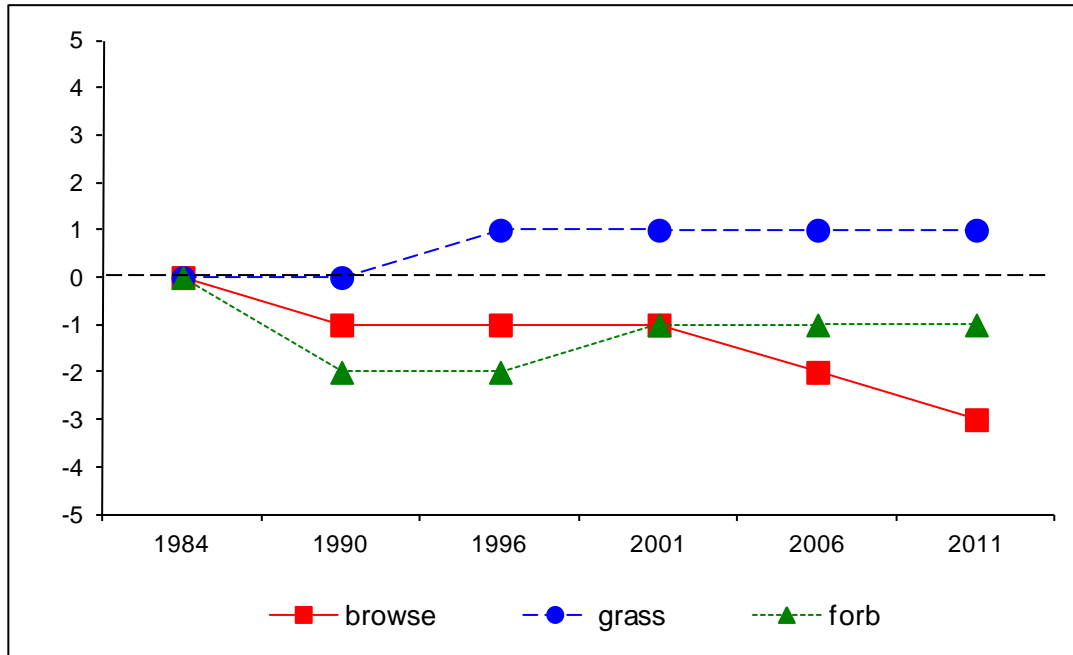
Management unit 2, study no: 33

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.1	10.4	1.8	30.0	-0.2	9.5	0.0	67.6	Excellent
01	19.2	10.9	3.0	30.0	-0.5	10.0	0.0	72.7	Excellent
06	14.2	7.5	2.6	30.0	-0.4	10.0	0.0	63.8	Good-Excellent
11	17.0	9.2	7.6	30.0	-1.8	10.0	0.0	72.0	Excellent

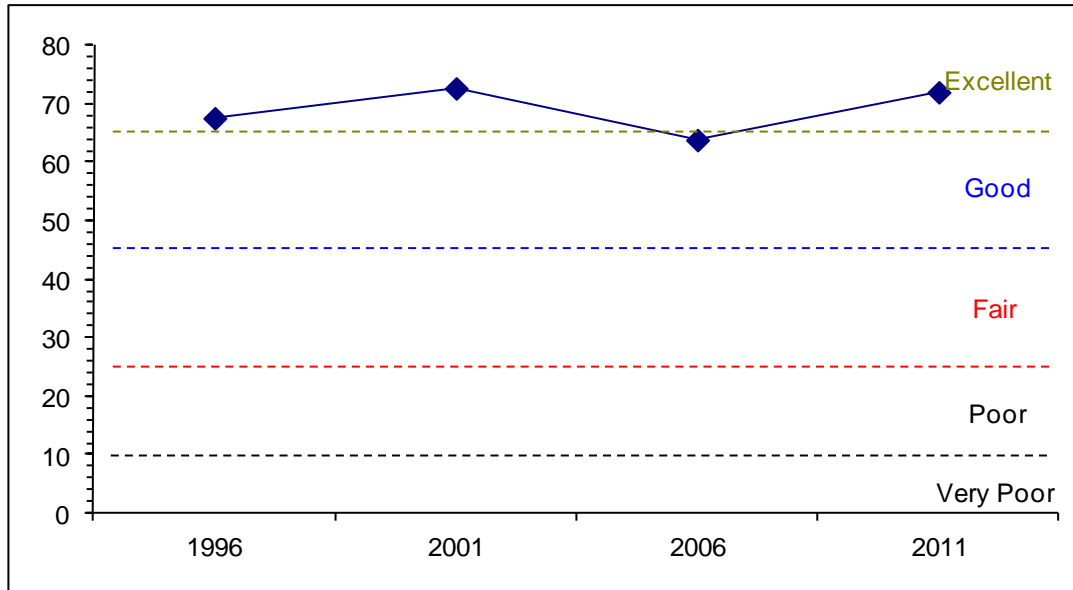
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 33



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 2, Study no: 33



HERBACEOUS TRENDS--
 Management unit 02, Study no: 33

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	c208	a119	ab166	c212	bc207	c220	6.76	10.46	12.07	15.75
G	Bromus tectorum (a)	-	-	a19	ab43	b54	c131	.21	.66	.59	2.45
G	Koeleria cristata	b23	ab11	a1	a6	a-	ab12	.00	.09	-	1.25
G	Oryzopsis hymenoides	a-	a-	a-	a-	a-	b10	-	-	-	.51
G	Poa fendleriana	a8	a-	b27	ab14	a3	a4	.28	.27	.03	.09
G	Poa secunda	a190	cd302	d308	b252	bc265	bcd263	8.95	4.30	5.39	8.03
G	Sitanion hystrix	-	-	3	-	-	2	.15	-	-	.01
G	Stipa comata	-	-	-	-	2	-	-	-	.03	-
Total for Annual Grasses		0	0	19	43	54	131	0.21	0.66	0.59	2.45
Total for Perennial Grasses		429	432	505	484	477	511	16.16	15.13	17.54	25.65
Total for Grasses		429	432	524	527	531	642	16.38	15.79	18.13	28.10
F	Agoseris glauca	-	-	-	-	4	6	-	-	.03	.04
F	Alyssum alyssoides (a)	-	-	a-	a-	b14	b18	-	-	.03	.11
F	Antennaria rosea	10	6	5	5	-	2	.06	.06	-	.15
F	Arabis holboellii	a1	a-	b10	ab6	ab3	ab7	.03	.06	.01	.04
F	Arenaria fendleri	b46	ab44	ab35	ab21	ab29	a14	1.61	.37	.61	.19
F	Aster chilensis	-	-	-	-	1	3	-	-	.04	.03
F	Astragalus convallarius	c43	ab4	a25	a43	b18	ab12	.51	.90	.37	.13
F	Astragalus sp.	115	13	8	4	37	24	.09	.01	.48	.59
F	Astragalus utahensis	1	3	-	2	4	8	-	.00	.03	.04
F	Balsamorhiza sagittata	8	5	2	14	7	8	.15	.31	.24	.74
F	Calochortus nuttallii	1	4	-	-	-	6	-	-	-	.01
F	Camelina microcarpa (a)	-	-	-	-	-	-	-	.00	-	-
F	Castilleja linariaefolia	-	-	-	4	-	5	-	.06	-	.02

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Chaenactis douglasii	3	-	-	-	-	-	-	-	-	-
F	Cirsium sp.	-	-	-	-	-	3	-	-	-	.01
F	Collinsia parviflora (a)	-	-	6	-	3	6	.01	-	.00	.01
F	Comandra pallida	a-	a-	a-	a8	ab8	b15	-	.09	.04	.13
F	Cordylanthus ramosus (a)	-	-	ab7	a1	a1	b12	.07	.00	.01	.03
F	Crepis acuminata	a28	a23	a24	ab43	a29	b60	.49	.57	.38	.81
F	Cryptantha sp.	b39	a-	a-	a-	a1	a-	-	-	.00	-
F	Cymopterus sp.	-	-	-	8	3	3	-	.05	.03	.01
F	Descurainia pinnata (a)	-	-	3	4	12	6	.03	.03	.02	.04
F	Draba sp. (a)	-	-	a-	a-	a3	b16	-	-	.00	.03
F	Erigeron divergens	a-	b34	a4	a6	a2	a7	.06	.06	.03	.56
F	Hackelia patens	-	9	-	3	3	4	-	.03	.03	.06
F	Haplopappus acaulis	4	-	14	2	11	6	.21	.03	.33	.04
F	Holosteum umbellatum (a)	-	-	-	-	6	8	-	-	.01	.02
F	Lappula occidentalis (a)	-	-	-	-	-	1	-	-	-	.00
F	Linum lewisii	-	-	-	-	-	4	-	-	-	.06
F	Lupinus sp.	-	-	-	2	-	2	-	.00	-	.01
F	Machaeranthera canescens	-	-	-	2	-	2	-	.00	-	.00
F	Melilotus officinalis	-	-	-	-	1	2	-	-	.00	.00
F	Penstemon humilis	b10	a2	ab3	a1	a-	a1	.01	.00	-	.03
F	Phacelia sp.	6	-	-	-	-	-	-	-	-	-
F	Phlox hoodii	a32	ab34	c74	c80	bc68	c89	.93	2.57	2.37	2.15
F	Phlox longifolia	a29	b83	ab60	a38	b85	a29	.52	.21	.68	.16
F	Physaria sp.	-	-	-	-	5	-	-	-	.01	-
F	Polygonum douglasii (a)	-	-	-	-	4	-	-	-	.01	-
F	Senecio multilobatus	3	-	-	1	-	-	-	.03	-	-
F	Solidago sp.	3	-	-	-	-	-	-	-	-	-
F	Tragopogon dubius (a)	-	-	-	-	-	3	-	-	-	.00
F	Trifolium sp.	-	-	6	13	5	-	.02	.08	.04	-
Total for Annual Forbs		0	0	16	5	43	70	0.11	0.04	0.10	0.26
Total for Perennial Forbs		382	264	270	306	324	322	4.73	5.54	5.78	6.05
Total for Forbs		382	264	286	311	367	392	4.85	5.59	5.88	6.32

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	4	1	0	2	-	.00	-	.03
B	Artemisia nova	82	80	87	80	10.04	13.06	9.27	11.07
B	Artemisia tridentata wyomingensis	42	30	2	10	1.89	.98	.15	.36
B	Ceratoides lanata	15	15	13	15	.07	.30	.51	.51
B	Chrysothamnus viscidiflorus viscidiflorus	29	34	33	38	1.03	3.69	2.57	3.71
B	Eriogonum microthecum	37	36	46	44	.87	1.05	1.46	1.64
B	Juniperus osteosperma	4	7	8	9	.56	1.23	2.14	3.36
B	Leptodactylon pungens	0	0	1	0	-	-	-	-
B	Opuntia sp.	2	2	2	1	-	-	-	-
B	Symphoricarpos oreophilus	5	4	6	2	.38	.21	.06	.09
B	Tetradymia canescens	0	0	1	0	-	.03	-	-
Total for Browse		220	209	199	201	14.85	20.59	16.18	20.80

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 33

Species	Percent Cover		
	'01	'06	'11
Amelanchier alnifolia	-	-	.41
Artemisia nova	-	10.76	10.60
Artemisia tridentata wyomingensis	-	.21	.28
Ceratoides lanata	-	.45	.55
Chrysothamnus viscidiflorus viscidiflorus	-	3.48	4.48
Eriogonum microthecum	-	2.00	2.09
Juniperus osteosperma	1.00	6.34	4.26
Opuntia sp.	-	.05	.06
Symphoricarpos oreophilus	-	.26	.46

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 33

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	-	3.1	5.6
Artemisia nova	0.2	0.5	0.9

POINT-QUARTER TREE DATA--

Management unit 02, Study no: 33

Species	Trees per Acre				Average diameter (in)			
	'96	'01	'06	'11	'96	'01	'06	'11
Juniperus osteosperma	100	121	127	117	1.9	3.7	2.8	2.3

BASIC COVER--

Management unit 02, Study no: 33

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.00	14.75	35.12	42.21	39.31	50.98
Rock	15.50	6.00	13.34	5.89	13.22	6.77
Pavement	16.00	24.50	16.43	13.54	16.69	24.03
Litter	49.25	32.50	26.29	33.81	24.45	24.34
Cryptogams	6.75	4.75	5.01	2.72	2.19	1.45
Bare Ground	9.50	17.50	11.36	19.00	24.33	10.88

SOIL ANALYSIS DATA --

Management unit 02, Study no: 33, Study Name: Brazier Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.5	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	7	5	9	4	-	-	-
Elk	-	2	7	1	1 (3)	8 (20)	-
Deer	33	25	27	16	48 (117)	80 (198)	42 (103)
Cattle	1	1	3	1	1 (2)	4 (11)	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 33

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	66	100	0	0	-	0	0	0	-/-
90	133	100	0	0	-	0	0	0	-/-
96	80	50	0	50	-	0	0	50	14/13
01	20	0	0	100	-	0	100	100	19/20
06	0	0	0	0	-	0	0	0	22/32
11	100	60	40	0	-	0	0	0	22/33
Artemisia nova									
84	14131	4	39	57	333	25	.47	2	7/13
90	11665	9	46	46	199	63	2	4	10/11
96	5340	3	83	14	180	28	.37	2	12/21
01	5760	7	80	13	560	17	1	6	12/20
06	5680	5	66	30	1080	.70	0	20	13/21
11	4840	15	62	23	200	13	2	19	10/19

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata wyomingensis</i>										
84	865	8	62	31	-	54	15	0	12/12	
90	1532	9	70	22	66	22	26	9	33/26	
96	1460	7	63	30	-	52	5	11	14/24	
01	1060	2	57	42	20	40	17	19	12/21	
06	40	50	0	50	40	50	0	50	-/-	
11	260	31	46	23	40	23	0	31	10/14	
<i>Ceratoides lanata</i>										
84	399	17	83	0	-	67	0	0	6/7	
90	465	57	29	14	-	29	14	0	6/5	
96	580	7	93	0	-	38	10	0	8/10	
01	680	0	100	0	-	6	0	0	8/15	
06	580	0	100	0	-	0	21	0	10/10	
11	460	9	91	0	100	0	0	0	11/13	
<i>Chrysothamnus nauseosus consimilis</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	28/65	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	2398	8	53	39	-	0	0	0	15/12	
90	2731	24	59	17	66	0	2	0	13/11	
96	840	2	83	14	-	2	0	0	13/19	
01	1020	0	92	8	-	0	0	0	12/20	
06	1160	3	90	7	-	2	0	10	11/15	
11	1340	15	76	9	-	0	0	0	14/20	
<i>Eriogonum microthecum</i>										
84	1398	29	71	0	399	0	0	0	9/8	
90	1465	55	45	0	66	5	0	0	5/7	
96	1300	2	98	0	-	0	0	0	7/9	
01	1380	0	100	0	-	0	1	0	6/8	
06	1740	3	97	0	20	1	0	0	8/12	
11	1600	15	84	1	-	3	0	1	9/12	
<i>Juniperus osteosperma</i>										
84	66	100	0	-	-	0	0	0	-/-	
90	66	100	0	-	66	0	0	0	-/-	
96	80	25	75	-	20	0	0	0	-/-	
01	140	71	29	-	-	0	0	0	-/-	
06	180	44	56	-	100	0	0	0	49/59	
11	180	78	22	-	60	0	0	0	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Leptodactylon pungens										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	20	0	0	100	-	0	0	100	-/-	
11	0	0	0	0	-	0	0	0	3/6	
Opuntia sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	0	100	-	-	0	0	0	3/10	
01	40	0	100	-	-	0	0	0	6/12	
06	80	25	75	-	-	0	0	0	3/3	
11	20	0	100	-	-	0	0	0	8/10	
Rosa woodsii										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	20/41	
11	0	0	0	-	-	0	0	0	-/-	
Symphoricarpos oreophilus										
84	599	44	56	-	-	0	0	0	16/6	
90	1799	4	96	-	-	19	4	15	22/12	
96	140	14	86	-	-	0	0	14	16/32	
01	120	0	100	-	-	0	0	0	18/32	
06	200	10	90	-	-	0	0	0	16/33	
11	80	0	100	-	-	25	0	0	19/35	
Tetradymia canescens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	12/30	
06	20	100	0	-	-	0	0	0	12/25	
11	0	0	0	-	-	0	0	0	21/25	

OTTER CREEK - TREND STUDY NO. 2-34-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: BLM

Elevation: 6,400 ft (1,951 m)

Aspect: East

Slope: 5%

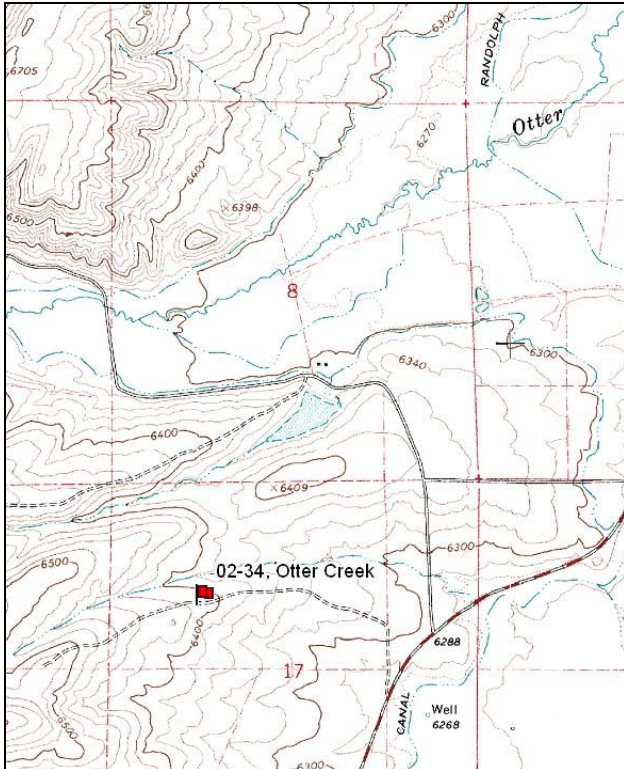
Transect bearing: 146° magnetic

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

Directions:

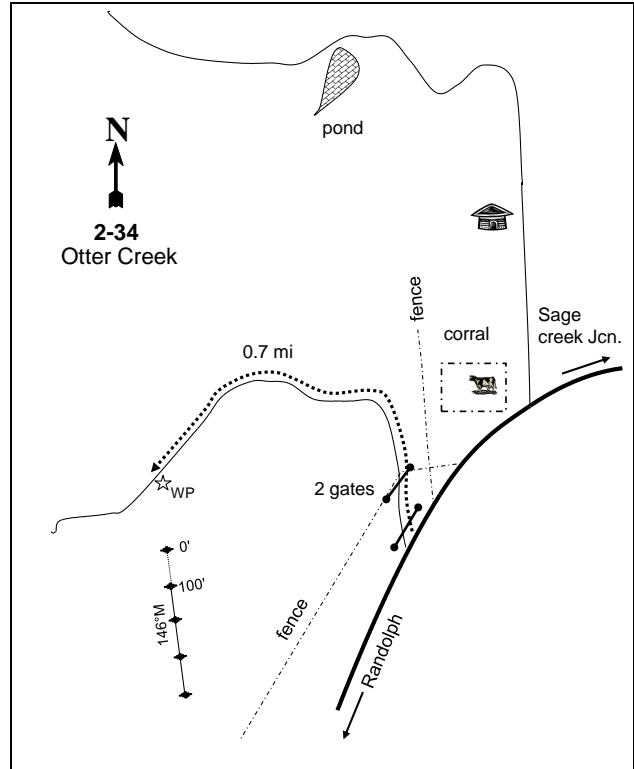
Proceed north from Randolph on U-16. Travel 0.5 mile past Nor Gray Lane. Turn left here, and proceed 0.7 miles from the first gate to a witness post on the left hand side of the road. From the witness post walk 15 feet at 160 degrees magnetic to the 0-foot stake of the baseline marked with browse tag #7977.

Map Name: Randolph



Township: 11N Range: 7E Section: 17

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 484694 E 4616262 N

Site Information

Site Description: This study is located approximately two miles north of Randolph on the west side of SR 16. The area is administered by the Bureau of Land Management (BLM) as part of the New Canyon allotment. Prior to 1984, the study area was treated with an unknown herbicide or some kind of mechanical means to control sagebrush. In addition, crested wheatgrass was drill seeded to increase forage production for livestock. By 2001, the area had returned to a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community. In the spring of 2004, a total 355 acres were treated with a Lawson aerator; a greenstripping design was used, which left some untreated strips of sagebrush. Although the exact seed mix is unknown, the seed mix included thickspike wheatgrass (*Agropyron dasystachyum*), crested wheatgrass (*A. cristatum*), slender wheatgrass (*A. trachycaulum*), Lewis flax (*Linum lewisii*), and forage kochia (*Kochia prostrata*). The pasture just south of the study area remains a thick sagebrush community. Many different animals occupy the area including cattle, sheep, deer, pronghorn, elk, and sage-grouse. Deer and pronghorn pellet groups were combined due to their similarity in appearance. Deer/pronghorn pellet groups were sampled in high abundance in 2001, but low abundance in 2006 and 2011. Elk pellet groups were sampled in low abundance in 2011. Sampled cattle pats have been minimal since 2001. Sage-grouse pellet groups were observed on the study in 2001 and 2011 (Table - Pellet Group Data).

Browse: Browse composition consists of a fairly dense stand of Wyoming big sagebrush, which has made up half of the total vegetation cover for the majority of the study's duration; except after the Lawson aeration treatment where cover decreased considerably when measured in 2006. The sagebrush population has been centered within the mature demographic for the duration of the study, except in 1984 when the majority of the population was centered within the young age class. Decadence within the sagebrush population has fluctuated with a mixture of low and high decadence over the course of the study years. The sagebrush population has had light to moderate utilization over the course of the study. The sagebrush population has displayed good vigor for the majority of sampled years, except in 1996 when most of the population experienced early leaf abscission due to dry conditions. Recruitment of young sagebrush plants has been good since the outset of the study (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory consists mainly of perennial grasses, with crested wheatgrass dominating the area. Before the study was established in 1984, the study was seeded and again in 2004 with the aerator treatment. Of the seeded perennial grass species, crested wheatgrass has been the only grass species sampled. Sandberg bluegrass (*Poa secunda*) is the only other common perennial grass found on the site. Forbs occur rarely and produced very little cover (Table - Herbaceous Trends).

Soil: Soils are part of the Pancheri component, which is found on hilltops. The parent material consists of eolian deposits derived from mixed sources (Soil Survey Staff 2011). Soils have a loam texture with a neutral soil reaction (pH 6.9) and limited organic matter (Table - Soil Analysis Data). Exposed bare ground cover is common, and is found primarily between the interspaces of browse cover. Adequate protective ground cover is provided by high amounts of vegetation and litter (Table - Basic Cover). The herbaceous cover provided by crested wheatgrass helps stabilize the soil. The study area is not badly eroded even though the amount of exposed bare ground is greater than the nearby undisturbed big sagebrush types. The soil erosion condition was classified to be slight in 2001 due to pedestalling around sagebrush. However, the erosion condition class was determined to be stable in 2006 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density for Wyoming big sagebrush decreased 20% from 9,565 plants/acre to 7,665 plants/acre. Decadence within the sagebrush population increased from 9% to 35%. Poor vigor in the sagebrush population increased from 0% to 10%.
- **1990 to 1996 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the sagebrush population decreased to 9%. However, the sagebrush population increased in poor vigor to 87%. Young sagebrush plants decreased from 28% to 16% of the population. Sagebrush cover was estimated at 17%.
- **1996 to 2001 - stable (0):** The density for Wyoming big sagebrush increased 9% from 9,620 plants/acre to 10,440 plants/acre. Decadence within the sagebrush population increased to 41%. However, the sagebrush population decreased in poor vigor to 2%. Young sagebrush plants decreased to 12% of the population. Sagebrush cover decreased and was estimated at 12%.
- **2001 to 2006 - down (-2):** The density for Wyoming big sagebrush decreased 35% to 6,760 plants/acre. The decrease in density was directly related to the aerator treatment which occurred in the spring of 2004. Decadence within the sagebrush population decreased to 21%. However, the sagebrush population increased in poor vigor to 14%. Young sagebrush plants decreased to 7% of the population. Sagebrush cover decreased and was estimated at 9%.
- **2006 to 2011 - slightly up (+1):** The density for Wyoming big sagebrush increased 14% to 7,720 plants/acre. Decadence within the sagebrush population decreased to 8%. Moreover, the sagebrush population decreased in poor vigor to 4%. Young sagebrush plants increased to 43% of the population. Sagebrush cover increased and was estimated at 17%. The Lawson aeration is likely involved in the revitalization the sagebrush population.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Crested wheatgrass decreased significantly in nested frequency. Sandberg bluegrass increased significantly in nested frequency.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 10%. Crested wheatgrass provided 12% cover. Sandberg bluegrass had a significant increase in nested frequency, and had a cover of 5%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Crested wheatgrass decreased in cover to 11%. Sandberg bluegrass decreased in cover to 3%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Crested wheatgrass increased in cover to 23%. Sandberg bluegrass maintained a cover of 3%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 12%. Crested wheatgrass decreased in cover to 13%. Sandberg bluegrass had a significant increased in nested frequency, and increased in cover to 6%.

Forb:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial forbs increased two-fold, but remained relatively rare on the site. Hoods phlox (*Phlox hoodii*) and longleaf phlox (*P. longifolia*) increased significantly in nested frequency. Clover (*Trifolium sp.*) had a significant decrease in nested frequency.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 22%. Because of the small size of the forb community, the decrease is likely due to small, accumulative decreases in nested frequency across the perennial forb community.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. No one forb species had a cover above 1%.

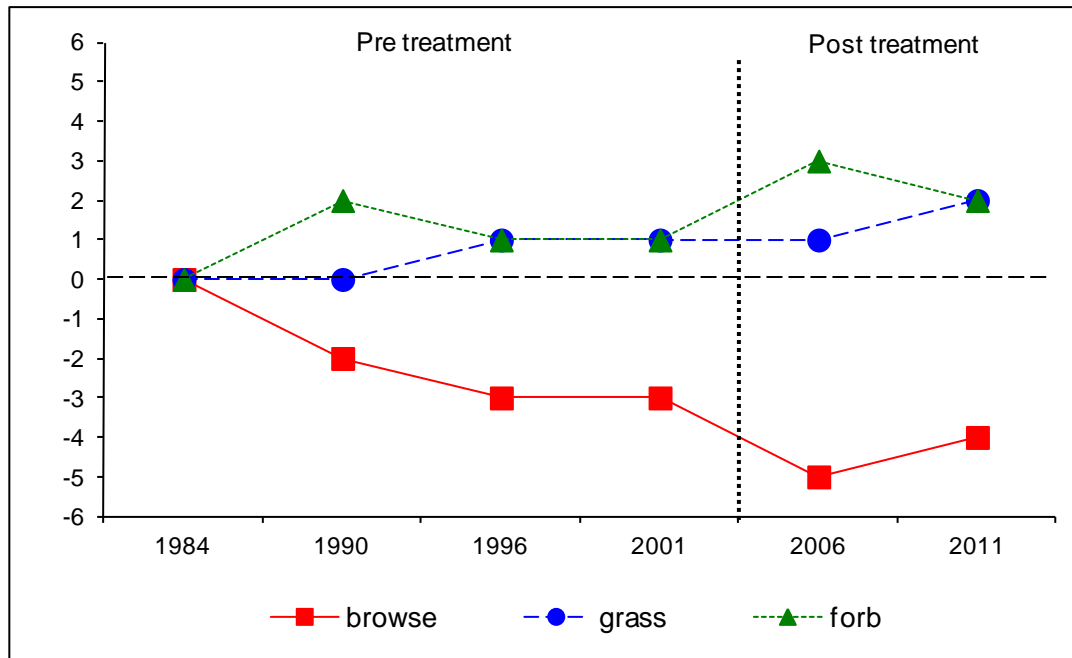
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 88%. As a seeded species, Lewis flax was observed for the first time, and had a significant increase in nested frequency. Lewis flax had a cover near 1%. Hoods phlox increased in cover from less than 1% to 3%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 26%. Lewis flax had a significant decrease in nested frequency. The annual forb species pale alyssum (*Alyssum alyssoides*) had a significant increase in nested frequency, and had a cover of less than 1%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 2, study no: 34

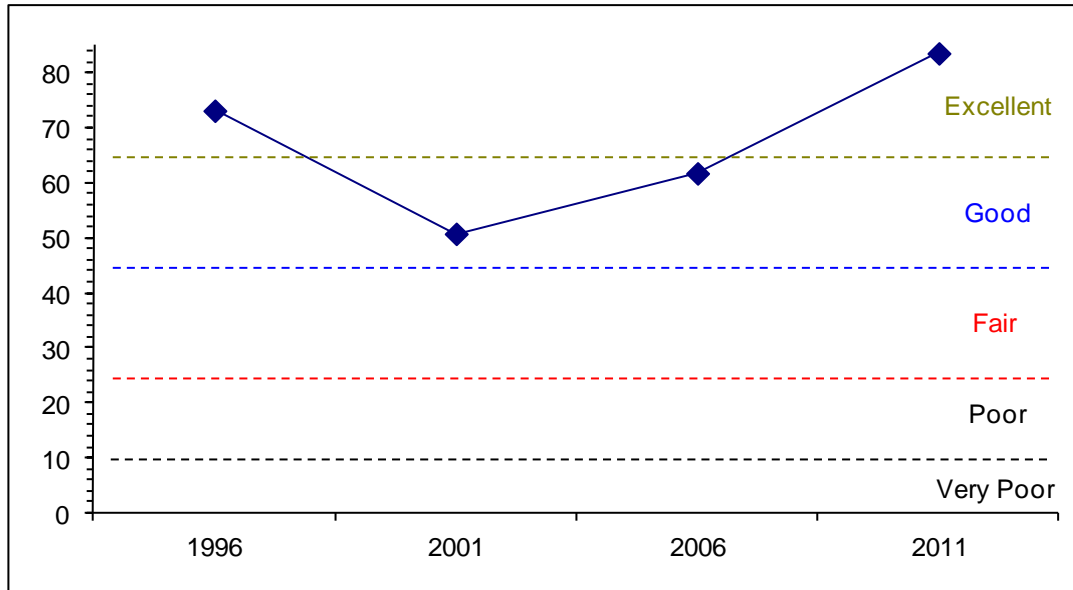
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	20.3	12.3	7.9	30.0	0.0	2.7	0.0	73.3	Excellent
01	14.2	2.7	6.0	26.3	0.0	1.5	0.0	50.8	Good
06	11.4	8.7	3.5	30.0	0.0	8.2	0.0	61.8	Good
11	21.4	12.6	15.0	30.0	0.0	4.6	0.0	83.6	Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2, Study no: 34



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 2, Study no: 34



HERBACEOUS TRENDS--
 Management unit 02, Study no: 34

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	b341	a309	ab310	a300	b317	b313	11.62	10.64	23.34	13.43
G	Carex sp.	-	4	-	4	5	10	-	.01	.18	.09
G	Oryzopsis hymenoides	-	-	-	3	-	-	-	.00	-	-
G	Poa secunda	a147	bc208	d265	bcd227	b190	cd248	5.29	2.48	3.41	5.74
G	Stipa comata	-	3	2	3	-	-	.01	.03	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		488	524	577	537	512	571	16.93	13.17	26.93	19.26
Total for Grasses		488	524	577	537	512	571	16.93	13.17	26.93	19.26
F	Alyssum alyssoides (a)	-	-	a-	b20	c52	d116	-	.04	.09	.42
F	Arabis sp.	-	-	-	1	1	-	-	.00	.00	-
F	Arenaria sp.	-	-	-	-	1	-	-	-	.03	-
F	Astragalus convallarius	-	-	-	-	-	7	-	-	-	.07
F	Astragalus utahensis	ab2	b6	ab5	ab3	a-	ab3	.03	.00	.00	.01
F	Calochortus nuttallii	-	-	-	2	-	-	-	.00	-	-
F	Chenopodium leptophyllum(a)	-	-	-	-	-	2	-	-	-	.00
F	Cordylanthus ramosus (a)	-	-	a-	a2	a-	b30	-	.01	-	1.08
F	Epilobium brachycarpum (a)	-	-	-	-	-	3	-	-	-	.03
F	Erigeron pumilus	-	-	-	1	1	1	-	.00	.00	.03
F	Holosteum umbellatum (a)	-	-	a-	a-	a-	b56	-	-	-	.81
F	Linum lewisii	-	-	a-	a-	b79	a-	-	-	.87	-
F	Lomatium sp.	-	1	-	9	-	-	-	.02	-	-
F	Phlox hoodii	a38	b81	ab75	ab58	b85	b80	1.16	.54	2.77	1.62
F	Phlox longifolia	a-	b50	b31	b25	b50	b53	.15	.10	.30	.46
F	Tragopogon dubius (a)	-	-	-	4	-	1	-	.03	-	.00

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Trifolium sp.	_b 29	_a 4	_a -	_{ab} 18	_{ab} 7	_b 23	-	.05	.02	.11
F	Unknown forb-perennial	1	-	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	-	-	-	4	3	-	-	.03	.07	-
Total for Annual Forbs		0	0	0	26	52	208	0	0.07	0.08	2.35
Total for Perennial Forbs		70	142	111	121	227	167	1.35	0.77	4.09	2.31
Total for Forbs		70	142	111	147	279	375	1.35	0.85	4.18	4.66

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	98	94	89	93	16.12	11.36	9.11	17.08
B	Atriplex gardneri falcata	8	9	7	1	.06	.18	.03	-
B	Chrysothamnus viscidiflorus stenophyllus	10	5	10	9	.60	.03	.18	.18
B	Eriogonum microthecum	1	1	0	1	.15	.03	-	-
B	Opuntia sp.	2	1	1	1	-	-	-	-
Total for Browse		119	110	107	105	16.93	11.60	9.32	17.26

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 34

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	7.81	17.25
Atriplex gardneri falcata	.16	-
Chrysothamnus viscidiflorus stenophyllus	.20	.15

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 34

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	0.8	1.0	4.3

BASIC COVER--

Management unit 02, Study no: 34

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	13.50	5.00	36.29	28.72	38.15	37.52
Rock	0	0	.03	.01	.04	.00
Pavement	0	0	.22	.10	.04	.04
Litter	40.25	40.50	29.26	35.75	43.18	27.14
Cryptogams	0	.50	3.84	4.25	1.48	1.04
Bare Ground	46.25	54.00	42.42	46.36	33.09	40.24

SOIL ANALYSIS DATA --

Management unit 02, Study no: 34, Study Name: Otter Creek

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.6	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	3	4	-	-	3 (8)	-	-
Rabbit	1	-	2	16	-	-	-
Grouse	-	-	-	1	-	-	-
Elk	7	-	1	1	-	-	1 (3)
Deer/Pronghorn	14	23	20	20	42 (103)	28 (69)	16 (40)
Cattle	5	6	3	4	11 (27)	11 (27)	14 (34)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 34

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata wyomingensis</i>									
84	9565	55	36	9	699	51	8	0	17/28
90	7665	28	37	35	166	42	0	10	15/14
96	9620	16	76	9	400	31	3	87	16/23
01	10440	12	47	41	-	32	0	2	15/22
06	6760	7	72	21	340	20	14	14	12/18
11	7720	43	50	8	27560	12	0	4	16/23
<i>Atriplex gardneri falcata</i>									
84	0	0	0	-	-	0	0	0	-/-
90	33	100	0	-	-	0	0	0	-/-
96	180	0	100	-	-	0	0	0	4/10
01	240	0	100	-	-	0	0	0	2/7
06	160	13	88	-	-	0	0	0	4/10
11	20	0	100	-	-	0	0	0	3/6

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Chrysothamnus viscidiflorus stenophyllus										
84	332	50	50	0	-	10	0	0	11/25	
90	699	0	5	95	-	0	0	86	8/15	
96	340	0	94	6	-	0	0	88	9/15	
01	140	0	57	43	-	0	0	0	7/14	
06	320	0	88	13	-	0	0	19	10/17	
11	340	0	100	0	-	6	0	0	8/15	
Eriogonum microthecum										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	20	0	100	0	-	0	0	0	6/11	
01	20	0	0	100	-	0	0	0	6/9	
06	0	0	0	0	-	0	0	0	-/-	
11	20	0	100	0	-	0	0	0	6/8	
Leptodactylon pungens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	33/44	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Opuntia sp.										
84	33	0	100	-	-	0	0	0	7/17	
90	33	0	100	-	-	0	0	0	6/17	
96	60	33	67	-	-	0	0	0	4/7	
01	20	0	100	-	-	0	0	0	4/11	
06	20	0	100	-	-	0	0	0	6/16	
11	20	0	100	-	-	0	0	0	4/12	

HIGGINS HOLLOW - TREND STUDY NO. 2-35-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: BLM

Elevation: 6,500 ft (1,981 m)

Aspect: Northeast

Slope: 14%

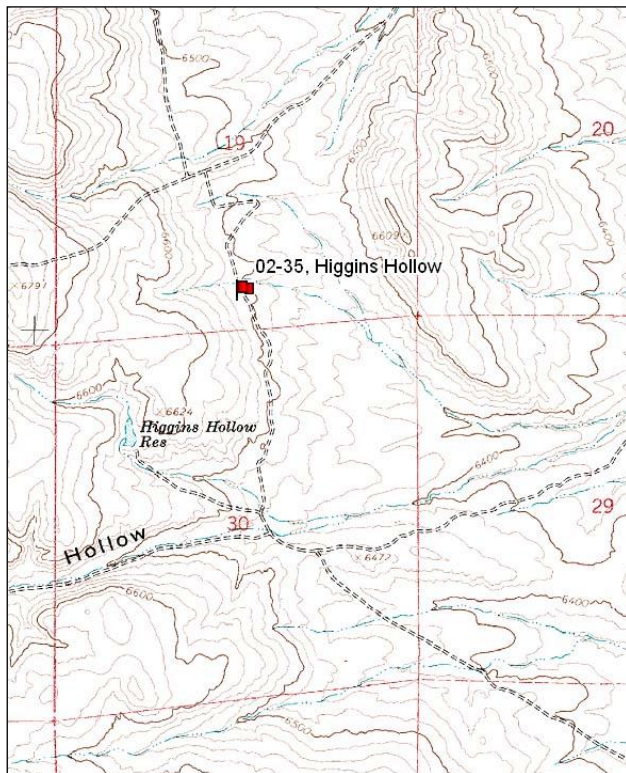
Transect bearing: 165° magnetic

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

Directions:

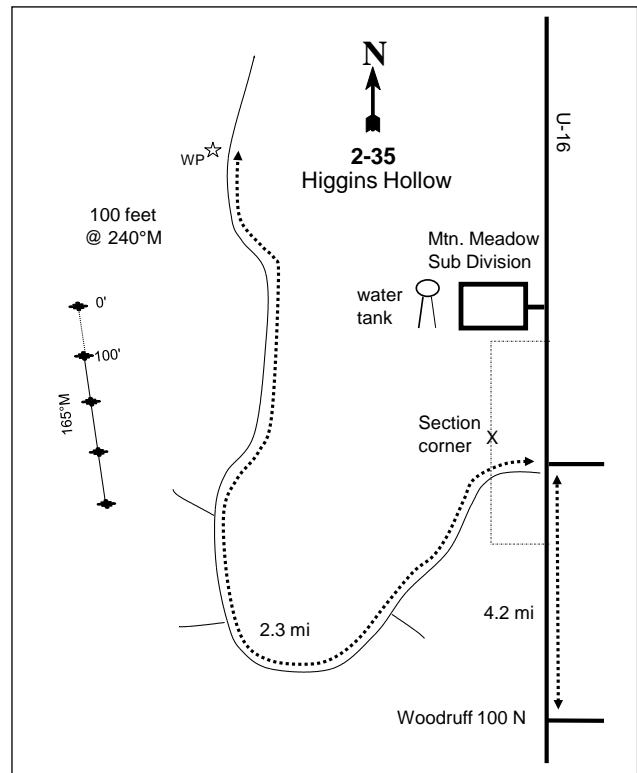
From 1st North in Woodruff proceed north on U-16 for 4.2 miles, and turn west to a dirt road. Proceed through pasture passing section marker at west gate. Travel a total of 2.3 miles (staying right) to a witness post on west side of road. From the witness post walk 100 feet at 240 degrees magnetic to the 0-foot stake (browse tag #9158) of the baseline.

Map Name: Woodruff



Township: 10N Range: 7E Section: 19

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 483456 E 4603655 N

HIGGINS HOLLOW - TREND STUDY NO. 2-35

Site Information

Site Description: This study is located north of Woodruff on the west side of SR 16. The area is administered by the Bureau of Land Management (BLM) as part of the Woodruff Pastures. The area is similar physically and edaphically to the Otter Creek study (2-34). The principal differences between these two areas are slope and past management practices. This study samples relatively undisturbed Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community. Thus, it provides a good comparison to the Otter Creek study (2-34), an area that was mechanically treated and seeded. Wildlife occupies the Higgin's Hollow study area infrequently. Deer and pronghorn pellet groups were combined due to their similarity in appearance. Deer/pronghorn pellet groups were sampled in low abundance in 2001 and 2006, but moderate abundance in 2011. Cattle pats have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The preferred browse species is Wyoming big sagebrush. It is the most abundant and palatable shrub on the study site. The Wyoming big sagebrush population varied slightly in density over the course of the study; however density decreased notably in 2006 and 2011. Over the sample years there has been a relatively high amount of decadence within the sagebrush population. Recruitment of young within the sagebrush population has progressively declined over the course of the study. The sagebrush population has had mostly moderate utilization over the sample years. Narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) occurs in fairly high numbers, although it is much smaller and seldom utilized (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous component is dominated by the perennial grass species Sandberg bluegrass (*Poa secunda*). Several other perennial grass species are present, but in limited numbers. These species include western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*). Forbs occur only rarely and are primarily low growing species with little forage value. Hoods phlox (*Phlox hoodii*) and longleaf phlox (*P. longifolia*) are the most common species (Table - Herbaceous Trends).

Soil: Soils are part of the Pancheri component, which is found on hilltops. The parent material consists of eolian deposits derived from mixed sources (Soil Survey Staff 2011). The soil is mostly rock free and has a loam texture with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Exposed bare ground cover is moderate, and is found primarily between the interspaces of browse cover. Adequate protective ground cover is provided by high amounts of vegetation and litter (Table - Basic Cover). Some erosion is apparent, but is not serious. The soil erosion condition was classified as stable in 2001, but slight in 2006 and 2011 due to apparent pedestalling around shrubs. A few active gullies have also formed on the steeper slopes.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** The density for Wyoming big sagebrush decreased remained similar, decreasing slightly from 6,865 plants/acre to 6,798 plants/acre. Decadence within the sagebrush population increased negligibly from 43% to 45%. The sagebrush population increased in poor vigor from 3% to 8%. Recruitment of young sagebrush increased from 23% to 33% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the sagebrush population decreased to 19%. The sagebrush population decreased in poor vigor to 2%. Young sagebrush recruitment decreased to 19% of the population.
- **1996 to 2001 - slightly up (+1):** The density for Wyoming big sagebrush increased 20% from 6,798 plants/acre to 8,080 plants/acre. However, decadence within the sagebrush population increased to 48%, and recruitment of young sagebrush decreased to 2% of the total population.

- **2001 to 2006 - down (-2):** The density for Wyoming big sagebrush decreased 25% to 6,040 plants/acre, returning to near 1996 levels. Cover for Wyoming big sagebrush decreased from 27% to 23%, but is still considered to be high. Decadence within the sagebrush population decreased to 36%. The sagebrush population increased in poor vigor from 2% to 26%. Recruitment of young sagebrush comprised 1% of the population.
- **2006 to 2011 - stable (0):** The density for Wyoming big sagebrush decreased 25% to 4,520 plants/acre. However, cover for Wyoming big sagebrush increased to 29%. Decadence within the sagebrush population remained similar at 35%. The sagebrush population maintained poor vigor at 26%. Recruitment of young sagebrush comprised 2% of the total population.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Western wheatgrass and Sandberg bluegrass increased significantly in nested frequency. A sedge species (*Carex sp.*) was present in small numbers, and also had a significant increase in nested frequency. However, bluebunch wheatgrass and bottlebrush squirreltail decreased significantly in nested frequency.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses decreased 26%. Sandberg bluegrass increased significantly in nested frequency, and had a cover of 16%. Western wheatgrass, bottlebrush squirreltail, and the sedge species had a significant decrease in nested frequency, and all had covers below 1%.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 17%. Western wheatgrass increased significantly in nested frequency and increased in cover to nearly 1%. Sandberg bluegrass decreased in cover to 14%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 12%. Bluebunch wheatgrass increased significantly in nested frequency and increased in cover from less than 1% to 2%. Sandberg bluegrass maintained cover near 14%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Sandberg bluegrass had a significant increase in nested frequency and increased in cover to 19%. However, the decrease in the sum of nested frequency is likely due to small, accumulative decreases in nested frequency across the perennial grass community.

Forb:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial forbs increased 70%. The increase is directly related to the significant increase in nested frequency for longleaf phlox.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 17%. Hoods phlox had a significant increase in nested frequency, and had a cover just over 1%. However, the decrease in the sum of nested frequency is likely due to small, accumulative decreases in nested frequency across the perennial forb community.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 12%. Clover (*Trifolium sp.*) had a significant increase in nested frequency, but was an insignificant component in cover.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 27%, and cover increased from 2% to 4%. Milkvetch (*Astragalus sp.*) and low fleabane (*Erigeron pumilus*) increased significantly in nested frequency, but provided limited cover.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 24%, and cover increased to 5%. Milkvetch, spreading fleabane (*Erigeron divergens*), and clover increased significantly in nested frequency. Hoods phlox and spreading fleabane had covers near 1%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

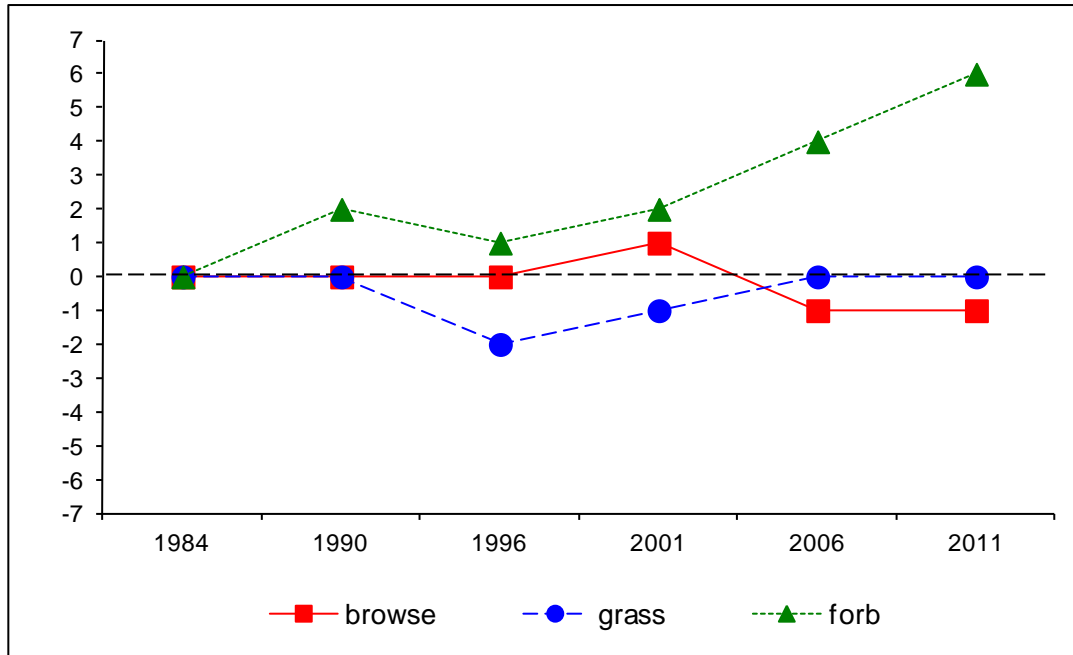
Management unit 2, study no: 35

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	25.7	9.3	9.5	30.0	0.0	4.2	0.0	78.7	Excellent
01	30.0	0.6	1.0	30.0	0.0	4.4	0.0	66.0	Good-Excellent
06	28.4	4.2	0.5	30.0	0.0	7.0	0.0	70.2	Excellent
11	30.0	4.5	1.0	30.0	0.0	10.0	0.0	75.5	Excellent

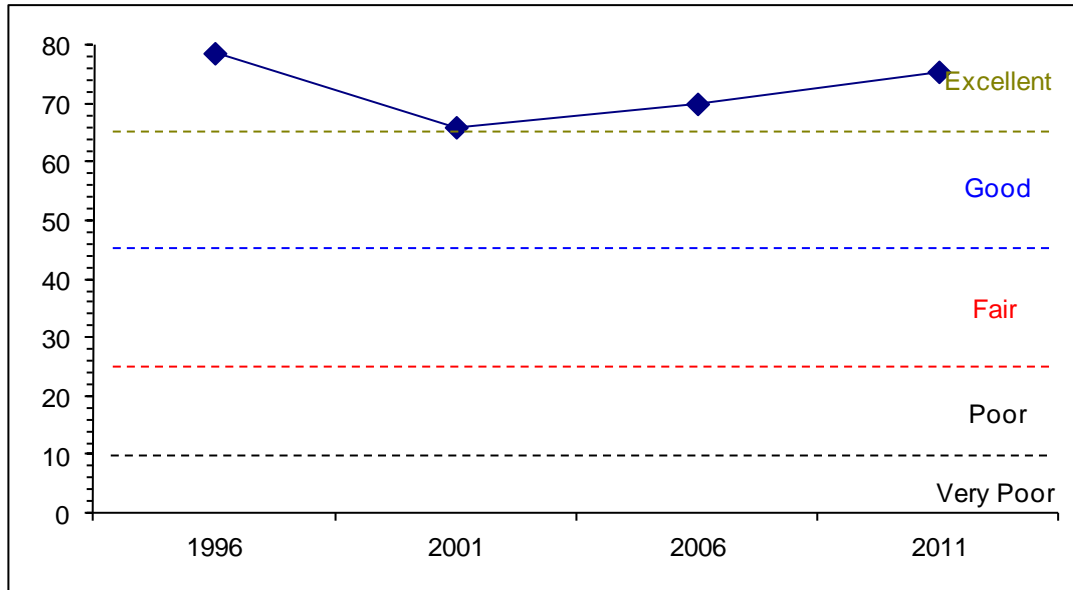
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 35



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 2, Study no: 35



HERBACEOUS TRENDS--
 Management unit 02, Study no: 35

Type	Species	Nestled Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron smithii	a-	c105	b14	c84	c111	c91	.07	.62	1.06	.85
G	Agropyron spicatum	c217	a14	a9	a24	b53	b56	.04	.29	1.72	.82
G	Bromus tectorum (a)	-	-	2	-	-	-	.00	-	-	-
G	Carex sp.	b29	c55	a4	a2	a10	ab20	.02	.03	.02	.11
G	Oryzopsis hymenoides	-	-	1	-	2	1	.00	-	.00	.00
G	Poa bulbosa	-	-	4	-	-	-	.15	-	-	-
G	Poa fendleriana	-	-	4	8	10	12	.04	.06	.44	.12
G	Poa pratensis	-	-	-	2	10	1	-	.03	.12	.00
G	Poa secunda	a263	ab304	d339	ab318	cd281	310	15.75	14.18	14.19	18.84
G	Sitanion hystrix	c91	b69	a30	ab34	ab53	ab31	.25	.50	.79	.53
G	Stipa comata	-	-	-	2	-	-	-	.03	-	-
Total for Annual Grasses		0	0	2	0	0	0	0.00	0	0	0
Total for Perennial Grasses		600	547	405	474	530	522	16.32	15.75	18.37	21.30
Total for Grasses		600	547	407	474	530	522	16.33	15.75	18.37	21.30
F	Agoseris glauca	4	-	-	4	3	-	-	.03	.03	-
F	Alyssum alyssoides (a)	-	-	-	-	-	7	-	-	-	.01
F	Antennaria rosea	-	8	4	2	3	4	.06	.03	.06	.04
F	Arabis sp.	2	13	3	6	-	14	.00	.02	-	.05
F	Astragalus convallarius	2	2	3	4	7	1	.03	.01	.04	.01
F	Astragalus sp.	a-	a-	a-	a-	b20	c38	-	-	.36	.25
F	Calochortus nuttallii	a3	a4	a-	a3	a1	b32	-	.00	.00	1.88
F	Chenopodium leptophyllum(a)	-	-	-	-	-	1	-	-	-	.00
F	Collinsia parviflora (a)	-	-	a-	a1	a3	b36	-	.00	.00	.39
F	Cordylanthus ramosus (a)	-	-	a8	ab23	b40	c142	.04	.14	.20	5.05

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Crepis acuminata</i>	-	-	-	-	1	-	-	-	.03	-
F	<i>Cryptantha</i> sp.	b13	a-	a-	a-	a-	a1	-	-	-	.00
F	<i>Descurainia pinnata</i> (a)	-	-	5	10	5	9	.01	.02	.01	.02
F	<i>Draba</i> sp. (a)	-	-	-	-	-	2	-	-	-	.00
F	<i>Erigeron divergens</i>	a14	a14	a19	a18	a12	b65	.28	.14	.15	.98
F	<i>Erigeron pumilus</i>	a12	a-	a3	a8	b42	a6	.03	.02	.69	.04
F	<i>Haplopappus acaulis</i>	-	-	-	-	-	4	-	-	.00	.18
F	<i>Lomatium triternatum</i>	-	9	-	5	5	1	-	.18	.01	.00
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b16	a-	a5	-	.03	-	.01
F	<i>Penstemon humilis</i>	5	1	1	-	5	-	.00	-	.06	-
F	<i>Phlox hoodii</i>	a5	a7	b53	b60	b54	b50	1.12	1.24	1.28	1.10
F	<i>Phlox longifolia</i>	a57	c160	bc113	ab89	ab101	ab83	.55	.40	.57	.42
F	<i>Polygonum douglasii</i> (a)	-	-	-	-	-	1	-	-	-	.00
F	<i>Salsola iberica</i> (a)	-	-	-	3	-	-	-	.00	-	-
F	<i>Schoenrambe linifolia</i>	-	-	-	1	5	4	-	.00	.01	.01
F	<i>Trifolium</i> sp.	bc25	b12	a-	b24	b15	c44	-	.08	.04	.24
F	<i>Veronica biloba</i> (a)	-	-	-	-	-	1	-	-	-	.00
F	<i>Zigadenus paniculatus</i>	a-	ab11	a2	a1	b11	ab6	.03	.03	.13	.03
Total for Annual Forbs		0	0	13	53	48	204	0.06	0.21	0.21	5.50
Total for Perennial Forbs		142	241	201	225	285	353	2.11	2.21	3.51	5.27
Total for Forbs		142	241	214	278	333	557	2.17	2.43	3.74	10.78

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	0	0	1	0	-	-	-	-
B	<i>Artemisia tridentata wyomingensis</i>	96	97	92	93	20.53	26.73	22.64	29.08
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	39	46	45	45	1.36	1.90	2.61	3.44
B	<i>Eriogonum microthecum</i>	8	4	6	6	.01	.00	.09	.09
B	<i>Opuntia</i> sp.	3	6	5	4	.00	-	-	.15
B	<i>Tetradymia canescens</i>	3	7	6	4	-	.06	.21	.21
Total for Browse		149	160	155	152	21.92	28.70	25.56	32.98

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 35

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	30.46	31.14
Chrysothamnus viscidiflorus stenophyllus	3.38	3.41
Eriogonum microthecum	.10	.05
Opuntia sp.	.08	.03
Tetradymia canescens	-	.15

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 35

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	0.7	0.8	1.4

BASIC COVER--

Management unit 02, Study no: 35

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	7.75	7.75	39.28	49.63	45.86	51.70
Rock	0	0	.10	.09	.11	.13
Pavement	.75	.25	.36	.46	1.01	.29
Litter	76.00	54.25	38.15	44.29	43.97	44.40
Cryptogams	2.75	14.25	10.31	13.38	6.60	3.42
Bare Ground	12.75	23.50	23.33	17.78	21.75	19.97

SOIL ANALYSIS DATA --

Management unit 02, Study no: 35, Study Name: Higgins Hollow

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	12	14	23	29	-	-	-
Grouse	-	-	-	2	-	-	-
Elk	-	-	1	2	-	-	-
Deer/Pronghorn	13	11	9	6	7 (17)	11 (26)	21 (53)
Cattle	9	2	2	-	12 (29)	4 (11)	4 (9)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 35

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	160	0	100	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Artemisia tridentata wyomingensis</i>										
84	6865	23	34	43	4266	44	17	3	17/21	
90	6798	33	22	45	1399	34	10	8	23/21	
96	6760	19	62	19	80	43	4	2	24/33	
01	8080	2	50	48	20	23	1	1	23/30	
06	6040	1	63	36	-	14	2	26	23/32	
11	4520	2	62	35	260	39	6	26	24/35	
<i>Chrysothamnus viscidiflorus stenophyllus</i>										
84	5531	16	66	18	-	0	0	0	9/13	
90	4998	4	5	91	199	4	0	52	8/12	
96	1620	0	96	4	-	0	0	9	10/17	
01	2320	0	90	10	-	0	0	5	10/17	
06	2480	0	91	9	20	0	0	12	10/17	
11	2460	6	93	2	-	0	0	0	10/16	
<i>Eriogonum microthecum</i>										
84	266	0	100	0	-	0	0	0	4/4	
90	133	100	0	0	-	0	0	0	-/-	
96	220	9	82	9	-	0	0	9	7/8	
01	80	0	100	0	-	0	0	0	6/9	
06	140	0	100	0	-	0	0	0	6/9	
11	140	0	100	0	-	0	0	0	6/10	
<i>Opuntia sp.</i>										
84	399	0	100	0	-	0	0	0	5/7	
90	199	0	100	0	66	0	0	0	5/1	
96	100	0	100	0	-	0	0	0	4/11	
01	180	0	89	11	-	0	0	0	3/8	
06	140	0	100	0	-	0	0	0	5/13	
11	80	0	75	25	-	0	0	25	5/15	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Tetradymia canescens										
84	332	20	80	0	-	80	0	0	5/4	
90	265	25	0	75	199	0	75	75	-/-	
96	60	0	67	33	-	0	0	33	5/10	
01	180	11	67	22	-	33	0	22	7/12	
06	140	14	71	14	-	0	0	0	6/8	
11	100	20	80	0	-	0	0	0	6/9	

WOODRUFF CO-OP - TREND STUDY NO. 2-36-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: DWR

Elevation: 6,550 ft (1996 m)

Aspect: South

Slope: 2%

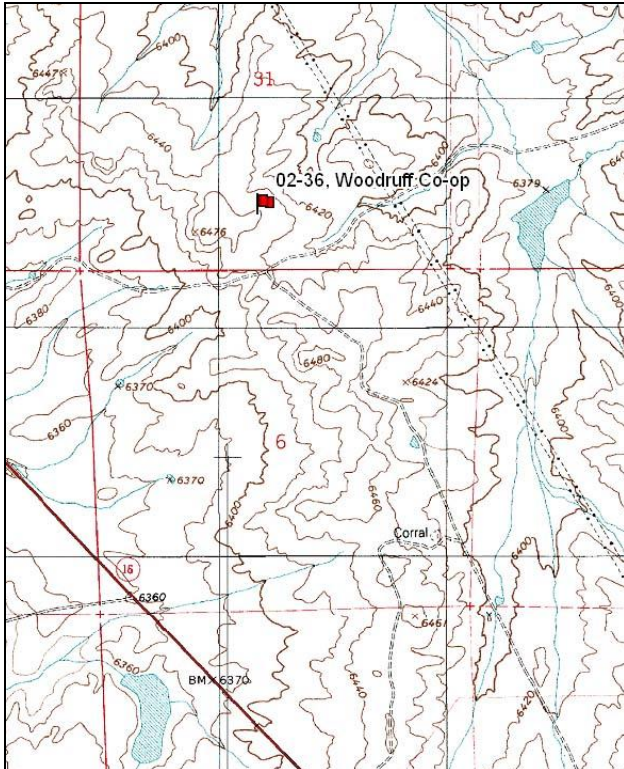
Transect bearing: 170° magnetic

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

Directions:

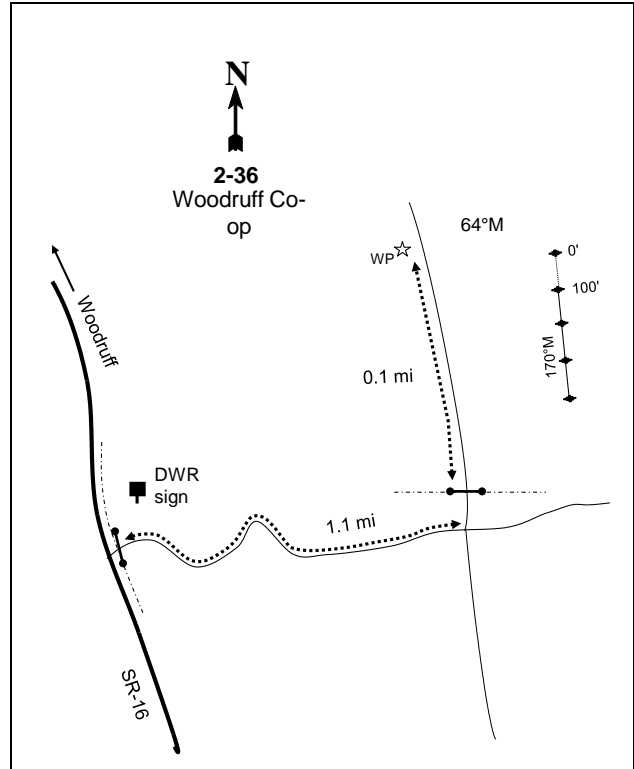
From the junction of SR-39 and SR-16 in Woodruff, travel south on SR-16, 5.7 miles to the Woodruff Co-op Livestock Management Area. Turn left (east) through the gate. Drive 1.1 miles to a fork. Turn left and go north through the gate. From the gate, go 0.1 miles. The study is on the east side of the road, approximately 60 paces to the 0-foot baseline stake. The study stakes are short fenceposts. 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



Township: 9N Range: 8E Section: 31

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 493109 E 4590692 N

Site Information

Site Description: This study was established in 1990 on land administered by Utah Division of Wildlife Recourses (UDWR) to monitor Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) reestablishment in an area, which is dominated by introduced perennial grasses. In 2003, 173 acres were disked twice and drill seeded (Table - Seed Mix) in the fall to establish more shrubs and to increase diversity within the community. Livestock were allowed back onto the allotment in 2005. The allotment continues to be used for spring cattle grazing. Pronghorn use in the area is year round, while deer and elk use is in the winter. Signs of sage-grouse are also common. Deer and pronghorn pellet groups are combined due to their similarity in appearance. Deer/pronghorn pellet groups were sampled in low abundance in 2001 and 2006, but moderate abundance in 2011. Pronghorn were in the area in 2011 at the time of sampling. Elk pellet groups were sampled in low abundance in 2001 and 2006. No pellet groups were sampled for elk in 2011. Sampled cattle pats were sampled in high abundance in 2001, but low abundance in 2006. No cattle sign was observed in 2011. Only one sage-grouse pellet group was encountered in 2006 (Table - Pellet Group Data).

Browse: Wyoming big sagebrush and winterfat (*Ceratoides lanata*) are the most important browse species on this study, although a small population of fourwing saltbush (*Atriplex canescens*) was observed for the first time in 2006. Fourwing saltbush was seeded in the 2003 treatment. Sagebrush density has been sparse for the duration of the study and has little variability in density. The sagebrush population is mostly mature and has displayed good vigor. Since 1996, decadence within the sagebrush population has been low; however decadence was high in 1984. The sagebrush population has had light to moderate use over the sample years. The recruitment of young sagebrush has been good over the sample years with the exception of 1996. Winterfat was the most abundant shrub on the study in 2001, but was almost completely absent by 2006 (Table - Browse Characteristics). Winterfat cover was low, and like sagebrush was decreased by the disk treatment (Table - Browse Trends). Other browse species that are present include low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), broom snakeweed (*Gutierrezia sarothrae*), gray horsebrush (*Tetradymia canescens*), and pricklypear cactus (*Opuntia polyacantha*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is dominated by crested wheatgrass (*Agropyron cristatum*), which has accounted for the majority of vegetation cover since 1996. Crested wheatgrass had been moderately utilized in 2001 and 2006. Sandberg bluegrass (*Poa secunda*), needle-and-thread (*Stipa comata*), and Indian ricegrass (*Oryzopsis hymenoides*) have also been sampled. Forbs are limited and provide very little cover or forage. Hoods phlox (*Phlox hoodii*) and longleaf phlox (*Phlox longifolia*) were the most abundant of the perennial forb species in 1996 and 2001, but were not sampled in 2006. This decrease may be treatment related. Alfalfa (*Medicago sativa*), which was seeded in the treatment, occurred at a relatively high frequency, and had the highest cover of all the forb species in 2006 and 2011 (Table - Herbaceous Trends).

Soil: The soil is part of the Woodpass component, which is found on upland slopes and alluvial fans. The parent material consists of alluvium derived from limestone and sandstone (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). Exposed bare ground cover occurs in regular distribution between the interspaces of browse and perennial grass colonies; moreover, bare ground cover was moderate in quantity in all sample years. Ample protective ground cover is provided by high amounts of vegetation and litter (Table - Basic Cover). The vegetation cover has been highly moderate due to the dense stand of crested wheatgrass, but there has also been a significant amount of bare soil in all other sampling years. Cryptogams are abundant around the base of crested wheatgrass plants. Soil pedestalling provides evidence that some erosion has occurred in the past. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the Wyoming big sagebrush population decreased noticeably from 31% to 6%. Poor vigor was not observed within the sagebrush population. Young sagebrush plants were not observed.
- **1996 to 2001 - slightly up (+1):** The density for Wyoming big sagebrush increased 31% from 320 plants/acre to 420 plants/acre. Decadence and poor vigor were not observed within the sagebrush population. Recruitment of young sagebrush plants increased to 24% of the population.
- **2001 to 2006 - slightly up (+1):** The density for Wyoming big sagebrush increased 48% to 620 plants/acre. It appears the seeding treatment from 2003 has increased sagebrush density. The increase in density was primarily due to an increase in young sagebrush plants, which comprised 42% of the population. Decadence and poor vigor were not observed within the sagebrush population. Fourwing saltbush was encountered for the first time with a density of 460 plants/acre. Decadence and poor vigor within the saltbush population was not observed.
- **2006 to 2011 - stable (0):** The density for Wyoming big sagebrush decreased 23% to 480 plants/acre. The decrease in density is primarily due to decreases in the recruitment of young sagebrush plants, which comprised 25% of the population. It appears that many of the young plants from 2006 did not establish in the population since the density of mature sagebrush plants remained similar. Decadence and poor vigor comprised 4% of the population. The density of fourwing saltbush decreased in density to 480 plants/acre. Decadence within the saltbush population remained similar at 4%

Grass:

- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses had no change. The perennial species crested wheatgrass was very prolific, and had a cover of 23%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Crested wheatgrass had no significant change in nested frequency, but increased in cover to 31%.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial grasses decreased 21%. Crested wheatgrass decreased significantly in nested frequency, and decreased in cover to 23%. Orchardgrass (*Dactylis glomerata*) increased significantly in nested frequency, and had a cover of less than 1%. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to less than 1%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 12%. Crested wheatgrass, thickspike wheatgrass (*Agropyron dasystachyum*), and Indian ricegrass increased significantly in nested frequency. Crested wheatgrass increased in cover to 42%. The remaining species had covers of less than 1%.

Forb:

- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 53%. Hoods phlox and longleaf phlox decreased significantly in nested frequency. Forbs were uncommon and were not diverse.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 60%, but remained relatively rare on the site. Longleaf phlox and clover (*Trifolium sp.*) increased significantly in nested frequency. No one perennial forb species had a cover above a 1%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 24%, but cover remained relatively rare on the site. Cover of perennial forbs increased from 1% to 2%. Hoods phlox, longleaf phlox, and clover decreased significantly in nested frequency. The seeded species Alfalfa (*Medicago sativa*) had a significant increase in nested frequency, and had a cover of 2%. The seeded species blue flax (*Linum perenne*) increased significantly in nested frequency, and had a cover of less than 1%.

- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 20%, but forbs were already relatively rare on the site. Alfalfa did not have a significant increase in nested frequency, but increased considerably in cover to 5%. Blue flax decreased significantly in nested frequency. The annual species pale alyssum (*Alyssum alyssoides*) had a significant increase in nested frequency, and was the most common forb species on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

Management unit 2, study no: 36

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	1.1	0.0	0.0	30.0	0.0	2.4	0.0	33.5	Fair
01	1.9	0.0	0.0	30.0	0.0	1.7	0.0	33.6	Fair
06	1.1	0.0	0.0	30.0	0.0	3.7	0.0	34.8	Fair
11	2.0	0.0	0.0	30.0	0.0	10.0	0.0	42.0	Fair

SEED MIX--

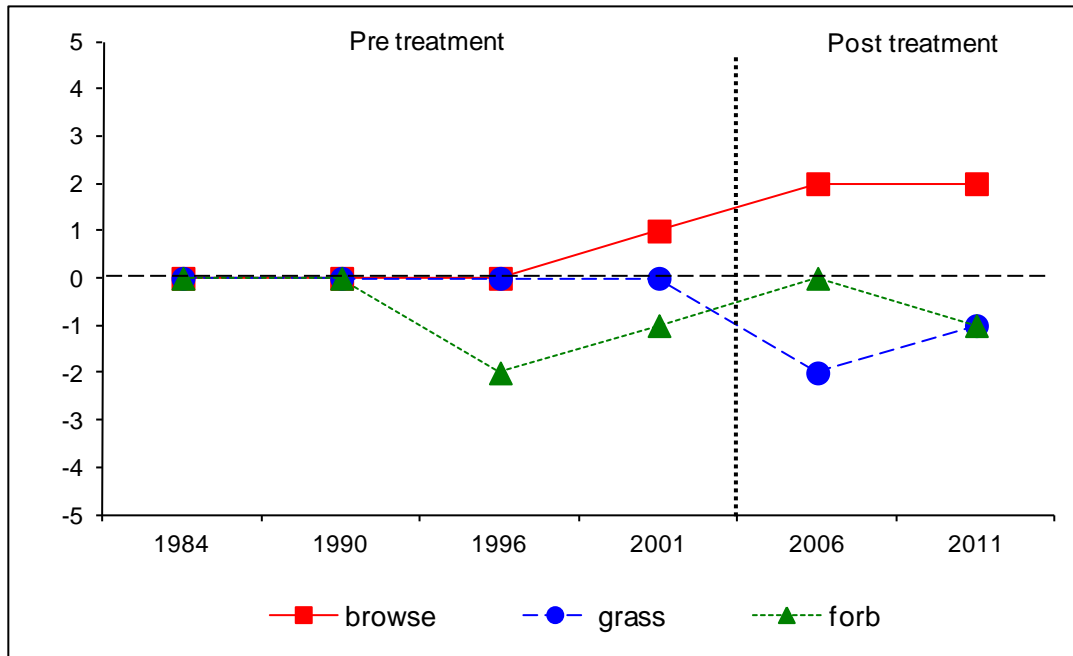
Management unit 02, Study no: 36

Project Name: Woodruff Co-op WMA			
Application: Disk and Seed		Acres: 173	
Seed Type	lbs in mix	lbs/acre	
G	Bluebunch Wheatgrass 'Goldar'	100	0.58
G	Great Basin Wildrye 'Trailhead'	121	0.70
G	Indian Ricegrass 'Rimrock'	100	0.58
G	Orchardgrass Paiute '	100	0.58
G	Russian Wildrye 'Bozoisky'	175	1.01
G	Thickspike Wheatgrass 'Critana'	100	0.58
F	Alfalfa 'Ranger'	250	1.45
F	Blue Flax 'Appar'	25	0.14
F	Cicer Milkvetch	150	0.87
F	Sainfoin 'Remont'	100	0.58
F	Small Burnet	250	1.45
F	Yellow Sweetclover	50	0.29
B	Fourwing Saltbush	200	1.16
B	Sagebrush, Wyoming	35	0.20
Total Pounds:		1756	10.15

Trend Summary

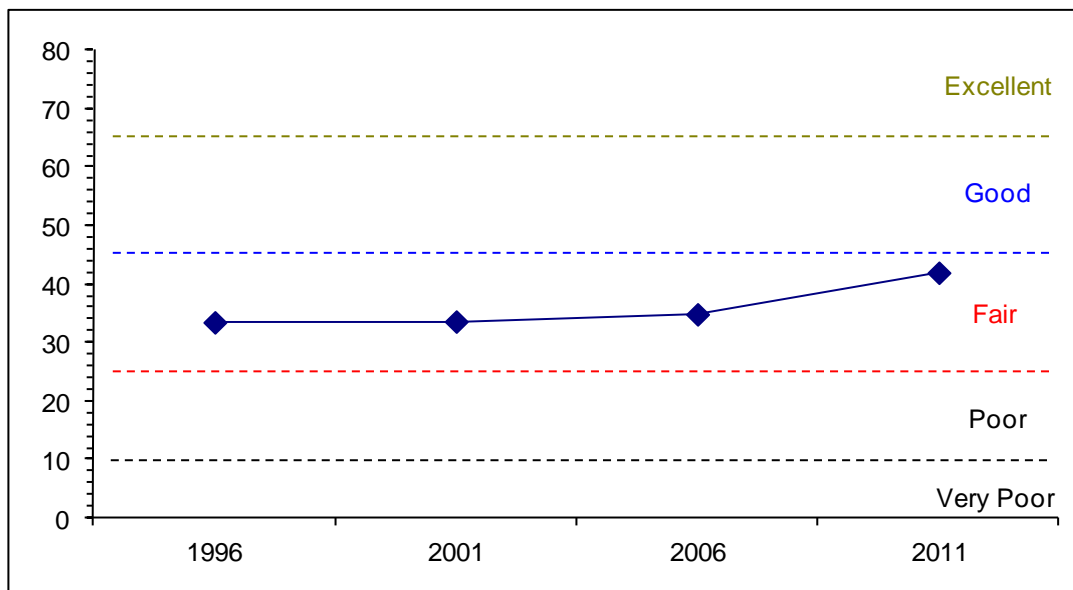
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2, Study no: 36



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--

Management unit 2, Study no: 36



HERBACEOUS TRENDS--
Management unit 02, Study no: 36

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	b348	b360	b344	a293	b350	22.46	30.84	22.66	41.90
G	Agropyron dasystachyum	a-	a-	a-	a-	b10	-	-	-	.06
G	Agropyron spicatum	-	-	-	1	4	-	-	.15	.15
G	Bromus tectorum (a)	-	-	-	5	6	-	-	.03	.01
G	Dactylis glomerata	a-	a-	a-	b15	a1	-	-	.19	.03
G	Elymus junceus	-	-	-	-	4	-	-	-	.09
G	Oryzopsis hymenoides	a5	a-	a4	ab19	b34	-	.03	.48	.40
G	Poa secunda	b89	b90	b99	a36	a9	1.38	1.44	.35	.02
G	Stipa comata	ab11	a1	b24	ab6	a1	.03	.45	.09	.00
Total for Annual Grasses		0	0	0	5	6	0	0	0.03	0.00
Total for Perennial Grasses		453	451	471	370	413	23.88	32.77	23.92	42.67
Total for Grasses		453	451	471	375	419	23.88	32.77	23.96	42.68
F	Alyssum alyssoides (a)	-	a41	b159	b123	c265	.10	.40	.97	2.41
F	Antennaria sp.	-	2	-	-	-	.00	-	-	-
F	Astragalus convallarius	-	-	4	-	1	-	.06	-	.00
F	Astragalus sp.	-	-	-	9	1	-	-	.05	.00
F	Astragalus utahensis	7	-	3	2	-	-	.03	.03	-
F	Lappula occidentalis (a)	-	-	-	-	1	-	-	-	.00
F	Linum perenne	a-	a-	a-	c33	b11	-	-	.22	.07
F	Lomatium sp.	-	-	-	-	1	-	-	-	.00
F	Medicago sativa	a-	a-	a-	b112	b104	-	-	1.50	5.05
F	Phlox hoodii	c83	b43	b33	a-	a-	1.10	.41	-	-
F	Phlox longifolia	c81	b37	c70	a-	a3	.08	.24	-	.00
F	Sanguisorba minor	-	-	-	5	-	-	-	.01	-
F	Schoenrambe linifolia	-	3	-	-	-	.00	-	-	-
F	Tragopogon dubius (a)	-	3	8	-	-	.00	.06	-	-
F	Trifolium sp.	b11	a-	c26	b8	bc14	-	.11	.02	.06
Total for Annual Forbs		0	44	167	123	266	0.10	0.47	0.97	2.41
Total for Perennial Forbs		182	85	136	169	135	1.19	0.86	1.86	5.21
Total for Forbs		182	129	303	292	401	1.30	1.33	2.83	7.63

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	14	16	22	19	.28	.96	.24	.39
B	Atriplex canescens	0	0	19	16	-	-	.52	1.17
B	Ceratoides lanata	40	42	1	1	.59	.53	-	.00
B	Chrysothamnus nauseosus consimilis	0	1	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	33	34	2	2	.26	.75	.06	.06
B	Gutierrezia sarothrae	5	7	0	1	.03	.33	-	-
B	Opuntia polyacantha	12	11	4	5	.18	.34	-	-
B	Tetradymia canescens	8	3	3	8	.06	-	.00	.06
Total for Browse		112	114	51	52	1.41	2.92	0.82	1.69

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 36

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	.16	.26
Atriplex canescens	.58	1.33
Ceratoides lanata	-	.51
Opuntia polyacantha	-	.06
Tetradymia canescens	-	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 36

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.1	0.9	1.5
Atriplex canescens	-	2.2	9.7
Ceratoides lanata	5	-	7.4

BASIC COVER--

Management unit 02, Study no: 36

Cover Type	Average Cover %				
	'90	'96	'01	'06	'11
Vegetation	16.75	28.00	39.97	27.23	49.97
Rock	1.75	2.09	1.01	2.54	.96
Pavement	1.25	3.02	1.88	1.97	3.69
Litter	36.50	34.31	44.11	42.73	34.44
Cryptogams	.50	.28	2.07	0	.30
Bare Ground	43.25	26.78	36.09	39.20	23.62

SOIL ANALYSIS DATA --

Management unit 02, Study no: 36, Study Name: Woodruff Co-op

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
13.2	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	10	7	76	7	-	-	-
Elk	-	-	1	3	3 (7)	7 (17)	-
Deer/Pronghorn	12	6	9	16	7 (18)	13 (31)	36 (89)
Cattle	15	19	4	7	41 (102)	17 (43)	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 36

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Artemisia tridentata wyomingensis</i>									
90	964	10	59	31	-	62	3	0	10/16
96	320	0	94	6	-	31	0	0	14/24
01	420	24	76	0	20	19	0	0	18/29
06	620	42	58	0	20	26	23	0	7/8
11	480	25	71	4	-	29	63	4	7/9
<i>Atriplex canescens</i>									
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	460	39	61	-	20	22	9	0	16/16
11	440	5	95	-	-	27	0	0	20/22
<i>Atriplex gardneri falcate</i>									
90	33	0	100	-	-	0	0	0	5/5
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Ceratoides lanata</i>									
90	332	30	70	0	-	40	0	0	7/5
96	2660	11	87	2	-	48	35	0	7/9
01	2500	10	90	0	-	54	.80	0	8/9
06	20	0	100	0	-	100	0	0	4/7
11	20	0	100	0	-	0	0	0	10/12

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Chrysothamnus nauseosus consimilis</i>									
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	40	0	100	-	-	100	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
90	1498	24	60	16	-	53	0	0	4/6
96	880	0	91	9	-	0	0	7	7/11
01	1060	0	98	2	-	0	0	0	7/11
06	40	0	100	0	-	100	0	0	5/10
11	40	0	100	0	-	0	0	0	7/10
<i>Gutierrezia sarothrae</i>									
90	0	0	0	-	-	0	0	0	-/-
96	120	0	100	-	-	0	0	0	5/7
01	220	0	100	-	-	0	0	0	7/12
06	0	0	0	-	-	0	0	0	5/10
11	20	0	100	-	-	0	0	0	7/9
<i>Opuntia polyacnatha</i>									
90	265	25	75	0	-	0	0	13	4/6
96	280	7	71	21	-	0	0	14	4/12
01	420	5	95	0	20	0	0	0	3/9
06	80	25	75	0	-	0	0	0	3/4
11	100	0	100	0	-	0	0	0	3/5
<i>Tetradymia canescens</i>									
90	0	0	0	0	-	0	0	0	-/-
96	200	0	90	10	-	40	10	0	5/9
01	60	0	100	0	-	0	0	0	5/13
06	80	0	100	0	20	25	75	0	5/10
11	180	0	100	0	-	0	0	0	11/14

TWIN CREEK - TREND STUDY NO. 2-38-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 6,500 ft (1,981 m)

Aspect: South

Slope: 35%

Transect bearing: 9° magnetic

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

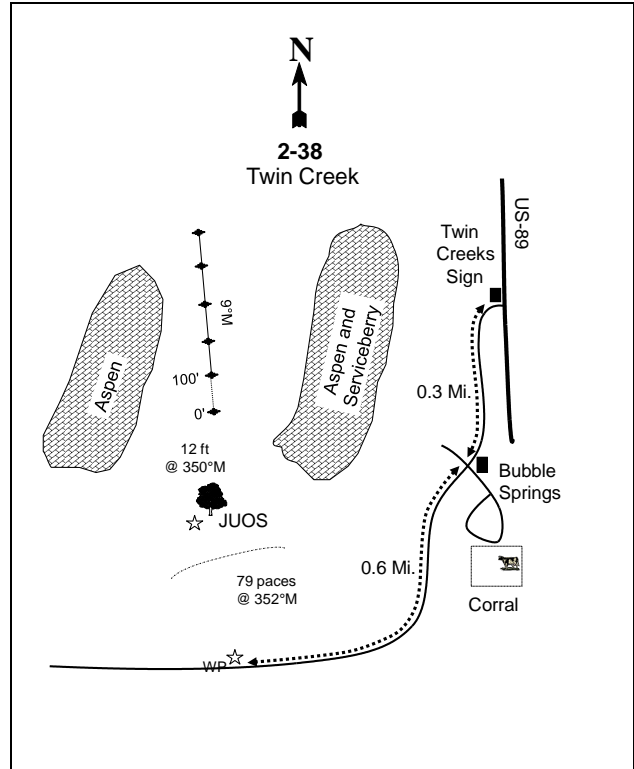
Directions:

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 Creek



Diagrammatic Sketch:



Township: 13N Range: 3E Section: 3

GPS: NAD 83, UTM 12S 451639 E 4634743 N

Site Information

Site Description: This study is located in Logan Canyon, just east of the Twin Creek corrals on land administered by the United States Forest Service (USFS). The study was established to monitor elk concentrations during the winter months. Signs of cattle, sheep, and deer have also been encountered. Elk pellet groups were sampled in high abundance in 2001, but low abundance in 2006 and 2011. Deer and cattle sign has been minimal since 2001 (Table - Pellet Group Data). Moose pellet groups have been observed on the study, but were not sampled within the pellet group transect.

Browse: A variety of palatable and preferred shrubs provide forage for wildlife, which include Saskatoon serviceberry (*Amelachier alnifolia*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), chokecherry (*Prunus virginiana*), and antelope bitterbrush (*Purshia tridentata*). Of these species, only mountain big sagebrush and bitterbrush are abundant. Mountain big sagebrush is a moderately dense, mostly mature population. The decadence of sagebrush has historically been low, but has steadily increased over the course of the study. The sagebrush population has had light to moderate utilization over the course of the study. The Mountain big sagebrush population has displayed good vigor for the duration of the study. The recruitment of young sagebrush plants has fluctuated over the course of the study, but was considered good in 1996 and 2011. The highly preferred shrubs bitterbrush and serviceberry are found in small numbers and have been heavily hedged throughout the study years. Antelope bitterbrush density is somewhat sparse and is centered within the mature demographic. The bitterbrush population has displayed good vigor, notwithstanding the heavy hedging. The Saskatoon serviceberry population is very sparse in density. Serviceberry was observed on the site in 1996 and 2001, but was not sampled in 2006 and 2011. In 1996, the serviceberry population was heavily hedged (Table - Browse Characteristics), and their leaves were covered with a rust fungus.

Herbaceous Understory: The herbaceous understory is abundant and diverse. Grasses and forbs combined produced half of the vegetation cover in 2001, 2006 and 2011. Bluebunch wheatgrass (*Agropyron spicatum*) and Kentucky bluegrass (*Poa pratensis*) are the most abundant perennial grass species found on the study site. Other perennial grass species found on the site include Sandberg bluegrass (*P. secunda*), bulbous bluegrass (*P. bulbosa*), slender wheatgrass (*Agropyron trachycaulum*), oniongrass (*Melica bulbosa*), mountain brome (*Bromus carinatus*), and Great Basin wildrye (*Elymus cinereus*). Bulbous bluegrass is present and has maintained a stable population from 1996 through 2006, but had a significant increase in nested frequency and cover in 2011. Cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) have been rarely encountered and provided very little cover. Forbs are diverse, but unfortunately weedy species dominate the composition. Perennials include mulesears wyethia (*Wyethia amplexicaulis*), aster (*Aster sp.*), and bastard toadflax (*Comandra pallida*), and arrowleaf balsamroot (*Balsamorhiza sagittata*). The annual/biannual species yellow salsify (*Tragopogon dubius*) is also abundant (Table - Herbaceous Trends).

Soil: NRCS soil data was not available for this site. Soil texture is a loam with a slightly acidic soil reaction (pH 6.3). Organic matter is high at 6.5% (Table - Soil Analysis Data). Bare ground cover is low and is present primarily due to burrowing rodent activity. Protective ground cover is provided by high amounts of vegetation and litter cover (Table - Basic Cover). Vegetation and litter cover is plentiful and well dispersed, which effectively limits soil erosion. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - slightly down (-1):** The density for mountain big sagebrush decreased 14% from 1,460 plants/acre to 1,260 plants/acre. Decadence within the sagebrush population increased from 3% to 8%. However, the sagebrush population decreased in poor vigor from 10% to 2%. Recruitment of young sagebrush plants decreased within the population from 18% to 3%. Antelope bitterbrush did

not change in density, however, decadence within the population increased from 11% to 22%, and poor vigor increased from 0% to 22% within the population.

- **2001 to 2006 - stable (0):** The density for mountain big sagebrush remained similar at 1,280 plants/acre. Decadence within the sagebrush population increased to 11%. The sagebrush population increased in poor vigor to 9%. Recruitment of young sagebrush increased and comprised 8% of the population. Antelope bitterbrush had no change in density. Decadence and poor vigor decreased and were not observed within the bitterbrush population.
- **2006 to 2011 - up (+2):** The density for mountain big sagebrush increased 55% to 1,980 plants/acre. Decadence within the sagebrush population increased to 20%. The sagebrush population maintained poor vigor at 9%. Young sagebrush recruitment comprised 11% of the population. The density for antelope bitterbrush increased 56% from 180 plants/acre to 280 plants/acre. Decadence within the bitterbrush population increased to 7%. Poor vigor was not observed within the bitterbrush population. Recruitment of young bitterbrush plants comprised 21% of the population.

Grass:

- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 13%. Kentucky bluegrass and Sandberg bluegrass increased significantly in nested frequency, and increased in cover from 3% to 7%, and less than 1% to 1%, respectively. Oniongrass increased significantly in nested frequency, and increased in cover from near 0% to 1%. Slender wheatgrass decreased significantly in nested frequency, and decreased in cover from 2% to less than 1%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 11%. Bluebunch wheatgrass increased significantly in nested frequency, and increased in cover from 8% to 17%. Oniongrass and Kentucky bluegrass decreased significantly in nested frequency, and decreased in cover to less than 1% and 2%, respectively.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 1% to 5%. Bulbous bluegrass became the second most abundant grass species in 2011. Great Basin wildrye increased significantly in nested frequency, and had a cover of 2%.

Forb:

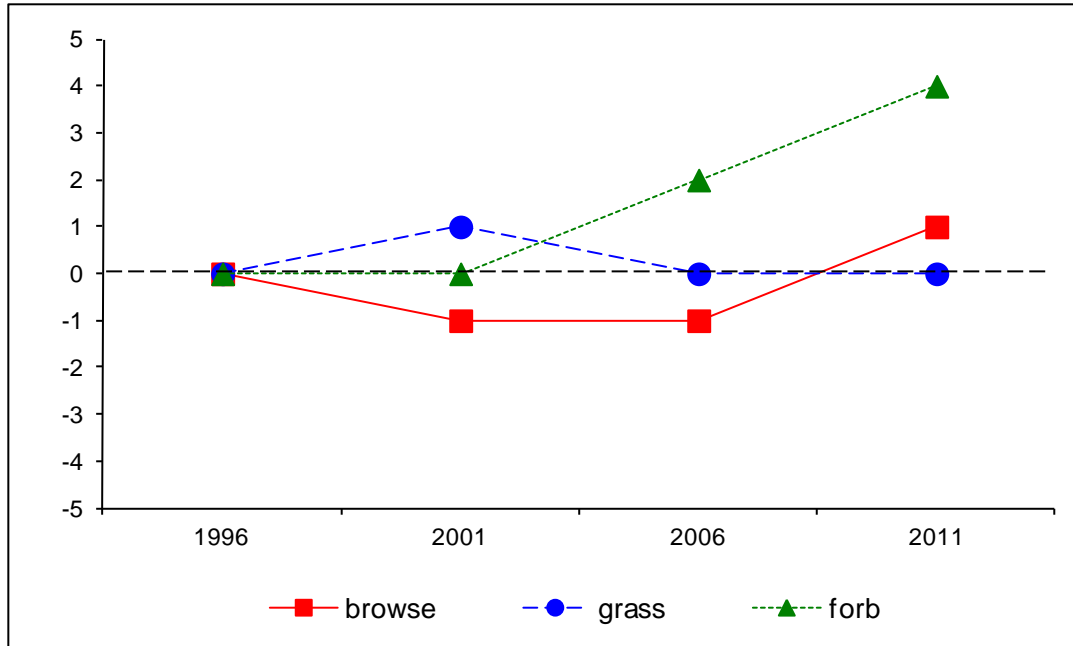
- **1996 to 2001 - stable (0):** The sum for nested frequency for perennial forbs remained similar. The unpalatable forb mulesear wyethia had a significant increase in nested frequency, and increased in cover from 4% to 7%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 40%. Pale agoseris (*Agoseris glauca*) had a significant increase in nested frequency. The sum of nested frequency of annual forbs decreased substantially, and cover decreased from 3% to 1%. The forb composition remained dominated by weedy increasers; however, the community composition is fairly diverse.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 33%. Milkvetch (*Astragalus sp.*) had a significant increase in nested frequency. Yellow salsify increased significantly in nested frequency, and increased in cover from less than 1% to 1%. The forb community maintained high diversity; however, less palatable species remained common.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 2, study no: 38

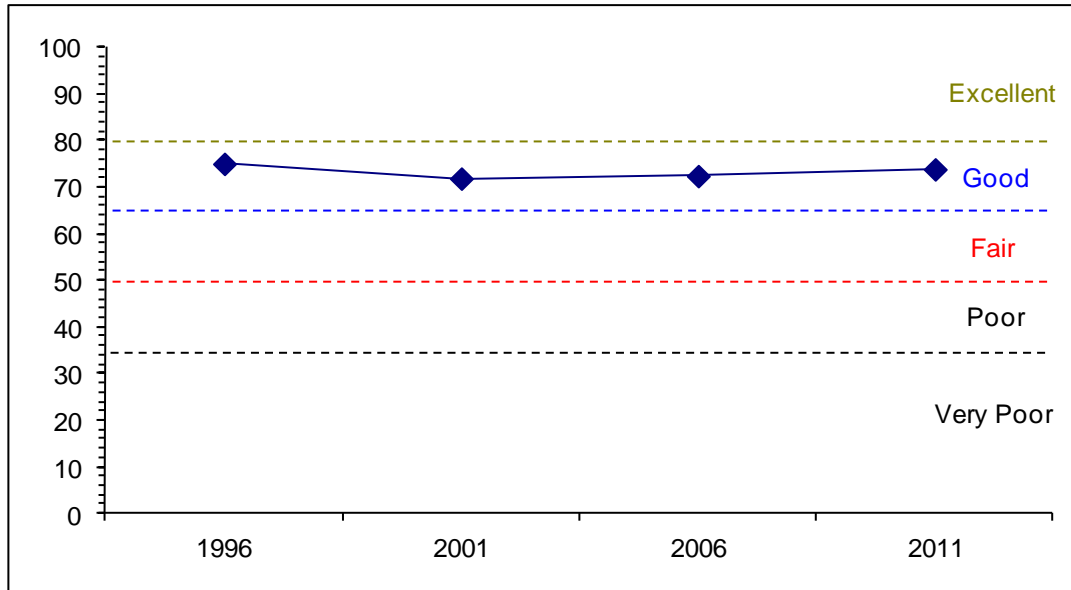
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.0	13.6	9.4	30.0	0.0	10.0	0.0	75.0	Good
01	18.3	11.7	1.8	30.0	0.0	10.0	0.0	71.8	Good
06	16.7	12.4	3.4	30.0	0.0	10.0	0.0	72.4	Good
11	17.5	9.7	6.6	30.0	0.0	10.0	0.0	73.8	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 2 Study no: 38



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 38



HERBACEOUS TRENDS--
 Management unit 02, Study no: 38

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a265	ab264	c339	bc335	12.38	7.47	17.09	15.50
G	Agropyron trachycaulum	b70	a19	a9	a20	1.93	.53	.21	.85
G	Bromus carinatus	ab40	a25	ab47	b74	.79	.38	.89	1.04
G	Bromus japonicus (a)	-	-	10	19	-	-	.04	.06
G	Bromus tectorum (a)	3	-	4	-	.06	-	.00	-
G	Carex sp.	-	-	-	-	-	.03	-	.00
G	Elymus cinereus	ab23	a9	a10	b32	1.04	.54	1.21	1.71
G	Melica bulbosa	a9	c64	ab27	bc51	.06	.89	.16	.29
G	Poa bulbosa	a33	a50	a46	b197	1.62	1.22	.73	4.99
G	Poa pratensis	b162	c222	ab137	a105	3.42	6.82	1.96	1.05
G	Poa secunda	a27	b67	ab36	a22	.46	.80	.34	.10
G	Stipa columbiana	9	13	-	4	.21	.21	-	.02
G	Stipa lettermani	-	-	-	2	-	-	-	.00
Total for Annual Grasses		3	0	14	19	0.06	0	0.04	0.06
Total for Perennial Grasses		638	733	651	842	21.94	18.93	22.62	25.60
Total for Grasses		641	733	665	861	22.00	18.93	22.66	25.67
F	Achillea millefolium	a16	a10	ab27	b43	.27	.10	.43	1.72
F	Agoseris glauca	a-	a-	b21	a8	-	-	.11	.02
F	Alyssum alyssoides (a)	c173	b117	a35	a55	.85	.28	.07	.10
F	Arabis drummondi	3	-	3	2	.02	.00	.00	.01
F	Aster sp.	9	-	-	5	.71	-	-	.03
F	Astragalus beckwithii	-	-	7	7	-	-	.04	.07
F	Astragalus sp.	a-	a-	a2	b19	-	-	.06	.22
F	Balsamorhiza macrophylla	-	-	1	2	-	-	.38	.41

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Balsamorhiza sagittata	2	6	13	11	.48	.86	1.12	1.35
F	Calochortus nuttallii	-	-	7	4	-	-	.01	.01
F	Camelina microcarpa (a)	-	4	-	-	-	.01	-	-
F	Chenopodium album (a)	-	-	3	5	-	-	.00	.00
F	Cirsium undulatum	3	-	4	9	.15	.00	.38	.04
F	Collinsia parviflora (a)	106	99	32	19	.30	.52	.07	.06
F	Collomia linearis (a)	a46	b94	b86	ab63	.17	.25	.19	.16
F	Comandra pallida	b22	b14	a11	a20	.48	.09	.15	.43
F	Crepis acuminata	5	7	7	4	.03	.19	.10	.04
F	Delphinium nuttallianum	10	3	-	-	.02	.01	-	-
F	Descurainia pinnata (a)	-	6	-	2	-	.01	-	.00
F	Draba sp. (a)	3	-	-	-	.01	-	-	-
F	Epilobium brachycarpum (a)	b99	a53	a62	a37	.66	.12	.17	.22
F	Galium aparine (a)	a4	a2	a1	b59	.03	.00	.03	.95
F	Gayophytum ramosissimum(a)	-	-	1	-	-	-	.00	-
F	Hackelia patens	-	3	-	13	-	.00	-	.10
F	Helianthella uniflora	5	9	21	15	.36	.27	1.57	1.43
F	Lactuca serriola (a)	18	3	1	-	.08	.03	.00	-
F	Lappula occidentalis (a)	8	3	3	14	.07	.00	.01	.10
F	Linum lewisii	-	-	1	4	-	-	.00	.04
F	Lithospermum ruderales	ab14	b19	ab10	a4	.24	.83	.42	.30
F	Lupinus argenteus	b20	ab9	ab9	a3	.38	.25	.20	.36
F	Lupinus sp.	-	-	-	18	-	-	-	.43
F	Microsteris gracilis (a)	bc46	c54	a22	b28	.21	.22	.04	.05
F	Phlox longifolia	-	-	2	-	-	-	.00	-
F	Polygonum douglasii (a)	b69	a22	b68	ab51	.22	.10	.16	.20
F	Senecio multilobatus	5	9	-	2	.03	.04	.00	.00
F	Taraxacum officinale	4	-	-	8	.01	-	-	.04
F	Thlaspi montanum	1	-	-	-	.00	-	.00	-
F	Tragopogon dubius (a)	c88	bc94	a17	b64	1.08	1.20	.13	.52
F	Verbascum blattaria	8	-	17	3	.07	-	.03	.00
F	Veronica biloba (a)	b132	a18	a3	a21	1.38	.04	.01	.11
F	Wyethia amplexicaulis	a31	b58	ab42	b69	3.81	6.89	4.64	4.47
Total for Annual Forbs		792	569	334	418	5.09	2.80	0.93	2.50
Total for Perennial Forbs		158	147	205	273	7.10	9.57	9.69	11.58
Total for Forbs		950	716	539	691	12.20	12.38	10.63	14.09

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	1	1	0	0	.38	.15	-	.03
B	Artemisia tridentata vaseyana	52	50	48	66	6.65	11.47	10.26	11.32
B	Chrysothamnus viscidiflorus viscidiflorus	57	62	56	52	7.40	6.65	4.82	3.92
B	Eriogonum heracleoides	22	25	22	25	2.15	2.32	1.96	2.37
B	Prunus virginiana	5	6	6	9	.09	.33	.51	.36
B	Purshia tridentata	8	9	8	12	2.02	2.21	2.13	1.93
B	Symphoricarpos oreophilus	30	38	32	40	5.64	7.69	6.46	6.13
Total for Browse		175	191	172	204	24.35	30.85	26.17	26.08

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 38

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	18.50	21.45
Chrysothamnus viscidiflorus viscidiflorus	7.41	6.41
Eriogonum heracleoides	2.46	2.96
Prunus virginiana	.18	.21
Purshia tridentata	1.85	2.70
Symphoricarpos oreophilus	9.31	12.98

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 38

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	3.7	-	2.5
Artemisia tridentata vaseyana	2.0	2.9	2.4
Purshia tridentata	3.1	4.3	3.4

BASIC COVER--

Management unit 02, Study no: 38

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	53.65	58.72	58.75	64.75
Rock	5.68	2.70	3.68	2.14
Pavement	2.76	5.84	5.72	3.99
Litter	55.04	42.15	33.81	41.30
Cryptogams	.58	.55	.01	.15
Bare Ground	5.33	11.01	18.77	4.68

SOIL ANALYSIS DATA --

Management unit 02, Study no: 38, Study Name: Twin Creek

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
13.0	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	2	-	-	2	-	-	-
Elk	28	18	2	6	42 (1030)	10 (25)	12 (30)
Deer	4	5	4	2	6 (15)	14 (35)	2 (5)
Cattle	2	-	7	2	3 (7)	13 (32)	12 (30)
Horse	-	-	-	-	-	-	1 (1)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 38

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
96	20	0	100	0	-	0	100	0	35/25
01	20	0	0	100	-	0	100	0	33/27
06	0	0	0	0	-	0	0	0	43/43
11	0	0	0	0	-	0	0	0	39/40
Artemisia tridentata vaseyana									
96	1460	18	79	3	280	51	4	10	27/43
01	1260	3	89	8	20	11	5	2	33/49
06	1280	8	81	11	600	3	0	9	30/50
11	1980	11	69	20	460	16	0	9	26/42
Chrysothamnus nauseosus									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	41/74
Chrysothamnus viscidiflorus viscidiflorus									
96	2180	3	96	1	-	0	0	2	16/26
01	2260	7	88	5	20	0	0	.88	15/26
06	1740	2	97	1	-	0	0	1	14/25
11	1800	1	92	7	-	0	0	1	14/22
Eriogonum heracleoides									
96	860	0	98	2	-	0	0	0	8/22
01	1060	0	98	2	-	0	0	2	8/21
06	840	0	100	0	-	7	0	0	9/21
11	840	0	100	0	-	0	0	0	5/21

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Prunus virginiana</i>										
96	140	86	14	-	-	43	0	0	13/9	
01	260	54	46	-	-	0	0	0	22/25	
06	400	10	90	-	-	0	90	0	11/15	
11	520	42	58	-	40	23	8	0	20/13	
<i>Purshia tridentata</i>										
96	180	22	67	11	-	44	44	0	21/41	
01	180	0	78	22	-	0	89	22	25/35	
06	180	0	100	0	-	22	67	0	25/46	
11	280	21	71	7	-	21	14	0	27/50	
<i>Symphoricarpos oreophilus</i>										
96	1220	10	84	7	20	10	18	13	29/46	
01	1060	0	92	8	-	0	0	0	32/49	
06	1000	8	92	0	-	0	0	0	30/46	
11	1480	5	95	0	-	3	0	0	26/44	

POLE HOLLOW SPRING - TREND STUDY NO. 2-39-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: DWR

Elevation: 6,177 ft (1,883 m)

Aspect: Southwest

Slope: 15%

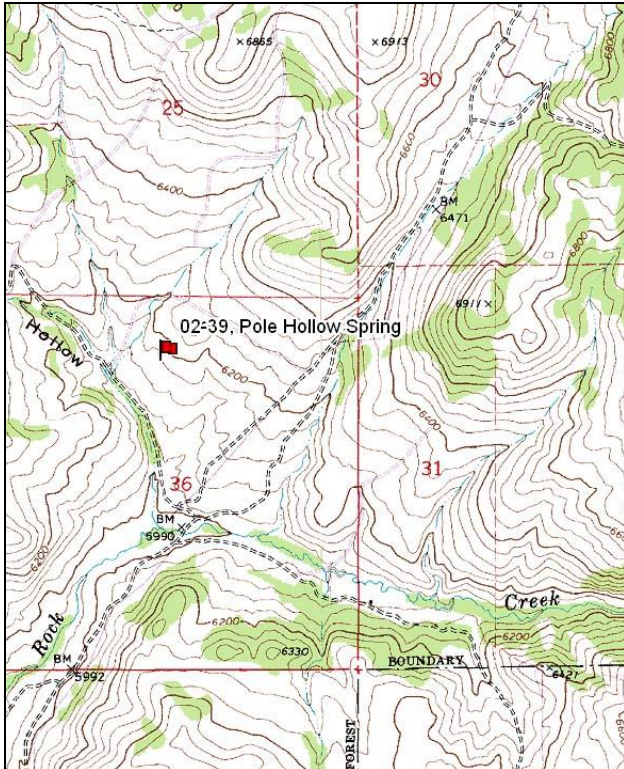
Transect bearing: 35° magnetic

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

Directions:

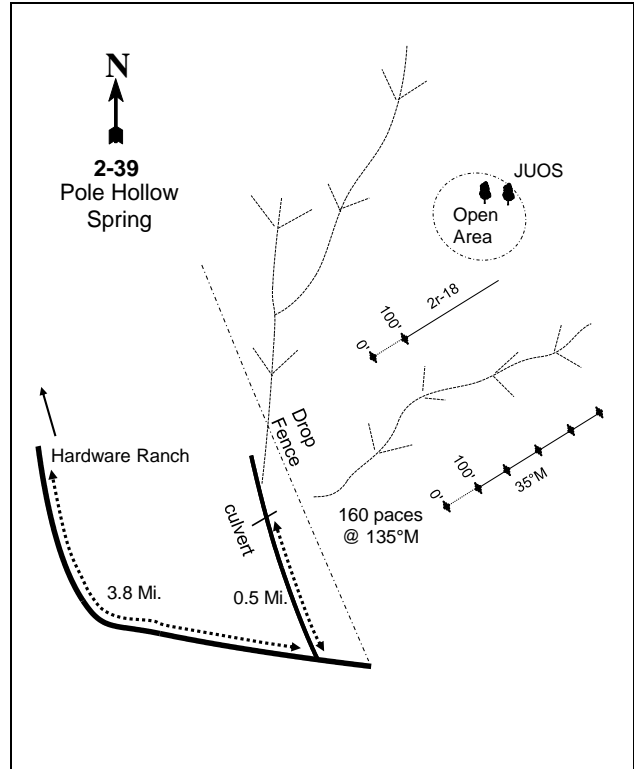
From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow for 0.5 miles to a culvert. From the open area, walk 160 paces at a bearing of approximately 135 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 35 degrees magnetic.

Map Name: Boulder Mountain



Township: 11N Range: 3E Section: 36

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 454128 E 4611223 N

POLE HOLLOW SPRING - TREND STUDY NO. 2-39

Site Information

Site Description: This study is located four miles northeast of the Hardware Ranch visitors' center on land administered by the Utah Division of Wildlife Resources (UDWR). The study monitors a mountain brush community and is best classified as summer/transitional range for wildlife. Cattle also use the area in summer. In the past, the study area may have been intensively grazed as part of the Hardware grazing study. A control study, temporarily surrounded by an electric fence, is located 300 feet to the northeast. In addition, sheep may have also grazed here in the past. Deer and cattle sign has been minimal since 2001. Sampled elk pellet groups inferred no presence in 2001, but low abundance in 2006 and 2011. A grouse pellet group was also sampled in 2006 (Table - Pellet Group Data).

Browse: The mixed mountain brush community has several important browse species. The key species are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and Saskatoon serviceberry (*Amelachier alnifolia*). The mountain big sagebrush population is moderately dense, and evenly distributed. The sagebrush population has been centered within the mature age class throughout the duration of the study, and has only fluctuated slightly. Decadence within the population has been low, but was at its peak in 2001. The sagebrush has had light to moderate utilization over the course of the study. The sagebrush population has been vigorous over the course of the study; however, chlorotic and diseased sagebrush have steadily increased, but are still a minor component of the population. Recruitment of young sagebrush has been mostly poor over the sampled years except in 2001. The antelope bitterbrush population has fluctuated slightly, and is modestly dense. The bitterbrush population has been centered within the mature age class throughout the duration of the study. Decadence within the population has been low, but was at its peak in 2001. Utilization of bitterbrush has been mostly light to moderate over the sample years. Saskatoon serviceberry is not abundant, but maintains a mature population. Utilization of serviceberry has been light to moderate over the course of the study. The majority of the serviceberry population has displayed good vigor, with few plants displaying chlorosis or disease. The mountain snowberry (*Symphoricarpos oreophilus*) population is mostly mature and has displayed very little utilization by wildlife (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is dominated by perennial grasses, but the sum of nested frequency of perennial grasses has steadily declined since 1996. Shrubs are very thick and are most likely competing with the grass community for resources. The most numerous perennial grass species was Kentucky bluegrass (*Poa pratensis*), but has decreased in abundance over the duration of the study. Bluebunch wheatgrass (*Agropyron spicatum*) has had moderate fluctuations in abundance, and was the most common grass species in 2011. Cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are the only annual grass species found on the site. Japanese chess was fairly common in 1996, but has since decreased in abundance over the course of the study. Smooth brome (*B. inermis*), Prairie junegrass (*Koeleria cristata*), mutton bluegrass (*Poa fendleriana*), Sandberg bluegrass (*P. secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and Letterman needlegrass (*Stipa lettermani*) are all present, but in relatively low numbers. Forbs are fairly abundant and diverse. Common forb species include western yarrow (*Achillea millefolium*), pacific aster (*Aster chilensis*), silvery lupine (*Lupinus argenteus*), yellow salsify (*Tragopogon dubius*) and bastard toadflax (*Comandra pallida*) (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. Soil is moderately deep with a clay texture and a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is low and is primarily due to burrowing rodent activity. Protective ground cover effectively limits soil erosion and is provided by high amounts of vegetation and litter cover (Table - Basic Cover). Terracing and bare trails were noted in 2001, along with soil movement in small areas. The soil erosion condition was classified as slight in 2001, but stable in 2006 and 2011.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density for mountain big sagebrush remained similar, increasing slightly from 4,020 plants/acre to 4,040 plants/acre. Decadence within the sagebrush population increased from 7% to 16%. The sagebrush population increased in poor vigor from 1% to 4%. Recruitment of young sagebrush plants increased from 9% to 12%. Antelope bitterbrush increased in density 32% from 500 plants/acre to 660 plants/acre. Decadence within the bitterbrush population increased from 0% to 16%. The bitterbrush population increased in poor vigor from 0% to 3%. Recruitment of young bitterbrush decreased from 12% to 6%. The density for Saskatoon serviceberry decreased 64% from 500 plants/acre to 180 plants/acre. Decadent plants were not observed within the serviceberry population. Poor vigor within the serviceberry population decreased from 4% to 0%.
- **2001 to 2006 - slightly down (-1):** The density for mountain big sagebrush decreased 15% to 3,440 plants/acre. Decadence within the sagebrush population decreased to 13%. The sagebrush population increased in poor vigor to 11%. Recruitment of young sagebrush plants decreased to 1% of the population. The density for antelope bitterbrush decreased 15% to 560 plants/acre. Decadence within the bitterbrush population decreased to 11%. The bitterbrush population increased in poor vigor to 4%. Young bitterbrush recruitment remained similar at 7% of the population. The density for Saskatoon serviceberry decreased 22% to 140 plants/acre. Decadence and poor vigor were not observed within the population. Young serviceberry plants were not observed within the population.
- **2006 to 2011 - slightly up (+1):** The density for mountain big sagebrush decreased 7% to 3,200 plants/acre. Decadence within the sagebrush population decreased to 9%. The sagebrush population increased in poor vigor to 21%. Recruitment of young sagebrush increased to 7% of the population. The density for antelope bitterbrush increased 54% to 860 plants/acre. Decadence within the bitterbrush population remained similar at 12%. The bitterbrush population increased in poor vigor to 12%. Recruitment of young bitterbrush remained similar at 2% of the population. The density for Saskatoon serviceberry increased just over two-fold to 320 plants/acre. Decadence within the serviceberry population was not observed, while poor vigor increased to 13% of the serviceberry population. Recruitment of young serviceberry plants increased to 13% of the population.

Grass:

- **1996 to 2001 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 11%. Bluebunch wheatgrass had a significant decrease in nested frequency, and decreased in cover from 7% to 3%. Mutton bluegrass had a significant increase in nested frequency, and increased in cover from less than 1% to 1%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 14%, but cover decreased from 19% to 10%. Slender wheatgrass (*Agropyron trachycaulum*) had a significant increase in nested frequency. Kentucky bluegrass decreased significantly in nested frequency, and decreased in cover from 12% to 3%. Bottlebrush squirreltail decreased significantly in nested frequency, and decreased in cover from 1% to near 0%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar, though cover increased from 10% to 19%. Bluebunch wheatgrass increased significantly in nested frequency, and increased in cover from 4% to 11%. Mutton bluegrass and Kentucky bluegrass decreased significantly in nested frequency, which decreased in cover from 1% to less than 1% and 3% to 1%, respectively.

Forb:

- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 19%. Wild onion (*Allium sp.*) had a significant increase in nested frequency. Bastard toadflax increased significantly in nested frequency, and increased in cover from near 0% to 1%.

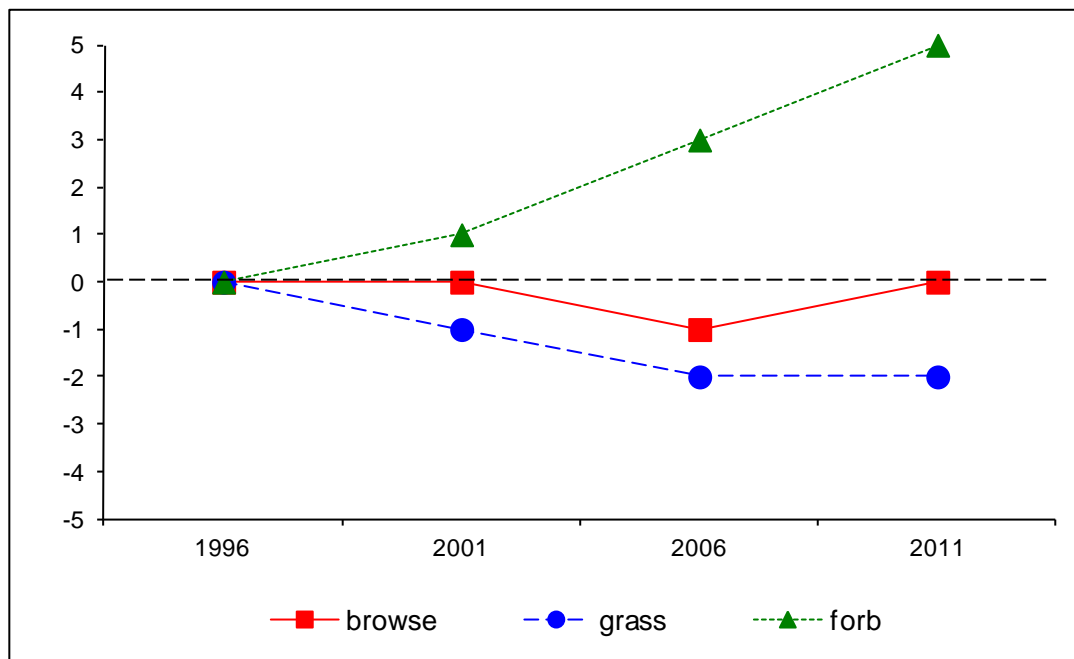
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 23%, and cover increased from 9% to 12%. Wild onion and timber poisonvetch (*Astragalus convallarius*) increased significantly in nested frequency. Western yarrow (*Achillea millefolium*) increased in cover from 1% to 3%. The annual species bush birdbeak (*Cordylanthus ramosus*) increased significantly in nested frequency, but yellow salsify and slenderleaf collomia (*Collomia linearis*) decreased significantly in nested frequency. The composition of the forb community increased slightly in diversity.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 30% and cover increased to 25%. Wild onion, Wavyleaf thistle (*Cirsium undulatum*), and the unpalatable species mulesears wyethia (*Wyethia amplexicaulis*) increased significantly in nested frequency. The forb community maintained a diverse composition. Wild onion and wavyleaf thistle increased in cover from less than 1% to 11% and less than 1% to 1%, respectively.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 39

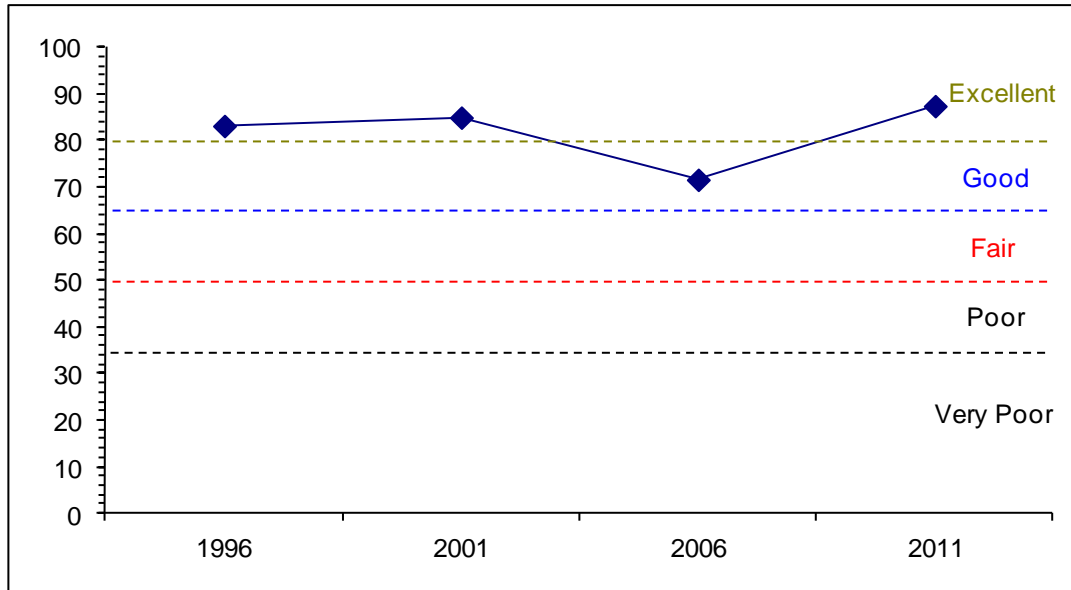
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	27.4	13.7	5.1	30.0	-3.1	10.0	0.0	83.1	Excellent
01	30.0	9.8	5.3	30.0	-0.2	10.0	0.0	84.9	Excellent
06	30.0	11.4	1.3	18.9	0.0	10.0	0.0	71.6	Good
11	30.0	12.2	5.5	30.0	-0.3	10.0	0.0	87.4	Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 39



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 39



HERBACEOUS TRENDS--
 Management unit 02, Study no: 39

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	b214	a109	ab164	c259	6.75	2.46	3.77	11.41
G	Agropyron trachycaulum	a-	a-	b23	b35	-	-	.21	.37
G	Bromus inermis	a3	ab16	ab15	b20	.03	.48	.09	1.82
G	Bromus japonicus (a)	c144	b66	a10	a14	2.54	.29	.02	.40
G	Bromus tectorum (a)	b32	a1	a2	a-	1.62	.03	.01	-
G	Carex sp.	-	-	-	5	-	-	-	.00
G	Elymus cinereus	-	1	-	-	-	.00	-	-
G	Koeleria cristata	29	32	27	65	.26	.49	.52	2.75
G	Poa bulbosa	-	-	-	1	-	-	-	.03
G	Poa fendleriana	a13	bc41	c52	ab28	.12	1.08	.58	.33
G	Poa pratensis	c279	c251	b141	a41	8.06	11.56	3.34	.86
G	Poa secunda	8	21	11	-	.19	.51	.18	-
G	Sitanion hystrix	ab14	b14	a2	b15	.10	.48	.00	.22
G	Stipa lettermani	42	50	28	32	.40	1.45	.75	1.61
Total for Annual Grasses		176	67	12	14	4.17	0.32	0.03	0.40
Total for Perennial Grasses		602	535	463	501	15.94	18.54	9.47	19.43
Total for Grasses		778	602	475	515	20.11	18.87	9.51	19.83
F	Achillea millefolium	ab98	a77	ab95	b115	1.71	.91	3.14	2.59
F	Agoseris glauca	5	-	2	-	.01	-	.00	-
F	Allium sp.	a-	b47	c90	d177	-	.33	.41	10.47
F	Alyssum alyssoides (a)	-	-	1	1	-	-	.00	.00
F	Artemisia ludoviciana	6	7	3	6	.30	.30	.03	.30
F	Aster chilensis	166	170	168	188	2.75	3.96	3.47	4.87
F	Astragalus beckwithii	-	-	4	-	-	-	.06	-

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Astragalus cibarius</i>	-	-	5	1	-	-	.18	.03
F	<i>Astragalus convallarius</i>	_a 9	_{ab} 16	_c 47	_{bc} 36	.04	.16	.49	.66
F	<i>Balsamorhiza macrophylla</i>	5	-	3	7	.03	.03	.03	.21
F	<i>Calochortus nuttallii</i>	-	3	2	2	-	.03	.00	.00
F	<i>Cirsium undulatum</i>	_{ab} 19	_{ab} 14	_a 3	_b 22	.49	.21	.18	.89
F	<i>Collinsia parviflora</i> (a)	_a 3	_b 27	_{ab} 9	_a 5	.01	.10	.02	.00
F	<i>Collomia linearis</i> (a)	_a -	_c 48	_b 12	_b 28	-	.18	.02	.08
F	<i>Comandra pallida</i>	_a 4	_b 54	_b 44	_b 38	.07	.90	.68	.96
F	<i>Cordylanthus ramosus</i> (a)	_a 1	21	73	_b 71	.03	.72	1.70	1.50
F	<i>Crepis acuminata</i>	-	-	2	-	-	-	.03	-
F	<i>Cryptantha</i> sp.	1	-	-	-	.00	-	-	-
F	<i>Eriogonum umbellatum</i>	7	-	6	13	.06	-	.15	.21
F	<i>Geranium viscosissimum</i>	_a -	_{ab} 2	_b 13	_{ab} 7	.03	.03	.19	.27
F	<i>Hackelia patens</i>	-	2	2	-	-	.00	.03	-
F	<i>Helianthella uniflora</i>	2	-	7	4	.06	-	.01	.30
F	<i>Holosteum umbellatum</i> (a)	-	-	5	1	-	-	.00	.00
F	<i>Ipomopsis aggregata</i>	2	-	1	13	.03	-	.03	.02
F	<i>Lactuca serriola</i> (a)	-	-	5	2	-	-	.03	.00
F	<i>Lappula occidentalis</i> (a)	3	-	-	-	.00	-	-	-
F	<i>Lupinus argenteus</i>	50	63	66	77	1.12	1.74	2.38	2.36
F	<i>Microsteris gracilis</i> (a)	_a 10	_{ab} 23	_b 40	_{ab} 21	.01	.05	.09	.08
F	<i>Penstemon humilis</i>	4	4	6	3	.01	.00	.06	.15
F	<i>Penstemon</i> sp.	-	-	-	4	-	-	-	.03
F	<i>Phlox hoodii</i>	-	-	2	-	-	-	.00	-
F	<i>Phlox longifolia</i>	5	-	-	-	.01	-	-	-
F	<i>Polygonum douglasii</i> (a)	14	20	6	1	.02	.03	.03	.00
F	<i>Potentilla diversifolia</i>	1	-	4	-	.15	-	.15	-
F	<i>Senecio multilobatus</i>	3	4	-	11	.00	.06	-	.04
F	<i>Taraxacum officinale</i>	3	7	6	3	.00	.01	.04	.00
F	<i>Tragopogon dubius</i> (a)	_{ab} 19	_b 28	_a 8	_{ab} 17	.20	.41	.10	.19
F	<i>Veronica biloba</i> (a)	12	13	15	14	.01	.04	.02	.05
F	<i>Viguiera multiflora</i>	3	-	-	-	.04	-	-	-
F	<i>Viola</i> sp.	-	-	-	8	-	-	-	.04
F	<i>Wyethia amplexicaulis</i>	_a 3	_a 3	_a -	_b 20	.00	.00	-	.45
F	<i>Zigadenus paniculatus</i>	2	2	3	6	.00	.00	.06	.06
Total for Annual Forbs		62	180	174	161	0.31	1.55	2.04	1.93
Total for Perennial Forbs		398	475	584	761	6.96	8.72	11.84	24.95
Total for Forbs		460	655	758	922	7.27	10.27	13.89	26.88

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	12	7	6	12	.18	.97	1.08	1.72
B	Artemisia tridentata vaseyana	83	87	81	89	12.31	16.63	19.53	21.28
B	Chrysothamnus viscidiflorus viscidiflorus	72	54	65	50	2.93	2.71	3.27	3.14
B	Eriogonum heracleoides	2	1	0	1	-	-	-	-
B	Juniperus osteosperma	0	0	1	0	-	-	-	-
B	Mahonia repens	28	37	38	32	1.49	1.11	1.90	1.81
B	Opuntia sp.	0	0	0	1	-	-	-	-
B	Purshia tridentata	23	30	25	32	7.86	9.56	7.24	8.01
B	Symphoricarpos oreophilus	53	58	58	59	11.23	11.42	12.08	9.61
Total for Browse		273	274	274	276	36.02	42.42	45.13	45.57

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 39

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	1.10	2.63
Artemisia tridentata vaseyana	26.31	21.63
Chrysothamnus viscidiflorus viscidiflorus	5.08	3.38
Eriogonum heracleoides	-	.05
Juniperus osteosperma	-	.06
Mahonia repens	1.10	.96
Purshia tridentata	9.68	13.96
Symphoricarpos oreophilus	17.29	23.21

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 39

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	-	2.9	4.3
Artemisia tridentata vaseyana	1.6	1.9	2.4
Purshia tridentata	3.5	3.7	3.0

BASIC COVER--

Management unit 02, Study no: 39

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	55.67	61.97	61.25	73.90
Rock	.50	.19	.09	.03
Pavement	1.85	1.89	.37	1.72
Litter	56.73	41.05	47.43	46.72
Bare Ground	14.36	15.38	22.48	8.72

SOIL ANALYSIS DATA --

Management unit 02, Study no: 39, Study Name: Pole Hollow Spring

Effective rooting depth (in)	pH	Clay			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
19.5	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	'11	'01	'06	'11
Rabbit	-	-	-	3	-	-	-
Elk	6	-	-	-	-	3 (7)	1 (2)
Deer	2	-	2	1	13 (32)	7 (17)	1 (2)
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					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
96	500	8	92	-	-	24	4	4	33/33	
01	180	33	67	-	20	22	0	0	44/44	
06	140	0	100	-	-	71	29	0	36/39	
11	320	13	88	-	-	25	0	13	37/41	
<i>Artemisia tridentata vaseyana</i>										
96	4020	9	83	7	420	27	4	.99	25/34	
01	4040	12	72	16	-	20	2	4	29/35	
06	3440	1	86	13	180	36	3	11	28/39	
11	3200	7	84	9	20	26	0	21	28/39	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
96	3200	4	89	8	-	.62	0	4	18/21	
01	2280	1	99	0	-	0	0	0	14/16	
06	2400	4	88	8	-	.83	0	13	14/17	
11	1720	5	94	1	40	0	0	2	14/17	
<i>Eriogonum heracleoides</i>										
96	60	0	100	-	-	0	0	0	7/19	
01	20	0	100	-	-	100	0	0	6/9	
06	0	0	0	-	-	0	0	0	-/-	
11	60	100	0	-	-	0	0	0	19/4	

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Juniperus osteosperma									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	20	100	0	-	-	0	0	0	-/-
11	0	0	0	-	20	0	0	0	-/-
Mahonia repens									
96	5640	21	79	0	40	0	0	0	4/5
01	6080	0	100	0	-	0	0	0	3/4
06	6900	0	100	0	40	0	0	0	3/5
11	3760	11	89	1	-	0	0	0	3/5
Opuntia sp.									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	100	0	100	-	-	0	0	0	-/-
Purshia tridentata									
96	500	12	88	0	-	40	0	0	35/62
01	660	6	73	21	-	30	9	3	34/47
06	560	7	82	11	20	29	50	4	32/61
11	860	21	67	12	20	37	7	12	34/53
Quercus gambelii									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	36/43
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
Symphoricarpos oreophilus									
96	2140	12	85	3	100	.93	0	2	32/51
01	1820	3	89	8	-	0	0	2	32/51
06	2280	5	95	0	-	3	0	0	32/49
11	2520	4	96	0	20	2	0	0	36/53

WARRENS SPRING - TREND STUDY NO. 2-40-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: Private

Elevation: 6,350 ft (1,936 m)

Aspect: Southwest

Slope: 30%

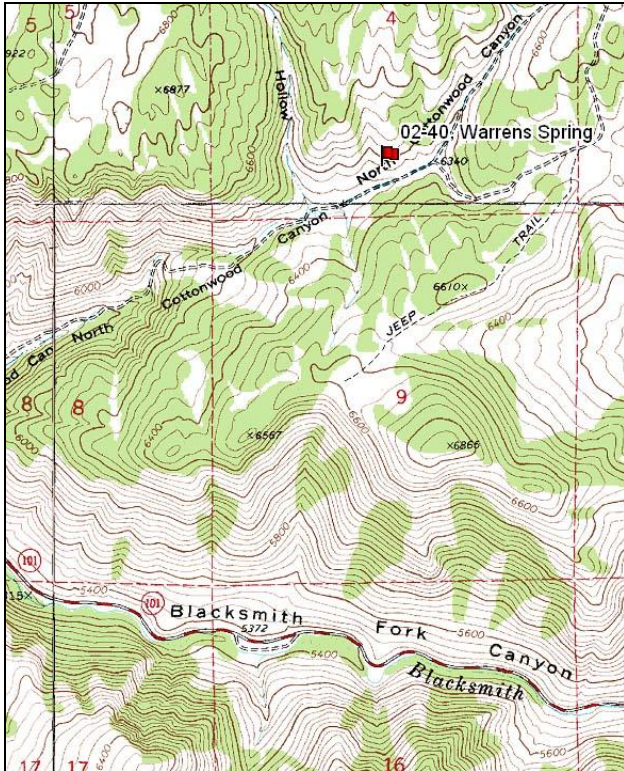
Transect bearing: 10° magnetic

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

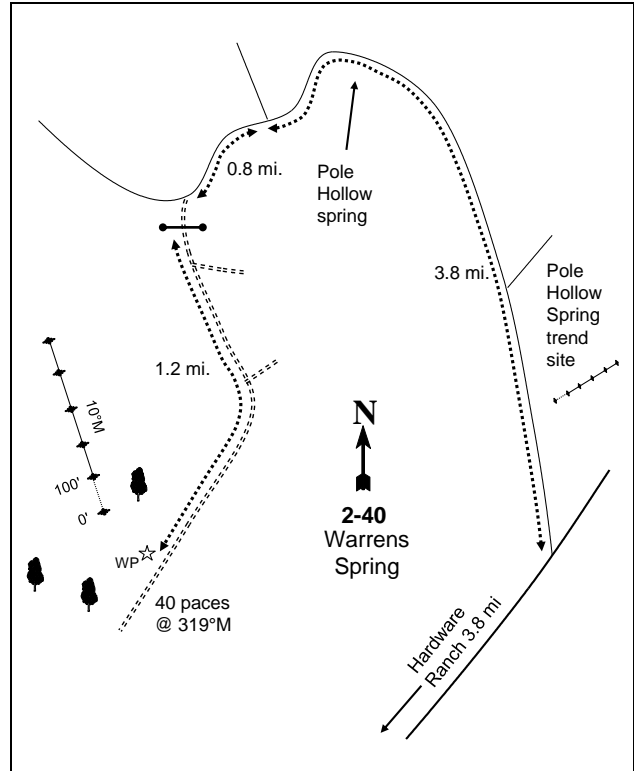
Directions:

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



Diagrammatic Sketch:



Township: 10N Range: 3E Section: 5

GPS: NAD 83, UTM 12S 449315 E 4608473 N

WARRENS SPRING - TREND STUDY NO. 2-40

Site Information

Site Description: This study is located on private land in North Cottonwood Canyon, which is a side canyon of Blacksmith Fork Canyon. The study monitors winter range in a mountain brush community and water is available at Warren Spring about a third of a mile to the southwest. 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. The area is occupied by deer, elk, moose, and cattle. Deer pellet groups were sampled in high abundance in 2001 and 2006, but low abundance in 2011. Elk pellet groups have been sampled in low abundance since 2001. Sampled cattle sign has been minimal since 2001; however, cattle sign and use is highly abundant throughout the bottom of the canyon. Moose pellet groups were sampled in low abundance in 2001 (Table - Pellet Group Data).

Browse: The key browse species in this mountain brush community are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*). The mountain big sagebrush population is dense with the population centered within the mature age class, and has only fluctuated slightly. Decadence within the sagebrush population has been fairly moderate and peaked in 2006. Utilization of sagebrush has been light to moderate over the sample years. The sagebrush population has displayed good vigor over the course of the study; however chlorotic and diseased sagebrush have steadily increased over time. Poor vigor is still a minor component of the population. Recruitment of young sagebrush has fluctuated over the sample years, but was considered good in 1996 and 2011. Antelope bitterbrush has maintained a small, mature population for the duration of the study. Decadence within the bitterbrush population has been low and has slowly decreased over time. Decadence was absent in the population in 2011. Utilization of bitterbrush has been moderate to heavy over the sample years. Recruitment of young bitterbrush has been absent on the study site. The bitterbrush population near the bottom of the canyon is heavily utilized, and is likely used by cattle as well as wildlife. Serviceberry (*Amelanchier alnifolia*) is rare and moderately utilized. Other browse species include western common chokecherry (*Prunus virginiana*), Woods rose (*Rosa woodsii*), and snowberry (*Symphoricarpos oreophilus*). Chokecherry is usually found growing under the canopy of sagebrush and the few Rocky Mountain junipers (*Juniperus scopulorum*) on the site (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is not particularly abundant for a mountain brush community. The grass component is diverse, but bluebunch wheatgrass (*Agropyron spicatum*) is the only common perennial species. In 2001, 2006 and 2011 bluebunch wheatgrass and Great Basin wildrye (*Elymus cinereus*) both displayed moderate to heavy use. The weedy annual grass species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) were abundant in 1996, and produced half of the total grass cover. These annual grasses have provided less cover in the other sample years. Forbs are very diverse and produce nearly as much cover as grasses. Annual forbs are abundant, as are weedy perennials which include weavyleaf thistle (*Cirsium undulatum*), common sunflower (*Helianthus annuus*), and the noxious weed dyer's woad (*Isatis tinctoria*). Perennial forb species have shown a consistent increase in sum of nested frequency for every year sampled (Table - Herbaceous Trends).

Soil: The study is part of the Agassiz-Goring association, and likely as part of the Goring component. These soils occur on mountain slopes. The parent material consists of colluvium and residuum weathered from limestone (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). Soils are moderately rocky on the surface and throughout the profile. Most of the bare ground is associated with livestock trails, and some compaction occurs due to livestock. Bare ground cover is moderately low, with a fair amount of vegetation, litter, and rock cover providing protective ground cover (Table - Basic Cover). Due to pedestalling, the soil erosion condition was classified as slight in 2001, but stable in 2006 and 2011.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density for mountain big sagebrush remained similar, increasing from 2,460 plants/acre to 2,560 plants/acre. Decadence within the sagebrush population increased slightly from 13% to 15%. The sagebrush population modestly increased in poor vigor from 2% to 4%. Young sagebrush recruitment decreased from 14% to 4% of the population. The density for antelope bitterbrush displayed no change at 180 plants/acre. Decadence within the bitterbrush population decreased from 22% to 11%. The bitterbrush population decreased notably in poor vigor from 22% to 0%. Recruitment of young bitterbrush was not observed.
- **2001 to 2006 - stable (0):** The density for mountain big sagebrush remained similar at 2,700 plants/acre. Decadence within the sagebrush population increased to 20%. The poor vigor within the sagebrush population increased modestly to 10%. Recruitment of young sagebrush increased to 7% of the population. The density for antelope bitterbrush did not change and remained at 180 plants/acre. Decadence and poor vigor remained the same at 11% and 0%, respectively.
- **2006 to 2011 - slightly down (-1):** The density for mountain big sagebrush decreased 15% to 2,300 plants/acre. Decadence within the sagebrush population decreased to 11%. The sagebrush population increased in poor vigor to 15%. Recruitment of young sagebrush increased to 10% of the population. The density for antelope bitterbrush remained at 180 plants/acre. Decadence within the bitterbrush decreased to 0%. The bitterbrush population increased in poor vigor to 11%. Recruitment of young bitterbrush was not observed.

Grass:

- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses remained similar. However, the weedy annual grass species cheatgrass and Japanese chess had a significant decrease in nested frequency, and annual grass cover from 6% to 1%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial grasses increased 31%. Bluebunch wheatgrass had a significant increase in nested frequency, and increased in cover from 5% to 6%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar, though cover decreased from 8% to 5%. No significant changes were notable within the grass community.

Forb:

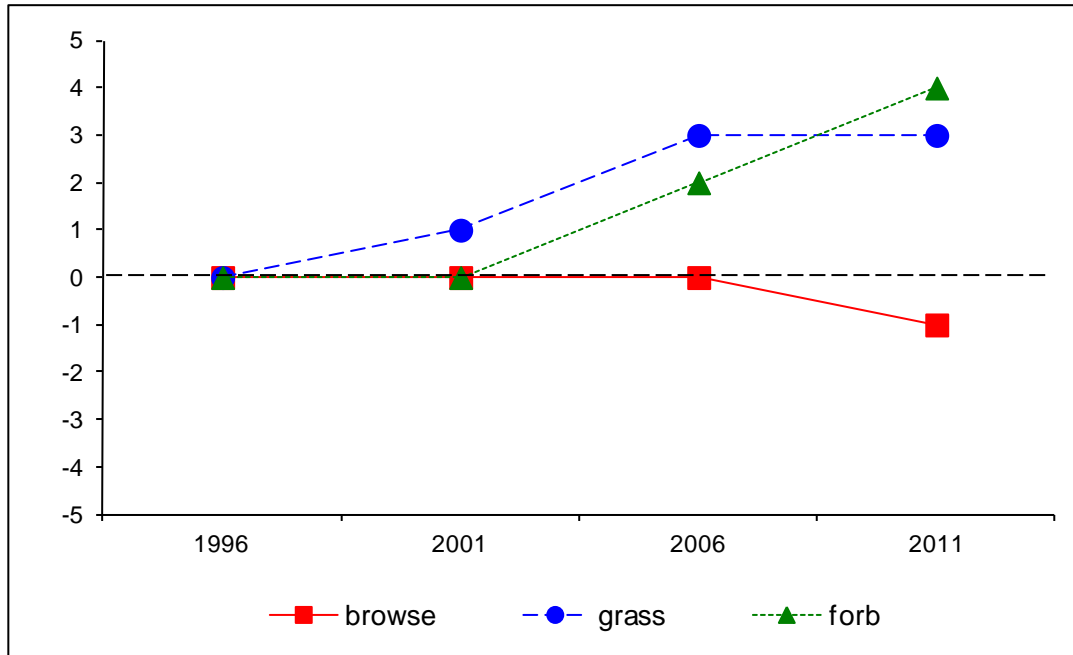
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The noxious weed Dyer's woad decreased significantly in nested frequency, and decreased in cover from near 1% to less than 1%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 42%. Pacific aster (*Aster chilensis*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and hoary aster (*Machaeranthera canescens*) increased significantly in nested frequency. Arrowleaf balsamroot increased in cover from 1% to 4%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 43%. The perennial forb species Lewis flax (*Linum lewisii*) and silvery lupine (*Lupinus argenteus*) increased in nested frequency. The weedy perennial forb species wild onion (*Allium sp.*), weavyleaf thistle, and cryptantha (*Cryptantha sp.*) also increased in nested frequency. Wild onion increased in cover from less than 1% to 1%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 2, study no: 40

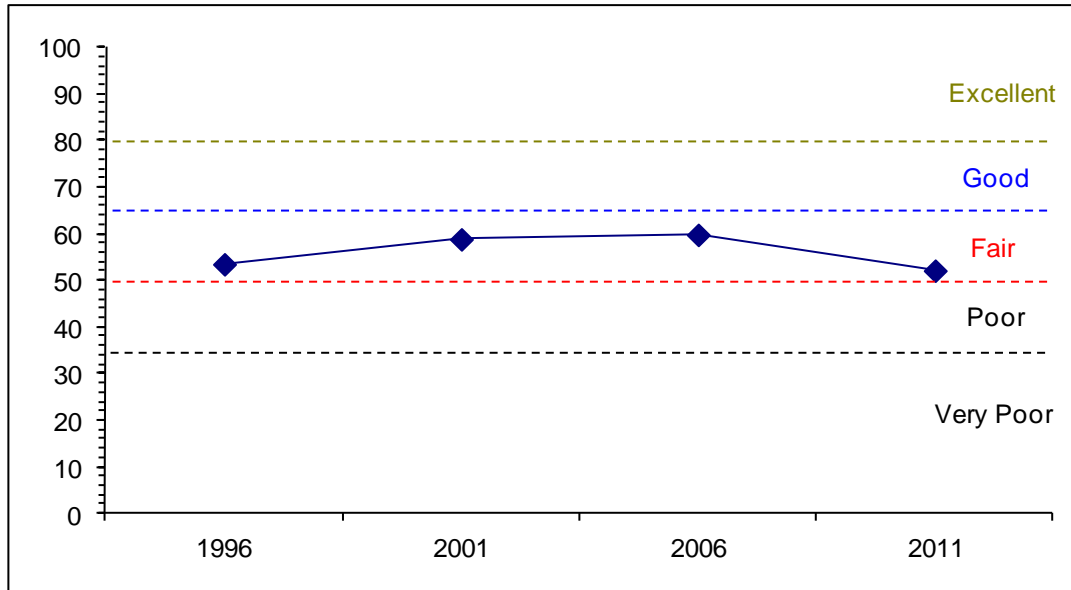
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	21.7	11.1	6.6	11.0	-4.5	9.6	-2.0	53.5	Fair
01	29.9	10.7	2.5	10.1	-0.7	8.3	-2.0	58.8	Fair
06	22.8	9.5	3.3	14.9	-0.7	10.0	0.0	59.8	Fair
11	19.9	12.0	4.6	8.9	-1.3	10.0	-2.0	52.1	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 2 Study no: 40



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 40



HERBACEOUS TRENDS--
 Management unit 02, Study no: 40

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	ab184	a161	b212	ab188	4.42	4.51	6.16	3.10
G	Agropyron trachycaulum	7	5	3	12	.18	.04	.02	.21
G	Bromus carinatus	a5	ab23	b32	ab25	.06	.17	.16	.09
G	Bromus inermis	-	-	-	2	-	-	-	.00
G	Bromus japonicus (a)	c142	a69	ab97	bc139	2.75	.65	.45	1.55
G	Bromus tectorum (a)	b156	a42	a59	a68	3.21	.28	.49	.12
G	Elymus cinereus	5	5	5	6	.38	.03	.41	.21
G	Melica bulbosa	-	-	-	-	-	-	.00	-
G	Poa bulbosa	16	23	26	21	.34	.53	.66	.70
G	Poa fendleriana	1	-	-	-	.00	-	-	-
G	Poa pratensis	12	14	21	20	.45	.19	.57	.54
G	Poa secunda	a4	ab14	ab22	b22	.01	.09	.11	.29
Total for Annual Grasses		298	111	156	207	5.96	0.93	0.94	1.68
Total for Perennial Grasses		234	245	321	296	5.85	5.58	8.10	5.14
Total for Grasses		532	356	477	503	11.82	6.52	9.05	6.82
F	Achillea millefolium	19	31	31	32	.16	.38	.36	.93
F	Agoseris glauca	-	3	5	6	-	.01	.03	.05
F	Allium sp.	a81	ab113	b129	c183	.25	.35	.41	1.35
F	Alyssum alyssoides (a)	c213	b129	a14	bc151	.96	.41	.04	.54
F	Arabis sp.	-	1	2	1	-	.00	.01	.00
F	Artemisia dracunculus	6	-	-	-	.03	-	-	-
F	Aster chilensis	a30	a32	b52	ab44	.66	.75	1.44	1.02
F	Astragalus sp.	14	4	-	8	.21	.06	-	.16
F	Astragalus utahensis	1	1	4	-	.03	.00	.01	-

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Balsamorhiza macrophylla	-	-	3	8	-	-	.18	.09
F	Balsamorhiza sagittata	a15	a13	b35	b46	1.33	1.28	3.58	4.06
F	Calochortus nuttallii	-	-	2	-	-	-	.00	-
F	Camelina microcarpa (a)	-	3	-	3	-	.01	-	.03
F	Castilleja linariaefolia	1	-	-	-	.00	-	-	-
F	Chaenactis douglasii	10	-	4	4	.04	-	.18	.03
F	Cirsium undulatum	a6	a5	a5	b22	.27	.06	.33	.25
F	Collinsia parviflora (a)	a44	a46	b137	a16	.41	.15	.22	.20
F	Collomia linearis (a)	a40	b107	b92	b77	.12	.52	.25	.30
F	Comandra pallida	5	2	-	1	.01	.01	-	.00
F	Crepis acuminata	5	1	3	2	.04	.15	.15	.00
F	Cryptantha sp.	a-	a5	a13	b33	-	.01	.07	.16
F	Cymopterus sp.	2	3	4	1	.00	.06	.09	.03
F	Descurainia pinnata (a)	-	2	-	-	-	.01	-	-
F	Epilobium brachycarpum (a)	ab65	a54	b78	ab46	.61	.26	.20	.28
F	Galium aparine (a)	a5	a-	a3	b40	.15	-	.00	.25
F	Hackelia patens	-	4	-	1	-	.03	-	.00
F	Helianthella uniflora	a-	a2	a10	b21	.00	.21	.15	.21
F	Helianthus annuus (a)	2	-	-	-	.63	-	-	-
F	Holosteum umbellatum (a)	1	2	4	6	.00	.00	.00	.01
F	Isatis tinctoria	b36	a8	a-	a15	.45	.06	-	.24
F	Lactuca serriola (a)	a1	ab8	a4	b28	.03	.02	.01	.10
F	Linum lewisii	a15	a22	a28	b69	.14	.14	.23	.23
F	Lithospermum ruderales	-	5	10	3	.00	.01	.18	.03
F	Lupinus argenteus	ab11	ab5	a2	b20	.85	.21	.15	.43
F	Machaeranthera canescens	a1	a1	b34	a6	.02	.03	.43	.04
F	Machaeranthera grindelioides	-	2	-	-	-	.00	-	-
F	Microsteris gracilis (a)	a33	b60	a16	a32	.10	.14	.04	.06
F	Penstemon humilis	-	5	3	5	.00	.06	.03	.01
F	Penstemon sp.	-	-	1	-	-	-	.03	-
F	Phlox longifolia	-	-	3	-	-	-	.03	-
F	Polygonum douglasii (a)	a50	a28	b96	a50	.13	.06	.25	.17
F	Senecio multilobatus	-	3	-	-	-	.03	-	-
F	Taraxacum officinale	1	3	-	-	.00	.01	-	-
F	Tragopogon dubius (a)	a21	a18	a17	b77	.40	.23	.19	.97
F	Veronica biloba (a)	b166	a121	b202	c306	.42	.33	1.20	6.44
F	Viguiera multiflora	5	-	5	8	.04	-	.18	.02
F	Viola sp.	-	-	-	5	-	-	-	.02
F	Wyethia amplexicaulis	1	1	1	11	.18	.15	.18	.24
Total for Annual Forbs		641	578	663	832	4.00	2.17	2.43	9.39
Total for Perennial Forbs		265	275	389	555	4.79	4.14	8.48	9.68
Total for Forbs		906	853	1052	1387	8.79	6.31	10.91	19.07

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	3	1	1	4	.15	-	.03	.03
B	Artemisia tridentata vaseyana	76	74	73	66	14.11	20.20	15.32	14.20
B	Chrysothamnus nauseosus consimilis	2	1	1	2	-	-	.00	.03
B	Chrysothamnus viscidiflorus viscidiflorus	24	24	24	27	1.19	1.91	1.70	1.68
B	Eriogonum heracleoides	1	0	0	2	.63	-	-	.03
B	Juniperus scopulorum	0	0	0	0	-	-	-	.03
B	Mahonia repens	5	3	6	9	.09	.24	.24	.10
B	Prunus virginiana	4	6	6	5	.38	.36	.36	.68
B	Purshia tridentata	9	9	8	8	1.69	2.79	2.11	.83
B	Rosa woodsii	2	1	1	1	.63	.03	.03	-
B	Symphoricarpos oreophilus	26	25	25	29	2.10	3.73	4.36	3.76
Total for Browse		152	144	145	153	20.98	29.29	24.18	21.39

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 40

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.08	.30
Artemisia tridentata vaseyana	19.36	21.89
Chrysothamnus nauseosus consimilis	.01	-
Chrysothamnus viscidiflorus viscidiflorus	2.83	2.36
Juniperus scopulorum	-	1.39
Mahonia repens	.16	.18
Prunus virginiana	.75	1.06
Purshia tridentata	2.36	2.66
Rosa woodsii	-	.10
Symphoricarpos oreophilus	6.53	4.96

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 40

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.5	1.9	0.7
Purshia tridentata	1.8	3.9	0.5

BASIC COVER--

Management unit 02, Study no: 40

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	38.24	41.59	40.48	49.59
Rock	5.32	7.12	7.66	7.83
Pavement	2.70	2.44	2.95	3.08
Litter	48.71	46.20	36.77	42.50
Cryptogams	.10	.00	0	.03
Bare Ground	19.22	28.33	30.67	11.97

SOIL ANALYSIS DATA --

Management unit 02, Study no: 40, Study Name: Warrens Spring

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
15.1	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	'11	'01	'06	'11
Rabbit	2	1	1	1	-	-	-
Elk	4	1	3	2	11 (28)	1 (2)	7 (17)
Deer	22	14	14	7	44 (107)	52 (127)	17 (43)
Cattle	1	3	-	-	9 (23)	7 (18)	1 (2)
Moose	-	-	-	-	1 (1)	-	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 40

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
96	60	0	100	-	-	100	0	0	36/29
01	20	0	100	-	-	100	0	0	38/41
06	20	0	100	-	-	0	100	0	34/39
11	80	50	50	-	-	25	0	0	36/38
Artemisia tridentata vaseyana									
96	2460	14	73	13	60	24	0	2	23/38
01	2560	4	81	15	20	5	0	4	23/35
06	2700	7	73	20	80	7	0	10	26/38
11	2300	10	79	11	20	25	0	15	22/37
Chrysothamnus nauseosus consimilis									
96	40	0	100	-	-	50	0	0	33/58
01	20	0	100	-	-	0	0	0	22/18
06	20	0	100	-	-	0	0	0	24/30
11	40	50	50	-	-	50	0	0	27/43

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
96	880	5	93	2	-	0	0	5	16/23	
01	840	5	93	2	-	0	0	0	13/22	
06	800	13	88	0	60	0	0	0	15/24	
11	720	0	97	3	-	6	0	3	14/20	
<i>Eriogonum heracleoides</i>										
96	20	0	100	-	-	0	0	0	2/4	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	40	0	100	-	-	0	0	0	3/3	
<i>Juniperus scopulorum</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	20	0	0	0	-/-	
<i>Mahonia repens</i>										
96	520	12	88	-	-	0	0	0	5/8	
01	660	6	94	-	-	0	0	0	3/5	
06	1040	0	100	-	60	0	0	0	3/5	
11	1080	0	100	-	-	0	0	0	4/3	
<i>Prunus virginiana</i>										
96	120	67	33	-	-	0	0	0	30/28	
01	320	88	13	-	20	6	0	0	32/31	
06	360	28	72	-	-	11	17	0	23/14	
11	140	0	100	-	-	57	0	0	25/20	
<i>Purshia tridentata</i>										
96	180	0	78	22	-	22	22	22	24/52	
01	180	0	89	11	-	22	67	0	23/49	
06	180	0	89	11	-	22	67	0	20/49	
11	180	0	100	0	-	67	22	11	21/47	
<i>Rosa woodsii</i>										
96	40	0	100	-	-	0	0	0	14/4	
01	20	100	0	-	-	0	0	0	22/11	
06	40	0	100	-	-	0	0	0	-/-	
11	40	0	100	-	-	0	0	0	9/8	
<i>Symphoricarpos oreophilus</i>										
96	760	5	79	16	-	0	0	8	21/35	
01	840	5	83	12	20	0	0	7	22/36	
06	960	8	92	0	-	0	0	0	18/34	
11	1100	4	96	0	40	13	0	0	18/34	

HARDWARE GRAVEL PIT - TREND STUDY NO. 2-42-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Stony Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 5,670 ft (1,728 m)

Aspect: East

Slope: 10%

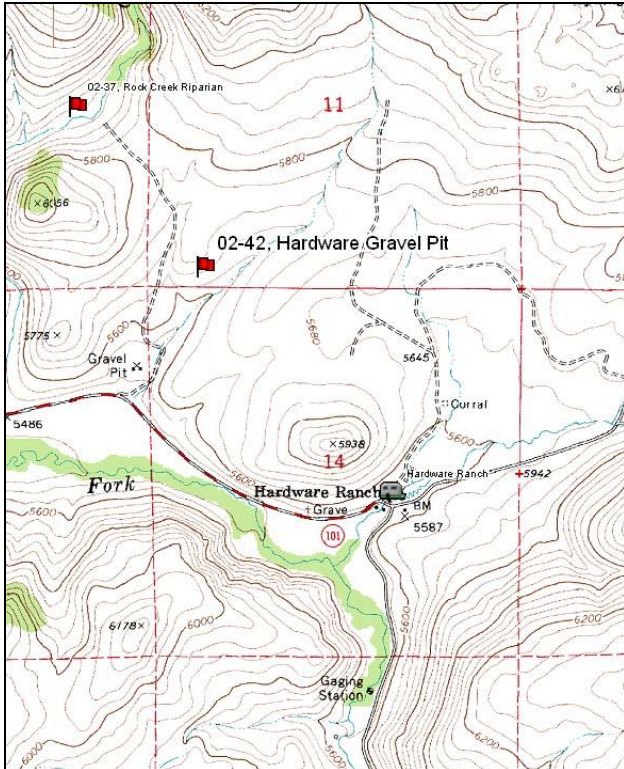
Transect bearing: 41° magnetic

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

Directions:

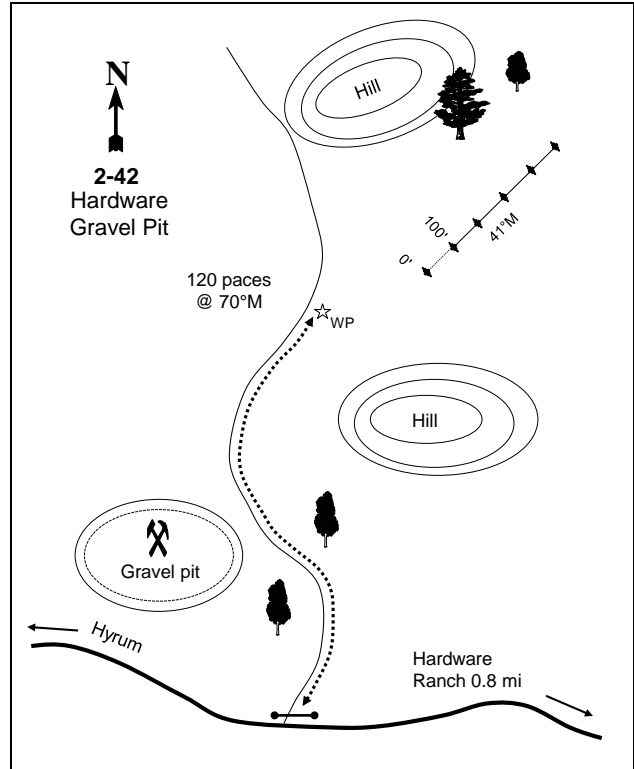
From the Hardware Ranch Visitors' Center, drive westbound on SR 101 for 0.8 mile to a dirt road and gate on the north side of the SR 101. Turn right and travel 0.3 mile to a witness post on the right hand side of the road. From the witness post, walk 120 paces at a bearing of 70 degrees magnetic to the 0-foot stake.

Map Name: Hardware Ranch



Township: 10N Range: 4E Section: 18

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 451971 E 4606733 N

HARDWARE GRAVEL PIT - TREND STUDY NO. 2-42

Site Information

Site Description: The study is located in about a mile northwest of the Hardware Ranch visitor center near an old gravel pit. Hardware Ranch is administered by the Utah Division of Wildlife Resources (UDWR). The study monitors a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) community within winter range that is crucial to deer and elk. The study was placed in a location that has experienced a high amount of winter kill in recent years prior to the study establishment. Hunting is not allowed within the area. Deer pellet groups were sampled in moderate abundance in 2011. Elk pellet groups were sampled in low abundance in 2011 (Table - Pellet Group Data).

Browse: The key browse species within the community are mountain big sagebrush and antelope bitterbrush. The big sagebrush in the area displays growth attributes of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) but fluoresces like mountain big sagebrush. The plants are likely a hybrid of the two species. It appears these plants are less palatable to wildlife, similar to basin big sagebrush. All of the big sagebrush plants were classified as mountain big sagebrush for the purposes of this study. The mountain big sagebrush is a moderately dense, mature population with a high amount of decadence within the population. Utilization of sagebrush plants was moderate. There was no recruitment of young sagebrush plants sampled. The antelope bitterbrush population is small and decadent. Utilization of bitterbrush plants was heavy. There was no recruitment of young bitterbrush plants sampled. Other browse species found on the study include the highly preferred Saskatoon serviceberry (*Amelanchier alnifolia*), the weedy increaser broom snakeweed (*Gutierrezia sarothrae*), and Utah juniper (*Juniperus osteosperma*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is comprised almost entirely of annual grass and forb species. The most abundant perennial grass species are Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Agropyron spicatum*), yet occur infrequently. The weedy annual species Japanese chess (*Bromus japonicus*) and cheatgrass (*B. tectorum*) are the most common grass species, and provide the bulk of herbaceous production. An annual muhly species (*Muhlenbergia* sp.) is also frequent on the study. The forb community is moderately diverse, but is dominated by annual species. The most abundant perennial forb is the weedy species mulesears wyethia (*Wyethia amplexicaulis*). Annual forbs are abundant and include pale alyssum (*Alyssum alyssoides*), annual stickseed (*Lappula occidentalis*), storksbill (*Erodium cicutarium*), and willowweed (*Epilobium brachycarpum*) (Table - Herbaceous Trends).

Soil: The soil is part of the Yeates Hollow component, which is found on mountain slopes. The parent material consists of residuum, colluvium, and alluvium derived from quartzite and sandstone (Soil Survey Staff 2011). The soil texture is a sandy loam with a neutral soil reaction (pH 6.6) (Table - Soil Analysis Data). Exposed bare ground cover occurs rarely, and is irregularly distributed. Protective ground cover is abundant and is provided by high amounts of rock, vegetation, and litter (Table - Basic Cover). The soil erosion condition was classified as stable in 2011.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 42

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
11	21.0	2.3	1.4	4.7	-19.1	10.0	0.0	20.4	Very Poor

HERBACEOUS TRENDS--

Management unit 02, Study no: 42

Type	Species	Nested	Average
		Frequency	Cover %
		'11	'11
G	Agropyron spicatum	29	.84
G	Bromus japonicus (a)	374	14.20
G	Bromus tectorum (a)	202	7.23
G	Muhlenbergia sp. (a)	45	3.99
G	Poa bulbosa	4	.04
G	Poa fendleriana	12	.25
G	Poa secunda	89	1.18
G	Sitanion hystrix	5	.06
Total for Annual Grasses		621	25.42
Total for Perennial Grasses		139	2.38
Total for Grasses		760	27.80
F	Achillea millefolium	7	.33
F	Agoseris glauca	10	.02
F	Alyssum alyssooides (a)	208	.92
F	Arenaria serpyllifolia	9	.53
F	Artemisia ludoviciana	2	.03
F	Camelina microcarpa (a)	1	.03
F	Cirsium sp.	10	.33
F	Collinsia parviflora (a)	98	.28
F	Collomia linearis (a)	112	.51
F	Descurainia pinnata (a)	38	.16
F	Draba sp. (a)	64	.25
F	Epilobium brachycarpum (a)	105	1.23
F	Erodium cicutarium (a)	116	.79
F	Galium aparine (a)	2	.03
F	Holosteum umbellatum (a)	107	.30
F	Lactuca serriola (a)	25	.08
F	Lappula occidentalis (a)	140	.63
F	Lomatium sp.	3	.03
F	Microsteris gracilis (a)	106	.34
F	Navarretia intertexta (a)	9	.18
F	Polygonum douglasii (a)	25	.10
F	Ranunculus testiculatus (a)	17	.05
F	Tragopogon dubius (a)	9	.02
F	Wyethia amplexicaulis	54	4.73
Total for Annual Forbs		1182	5.94
Total for Perennial Forbs		95	6.01
Total for Forbs		1277	11.96

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

BROWSE TRENDS--

Management unit 02, Study no: 42

Type	Species	Strip Frequency	Average Cover %
		'11	'11
B	Artemisia tridentata vaseyana	81	15.98
B	Gutierrezia sarothrae	12	.53
B	Juniperus osteosperma	1	
B	Purshia tridentata	7	.68
Total for Browse		101	17.20

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 42

Species	Percent Cover
	'11
Artemisia tridentata vaseyana	21.08
Gutierrezia sarothrae	.65
Purshia tridentata	2.36

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 42

Species	Average leader growth (in)
	'11
Artemisia tridentata vaseyana	4.3
Purshia tridentata	2.0

BASIC COVER--

Management unit 02, Study no: 42

Cover Type	Average Cover %
	'11
Vegetation	57.22
Rock	12.34
Pavement	.95
Litter	51.09
Cryptogams	.29
Bare Ground	3.14

SOIL ANALYSIS DATA --

Management unit 02, Study no: 42, Study Name: Hardware Gravel Pit

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
	6.6	54.0	32.9	13.1	2.9	17.1	187.2	0.4

PELLET GROUP DATA--

Management unit 02, Study no: 42

Type	Quadrat Frequency '11	Days use per acre (ha) '11
Grouse	1	-
Elk	3	5 (13)
Deer	9	21 (53)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 42

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Amelanchier alnifolia</i>									
11	0	0	0	-	-	0	0	0	67/61
<i>Artemisia tridentata vaseyana</i>									
11	3160	3	56	41	120	39	1	30	27/45
<i>Gutierrezia sarothrae</i>									
11	420	14	86	-	-	0	0	0	11/13
<i>Juniperus osteosperma</i>									
11	20	100	0	-	-	0	0	0	-/-
<i>Purshia tridentata</i>									
11	140	0	29	71	-	29	43	71	40/54

WOODRUFF LONGHILL - TREND STUDY NO. 2-43-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: [Upland Stony Loam \(Wyoming Big Sagebrush\), R047XA338UT](#)

Land Ownership: BLM

Elevation: 6,794 ft (2,071 m)

Aspect: Northeast

Slope: 11%

Transect bearing: 44° magnetic

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

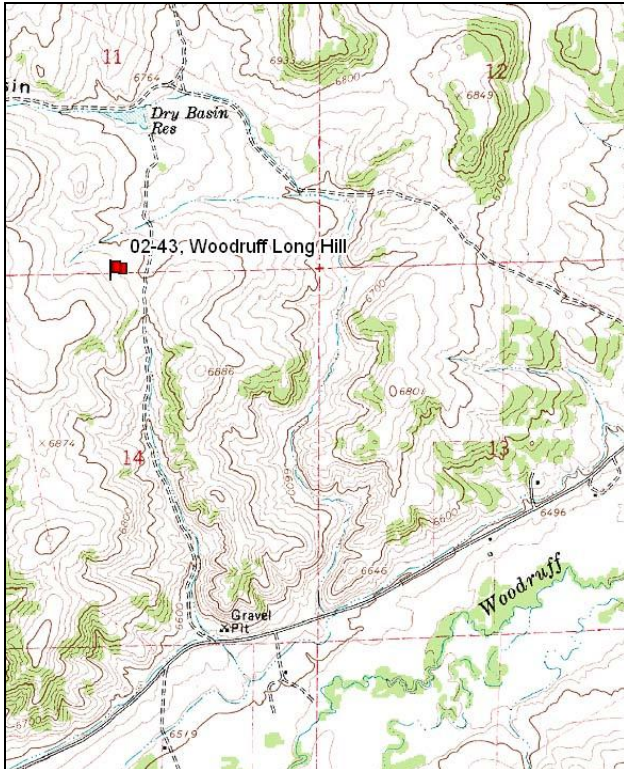
Directions:

From SR-16 (Woodruff Main street) turn left onto SR-39 (towards Monte Cristo) and follow for 3.8 miles.

Turn right (north) onto a dirt road and continue for 1.15 miles to an intersecting dirt road just north of a saddle.

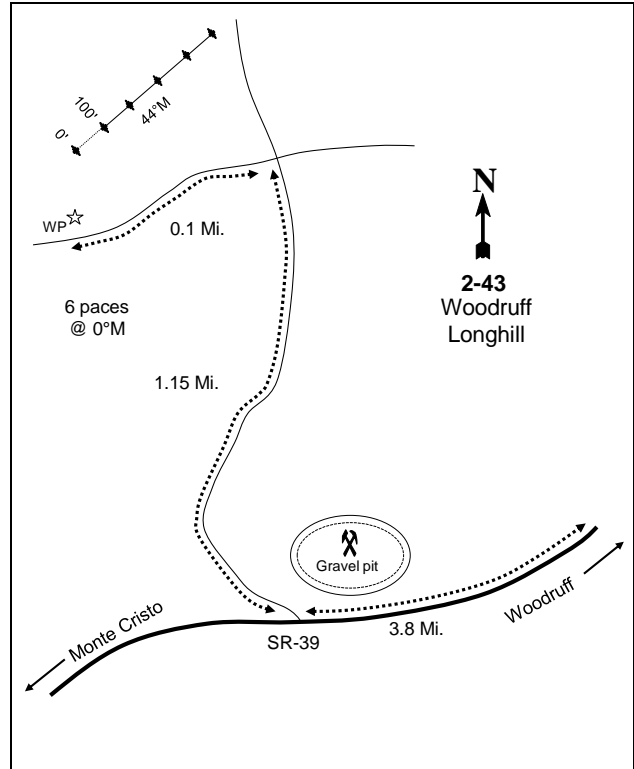
Turn left (west) for 0.1 miles. Witness post is on the right. 0' stake is 6 paces at 0°.

Map Name: Woodruff



Township: 9N Range: 6E Section: 11

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 480154 E 4596846 N

WOODDRUFF LONGHILL - TREND STUDY NO. 2-43

Site Information

Site Description: This study is located approximately four miles west of Woodruff on the north side of SR 32. The area is on land administered by the Bureau of Land Management (BLM) as part of the Woodruff Pastures allotment. The study monitors a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community within crucial winter range for deer. This site was established in 2009 prior to a proposed Spike (tebuthiuron) treatment designed to thin sagebrush ([Project #1477](#)). However, due to the presence of pygmy rabbits inhabiting the area, the study site was not treated by Spike. The project was altered and a lop and scatter treatment of 3,069 acres that occurred in the fall of 2009 to remove Utah juniper (*Juniperus osteosperma*) trees. The trees around and within the study site were treated, though there were very few trees present on the site (WRI Database 2012). Due to differences in methodology, plant data for 2009 was not included in this report, but pellet group methods were similar in 2009 and 2011. Deer pellet groups were sampled in high abundance in 2009 and 2011. Elk pellet groups were sampled in low abundance in 2009 and 2011. Sampled cattle sign was minimal in 2009 and 2011. Grouse pellet groups were sampled in 2011 (Table - Pellet Group Data).

Browse: The key browse species found on the site is Wyoming big sagebrush. The sagebrush population is a fairly dense, mature population and is centered within the mature demographic. Decadence within the sagebrush population is moderately low. Utilization of sagebrush was moderately heavy. Recruitment of young Wyoming big sagebrush was poor. Other browse species sampled on the site include stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), prickly phlox (*Leptodactylon pungens*), mountain snowberry (*Symphoricarpos oreophilus*), and Gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: The perennial grass species crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) dominate the herbaceous understory. A few other perennial grass species are present, but are limited in number. Forbs occur rarely and are primarily found under the cover of Wyoming big sagebrush. Common perennial forbs include longleaf phlox (*Phlox longifolia*), Hoods phlox (*P. hoodii*), low penstemon (*Penstemon humilis*), and wild onion (*Allium sp.*). The annual species bush birdbeak (*Cordylanthus ramosus*) occurs most frequently, and provides the most cover of all forbs within the community (Table - Herbaceous Trends).

Soil: The soil is part of the Cutoff component, which is found on hillslopes. The parent material consists of colluvium and/or slope alluvium over residuum weathered from sandstone. The natural drainage class is well drained (Soil Survey Staff 2011). Exposed bare ground cover is high, and occurs frequently between the interspaces of browse species. Protective ground cover is moderately abundant and is provided by high amounts of vegetation and litter (Table - Basic Cover). Due to surface litter movement and the presence of flow patterns, the soil erosion condition was classified as slight in 2009, but stable in 2011.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 2, study no: 43

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
11	30.0	4.2	0.5	27.0	0.0	3.0	0.0	64.8	Good-Excellent

HERBACEOUS TRENDS--

Management unit 02, Study no: 43

Type	Species	Nested	Average
		Frequency	Cover %
		'11	'11
G	Agropyron cristatum	259	10.06
G	Agropyron spicatum	9	.02
G	Carex sp.	8	.06
G	Elymus junceus	3	.00
G	Poa secunda	213	3.37
Total for Annual Grasses		0	0
Total for Perennial Grasses		492	13.52
Total for Grasses		492	13.52
F	Allium sp.	20	.04
F	Alyssum alyssoides (a)	21	.04
F	Antennaria rosea	6	.18
F	Arabis sp.	2	.01
F	Astragalus sp.	8	.04
F	Chaenactis douglasii	3	.00
F	Collinsia parviflora (a)	73	.17
F	Comandra pallida	11	.12
F	Cordylanthus ramosus (a)	209	6.76
F	Crepis acuminata	-	.00
F	Cryptantha sp.	1	.00
F	Erigeron pumilus	2	.03
F	Gayophytum ramosissimum(a)	1	.00
F	Penstemon humilis	24	.30
F	Penstemon sp.	3	.03
F	Phlox hoodii	28	.52
F	Phlox longifolia	55	.21
F	Polygonum douglasii (a)	7	.02
F	Ranunculus testiculatus (a)	72	1.16
Total for Annual Forbs		383	8.17
Total for Perennial Forbs		163	1.51
Total for Forbs		546	9.68

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

BROWSE TRENDS--

Management unit 02, Study no: 43

Type	Species	Strip Frequency '11	Average Cover % '11
B	Artemisia tridentata wyomingensis	96	15.36
B	Chrysothamnus viscidiflorus viscidiflorus	76	5.36
B	Symphoricarpos oreophilus	2	
B	Tetradymia canescens	1	
Total for Browse		175	20.72

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 43

Species	Percent Cover '11
Artemisia tridentata wyomingensis	25.18
Chrysothamnus viscidiflorus viscidiflorus	7.05

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 43

Species	Average leader growth (in) '11
Artemisia tridentata wyomingensis	1.8

BASIC COVER--

Management unit 02, Study no: 43

Cover Type	Average Cover % '11
Vegetation	35.77
Rock	.37
Pavement	.91
Litter	35.94
Cryptogams	3.77
Bare Ground	37.11

PELLET GROUP DATA--

Management unit 02, Study no: 43

Type	Quadrat Frequency '11	Days use per acre (ha)	
		'09	'11
Rabbit	26	-	-
Grouse	2	-	-
Elk	-	1(2)	5 (13)
Deer	33	82(202)	40 (99)
Cattle	3	20(50)	5 (13)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 43

		Age class distribution			Utilization				
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>									
11	7200	2	63	36	-	28	38	30	18/28
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
11	5400	0	97	3	20	.74	0	3	10/16
<i>Leptodactylon pungens</i>									
11	0	0	0	-	-	0	0	0	7/13
<i>Symphoricarpos oreophilus</i>									
11	60	0	100	-	-	33	0	0	16/23
<i>Tetradymia canescens</i>									
11	20	0	100	-	-	0	0	0	8/11

COLDWATER WMA - TREND STUDY NO. 2R-5-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Substantial Elk Year-long

NRCS Ecological Site Description: [Upland Stony Loam \(Mountain Big Sagebrush\), R028AY334UT](#)

Land Ownership: DWR

Elevation: 5,100 ft (1,555 m)

Aspect: Southwest

Slope: 18%

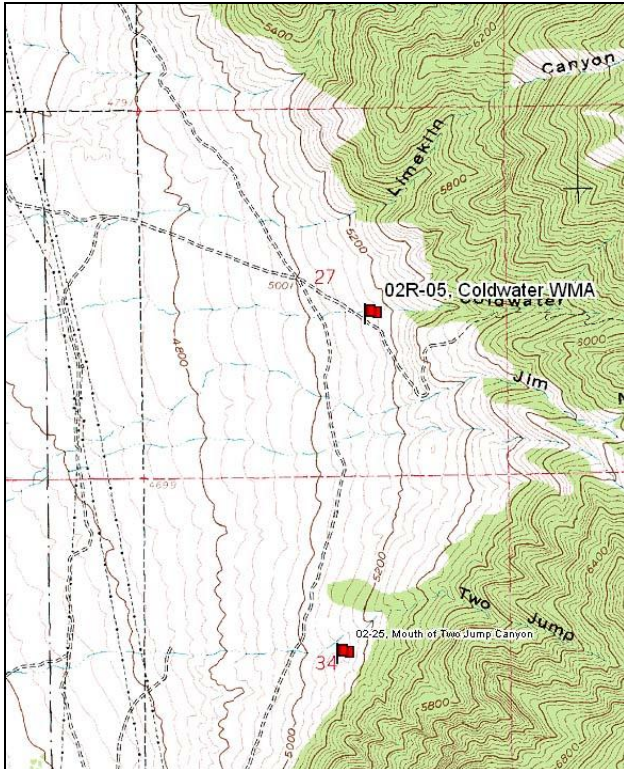
Transect bearing: 240° magnetic

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

Directions:

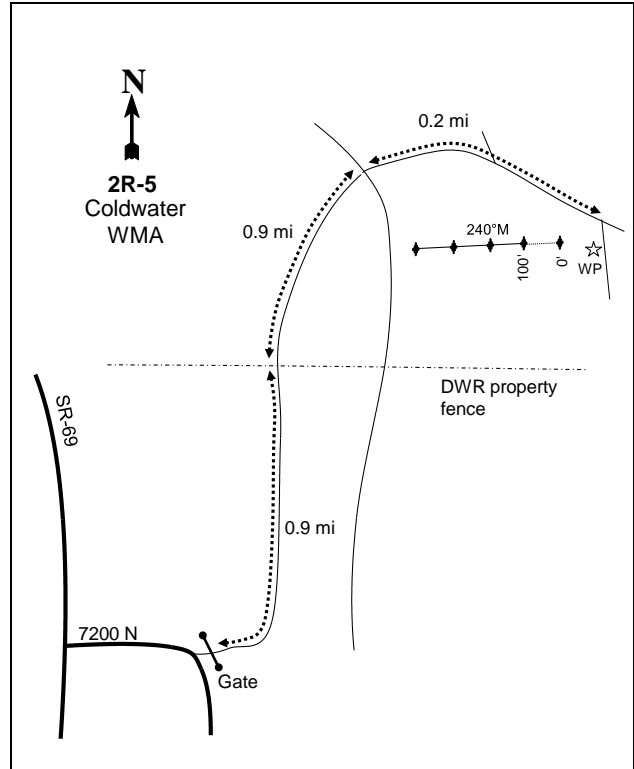
From the junction of 7200 North and SR-69 in Honeyville, proceed east and north for 0.55 miles to a gate. Proceed 0.9 miles to the north to a fence. Continue another 0.9 miles and as the road turn south keep left for 0.2 miles to a fork, keep right for approximately 300 feet to a witness post. Walk 11 paces at 210 degrees magnetic to the 0' stake. The baseline runs 240 degrees magnetic.

Map Name: Honeyville



Township: 11N Range: 2W Section: 34

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 412276 E 4612700 N

COLDWATER WMA - TREND STUDY NO. 2R-5

Site Information

Site Description: This study is located northeast of Honeyville, near the mouth of Coldwater Canyon. The vegetation is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community. The area is administered by the Utah Division of Wildlife Resources (UDWR) as part of the Coldwater Wildlife Management Area (WMA). The spring near the study has been developed into a trough, and the study is nearly surrounded by roads. Deer pellet groups have been sampled in low abundance since 2001. Cattle pats were sampled in low abundance in 2006 (Table - Pellet Group Data).

Browse: The key browse species is mountain big sagebrush, but the study is located just below the steeper slopes covered by Utah juniper (*Juniperus osteosperma*). A few junipers are encroaching into the sagebrush community. The mountain big sagebrush is a dense, mature population, and is spaced uniformly across the site. The sagebrush population is centered within the mature age class. Utilization of sagebrush has been light over the sample years. Decadence and poor vigor have been low throughout the study years. Recruitment of young Wyoming big sagebrush has been nominal, though at the outset of the study recruitment was good. Other shrubs include white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), broom snakeweed (*Gutierrezia sarothrae*), and smooth sumac (*Rhus trilobata*). Young smooth sumac plants were abundant in 1998; however, very little survived to maturity, and smooth sumac was sampled as having low density the following sample years (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is composed mainly of annual weeds and perennial increasers. The most abundant perennial grass species are bulbous bluegrass (*Poa bulbosa*) and Sandberg bluegrass (*P. secunda*). Bulbous bluegrass was not sampled in 1998, but has steadily increased in abundance over the course of the study. The weedy annual species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are the most common grasses, and provide the bulk herbaceous production. Cheatgrass has historically been the dominant grass; however, Japanese chess has taken the place cheatgrass as the most abundant annual grass species. The forb community is not characterized as noticeably diverse, but forbs occur regularly. White sweetclover (*Melilotus alba*) and yellow sweetclover (*Melilotus officinalis*) are the desirable forbs found on the site, and are encountered regularly, though white sweetclover was not sampled in 2011. The weedy species western ragweed (*Ambrosia psilostachya*) has dominated the site in the past, but has decreased in abundance and production over the course of the study (Table - Herbaceous Trends)

Soil: The soil is part of the Sterling component, which is found on alluvial fans. The parent material consists of alluvium, colluviums, and lacustrine deposits derived from limestone, dolomite sandstone, and quartzite (Soil Survey Staff 2011). The texture is a loam with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Soils are highly rocky on the surface, but not throughout the profile. Bare ground cover is low, with a high amount of vegetation and litter, and moderate amount of rock providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2006.

Trend Assessments

Browse:

- **1998 to 2006 - stable (0):** The density for mountain big sagebrush remained similar, decreasing from 2,820 plants/acre to 2,780 plants/acre. Decadence of the sagebrush population decreased slightly from 6% to 4%. The sagebrush population decreased in poor vigor from 8% to 1%, and cover increased from 12% to 30%. The increase in cover is due to an increase in the size of plants. Average crown diameter increased from 37in. to 41in. Recruitment of young sagebrush decreased from 11% to 0% of the population, while the decadence decreased slightly from 6% to 4%.
- **2006 to 2011 - stable (0):** The density for mountain big sagebrush increased 9% to 3,040 plants/acre, and cover increased to 32%. The average crown diameter increased to 47 inches. Decadence in the

sagebrush population increased to 9%, and poor vigor increased to 9%. Recruitment of young sagebrush increased to 1%.

Grass:

- **1998 to 2006 - up (+2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 59%. Sandberg bluegrass had a significant increase in nested frequency, and increased in cover from 1% to 5%. The weedy perennial species bulbous bluegrass had a significant increase in nested frequency, and increased in cover from 0% to 6%. The weedy annual species Japanese chess and cheatgrass had a significant decrease in nested frequency, and decreased in cover from 7% to 2% and 11% to 6%, respectively.
- **2006 to 2011 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 74%. Kentucky bluegrass and Sandberg bluegrass decreased significantly in nested frequency. Sandberg bluegrass decreased in cover to 1%. Bulbous bluegrass had a significant increase in nested frequency, and increased in cover to 10%. The annual species Japanese chess increased significantly in nested frequency, and increased in cover to 13%. Cheatgrass decreased significantly in nested frequency, and decreased in cover to less than 1%.

Forb:

- **1998 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The weedy species western ragweed (*Ambrosia psilostachya*) decreased significantly in nested frequency, and decreased in cover from 8% to 1%. Spreading dogbane (*Apocynum androsaemifolium*) and death camas (*Zigadenus paniculatus*) had a significant increase in nested frequency, and increased in cover from 0% to 3% and 0% to 1%, respectively. The annual species prickly lettuce (*Lactuca serriola*) decreased significantly in nested frequency.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 27%. Yellow sweetclover had a significant increase in nested frequency, and increased in cover from 1% to 3%. The weedy species spreading dogbane increased significantly in nested frequency, and increased in cover to 9%. The annual species prickly lettuce increased significantly in nested frequency, but cover was minimal.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

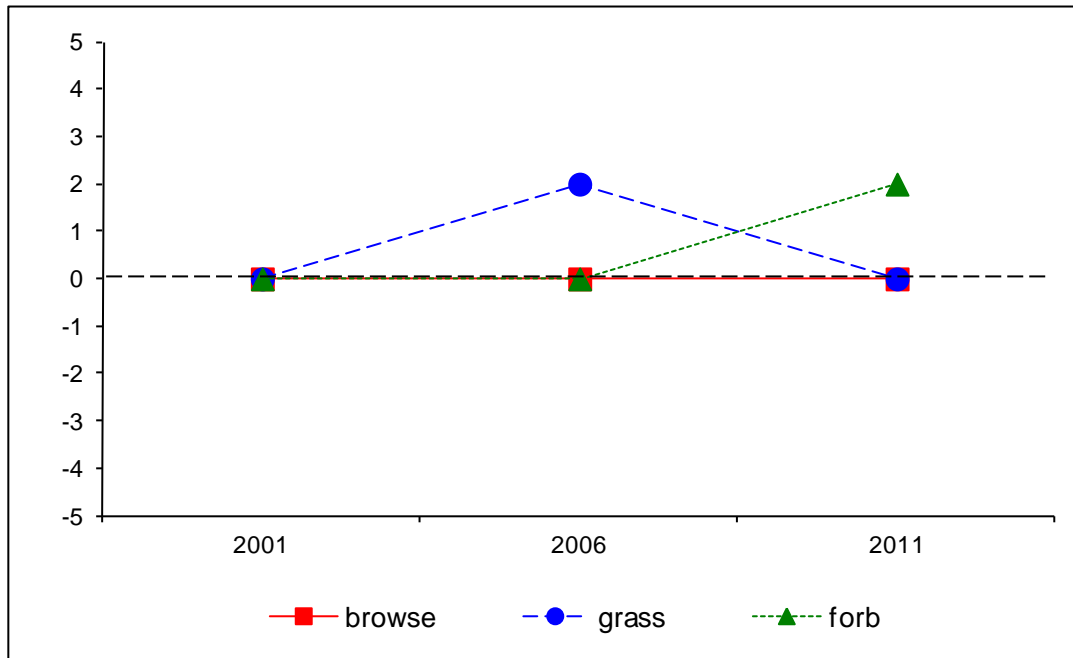
Management unit 2R, study no: 5

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
98	23.0	13.0	3.4	5.5	-13.6	10.0	0.0	41.2	Poor
06	30.0	11.2	0.0	16.8	-6.0	10.0	-2.0	60.1	Fair
11	30.0	10.9	0.5	1.7	-10.0	10.0	0.0	43.1	Poor

Trend Summary

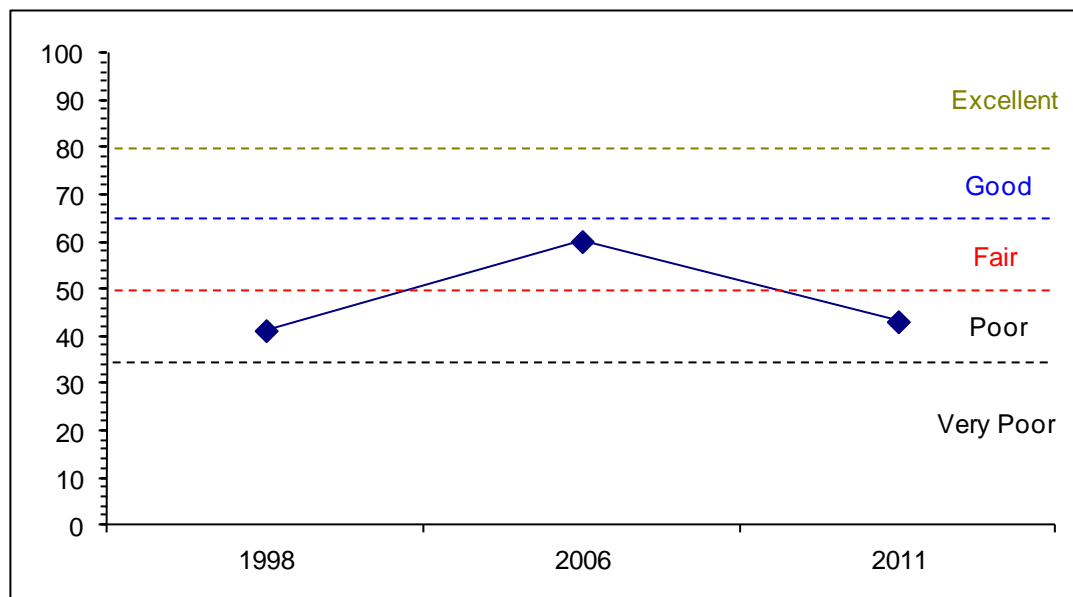
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2R Study no: 5



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 2R, Study no: 5



HERBACEOUS TRENDS--
Management unit 02R, Study no: 5

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'06	'11	'98	'06	'11
G	<i>Bromus brizaeformis</i> (a)	20	13	25	.45	.11	.14
G	<i>Bromus japonicus</i> (a)	_b 320	_a 128	_b 310	6.78	1.61	12.81
G	<i>Bromus tectorum</i> (a)	_c 415	_b 216	_a 43	10.87	6.23	.39
G	<i>Poa bulbosa</i>	_a -	_b 177	_c 288	-	6.16	9.46
G	<i>Poa fendleriana</i>	3	3	4	.06	.03	.15
G	<i>Poa pratensis</i>	_b 80	_b 80	_a 4	1.67	2.69	.00
G	<i>Poa secunda</i>	_a 48	_b 120	_a 45	1.00	5.05	.70
G	<i>Sporobolus cryptandrus</i>	-	5	1	-	.63	.00
Total for Annual Grasses		755	357	378	18.12	7.95	13.35
Total for Perennial Grasses		131	385	342	2.73	14.58	10.33
Total for Grasses		886	742	720	20.86	22.53	23.69
F	<i>Allium</i> sp.	-	2	-	-	.00	-
F	<i>Alyssum alyssoides</i> (a)	_a 63	_a 83	_b 234	.26	.21	6.07
F	<i>Ambrosia psilostachya</i>	_b 178	_a 37	_a 33	8.10	1.23	.30
F	<i>Apocynum androsaemifolium pumilum</i>	_a -	_b 76	_c 124	-	3.07	8.92
F	<i>Artemisia ludoviciana</i>	8	10	6	.53	.93	.41
F	<i>Asclepias asperula</i>	4	11	6	.18	.59	.71
F	<i>Astragalus</i> sp.	3	-	-	.03	-	-
F	<i>Calochortus nuttallii</i>	-	-	5	-	.00	.01
F	<i>Carduus nutans</i> (a)	4	-	-	.00	-	-
F	<i>Cirsium undulatum</i>	1	2	-	.00	.15	-
F	<i>Collinsia parviflora</i> (a)	-	2	2	-	.00	.00
F	<i>Collomia linearis</i> (a)	3	-	-	.00	-	-
F	<i>Cryptantha</i> sp.	-	-	3	-	-	.00
F	<i>Cymopterus</i> sp.	-	2	-	-	.00	-
F	<i>Draba</i> sp. (a)	-	3	7	-	.00	.01
F	<i>Epilobium brachycarpum</i> (a)	_b 79	_b 90	_a 8	.44	.22	.01
F	<i>Erodium cicutarium</i> (a)	_a -	_b 26	_b 31	-	.32	.11
F	<i>Galium aparine</i> (a)	_a -	_a -	_b 14	-	-	.15
F	<i>Helianthus annuus</i> (a)	_a 22	_a 9	_b 69	.26	.16	.41
F	<i>Holosteum umbellatum</i> (a)	7	5	13	.15	.01	.44
F	<i>Isatis tinctoria</i>	-	-	-	-	.00	-
F	<i>Lactuca serriola</i> (a)	_b 15	_a -	_b 10	.09	-	.03
F	<i>Melilotus alba</i>	_b 17	_b 8	_a -	1.47	1.25	-
F	<i>Melilotus officinalis</i>	_a 12	_a 34	_b 88	.90	.87	2.70
F	<i>Microsteris gracilis</i> (a)	-	9	5	-	.01	.01
F	<i>Penstemon</i> sp.	6	-	-	.03	-	-
F	<i>Phlox longifolia</i>	-	4	1	-	.00	.03
F	<i>Tragopogon dubius</i> (a)	_{ab} 9	_a 3	_b 17	.09	.00	.26
F	<i>Veronica biloba</i> (a)	-	-	2	-	-	.00
F	<i>Viola</i> sp.	-	4	15	-	.03	.08
F	<i>Zigadenus paniculatus</i>	_a 7	_b 40	_a 11	.03	.73	.15

Type	Species	Nested Frequency			Average Cover %		
		'98	'06	'11	'98	'06	'11
	Total for Annual Forbs	202	230	412	1.33	0.95	7.53
	Total for Perennial Forbs	236	230	292	11.30	8.89	13.33
	Total for Forbs	438	460	704	12.63	9.85	20.87

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	'11	'98	'06	'11
B	Artemisia tridentata vaseyana	70	67	74	11.63	29.52	32.05
B	Chrysothamnus nauseosus albicaulis	15	15	14	5.74	3.78	1.72
B	Gutierrezia sarothrae	35	12	13	4.34	.39	.07
B	Rhus trilobata	15	1	1	1.25	.30	.00
	Total for Browse	135	95	102	22.97	34.00	33.85

CANOPY COVER, LINE INTERCEPT--

Management unit 02R, Study no: 5

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	32.31	38.11
Chrysothamnus nauseosus albicaulis	6.46	2.58
Gutierrezia sarothrae	.13	.56
Rhus trilobata	.43	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02R, Study no: 5

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	-	2.1	2.0

BASIC COVER--

Management unit 02R, Study no: 5

Cover Type	Average Cover %		
	'98	'06	'11
Vegetation	53.35	65.52	63.10
Rock	11.89	8.32	10.47
Pavement	6.50	3.90	7.19
Litter	42.60	43.31	49.00
Cryptogams	.00	0	.03
Bare Ground	8.63	3.10	6.32

SOIL ANALYSIS DATA --

Management unit 02R, Study no: 5, Study Name: Cold Water WMA

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
7.7	7.1	38.7	36.7	24.6	6.7	11.5	150.4	0.9

PELLET GROUP DATA--

Management unit 02R, Study no: 5

Type	Quadrat Frequency		Days use per acre (ha)	
	'06	'11	'06	'11
Rabbit	17	11	-	-
Deer	6	6	13 (31)	13 (31)
Cattle	-	-	1 (2)	-

BROWSE CHARACTERISTICS--

Management unit 02R, Study no: 5

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Artemisia tridentata vaseyana</i>									
98	2820	11	84	6	100	9	0	8	30/37
06	2780	0	96	4	260	6	0	1	33/41
11	3040	1	91	9	1720	1	0	9	32/47
<i>Chrysothamnus nauseosus albicaulis</i>									
98	400	0	90	10	-	0	0	0	45/68
06	420	0	19	81	-	0	0	81	36/58
11	340	0	0	100	-	0	0	94	32/39
<i>Gutierrezia sarothrae</i>									
98	1960	2	98	0	-	0	0	0	18/22
06	320	0	63	38	-	0	0	31	12/12
11	480	17	83	0	-	0	0	4	16/15
<i>Rhus glabra cismontana</i>									
98	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	20/20
<i>Rhus trilobata</i>									
98	3340	100	0	-	40	0	0	0	-/-
06	20	0	100	-	-	0	0	0	47/87
11	20	100	0	-	-	0	0	0	47/74
<i>Symphoricarpos oreophilus</i>									
98	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	27/49

CURTIS RIDGE - TREND STUDY NO. 2R-15-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA446UT](#)

Land Ownership: DWR

Elevation: 6,720 ft (2,048 m)

Aspect: Southeast

Slope: 5%

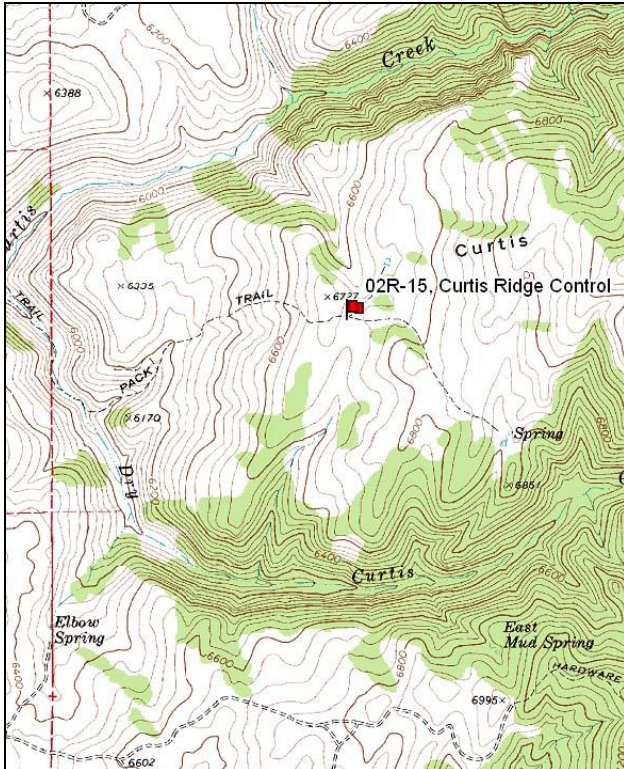
Transect bearing: 140° magnetic

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

Directions:

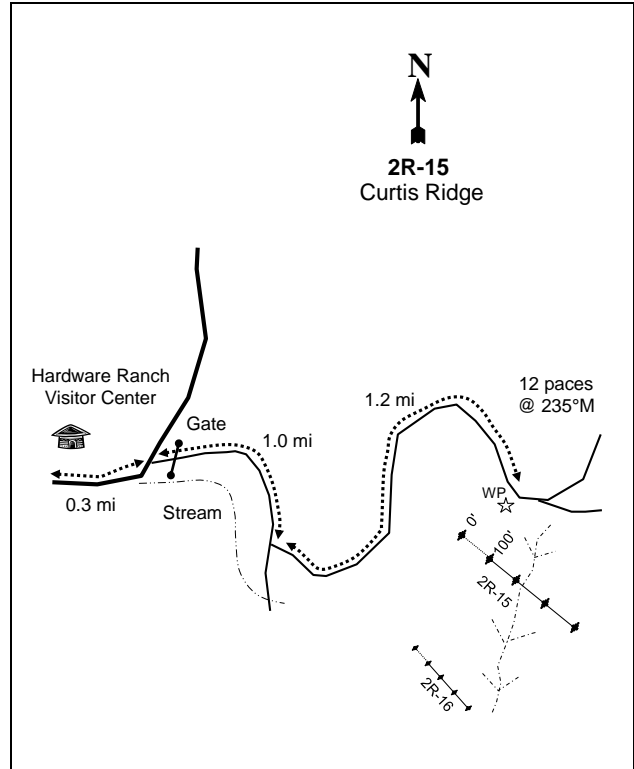
From the Hardware Ranch Visitors' Center, drive 0.3 miles to a fork in the road and a gate. Take a right through a gate (this road follows a stream a short distance). Proceed 1.0 miles to a fork. Take a left and drive 1.2 miles to a witness post on the right. From the witness post, walk 12 paces at 235 degrees magnetic to the 0-foot stake with browse tag #144. Transect baseline is at a bearing of 140 degrees magnetic.

Map Name: Hardware Ranch



Township: 10N Range: 4E Section: Unsurveyed

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 456274 E 4605931 N

CURTIS RIDGE - TREND STUDY NO. 2R-15

Site Information

Site Description: This study was established as a control to an intensive grazing project conducted on Hardware Ranch to improve browse composition. Hardware Ranch is administered by the Utah Division of Wildlife Resources (UDWR). The study is located on Curtis Ridge two miles east of the Hardware Ranch visitor's center. The vegetation is comprised of a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and low sagebrush (*Artemisia arbuscula*) community, with several belts also sampling a dry meadow. The study was established prior to the intensive grazing treatment that was scheduled to take place later in the summer of 2006, and an electric fence was built around the study area before the grazing treatment. Deer, elk, and cattle sign were sampled in low abundance in 2006 and 2011 (Table - Pellet Group Data).

Browse: The preferred browse species found on the site are low sagebrush, mountain big sagebrush, and antelope bitterbrush (*Purshia tridentata*). The low sagebrush population is dense, and is centered within the mature demographic. Low sagebrush decadence and poor vigor are low. Utilization of low sagebrush has been mostly light over the sample years. The recruitment of young low sagebrush has been good since the outset of the study. The mountain big sagebrush population is moderately dense, and is centered within the mature demographic. Decadence of mountain big sagebrush has been moderately high, but poor vigor has been low over the sample years. The mountain big sagebrush has had light to moderate use over the sample years. The recruitment of young mountain big sagebrush has been fairly good. Saskatoon serviceberry (*Amelanchier alnifolia*) and antelope bitterbrush were also sampled in low densities. Utilization of bitterbrush has been moderate to heavy over the sample years (Table - Browse Characteristics). Rocky Mountain juniper (*Juniperus scopulorum*), parsnipflower buckwheat (*Eriogonum heracleoides*), Woods rose (*Rosa woodsii*), mountain snowberry (*Symphoricarpos oreophilus*) are also found on the site (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is diverse. The perennial grass species Letterman needlegrass (*Stipa lettermani*) was the dominant grass in 2006 and 2011. Other common perennial grasses include alpine fescue (*Festuca ovina*), prairie junegrass (*Koeleria cristata*), bulbous bluegrass (*Poa bulbosa*), and Sandberg bluegrass (*P. secunda*), slender wheatgrass (*Agropyron trachycaulum*), and thickspike wheatgrass (*A. dasystachyum*). Common perennial forb species include aster (*Aster* sp.), western yarrow (*Achillea millefolium*), pale agoseris (*Agoseris glauca*), lambstongue groundsel (*Senecio integerrimus*), and Douglas knotweed (*Polygonum douglasii*). The annual species cluster tarweed (*Madia glomerata*) was the most common of the annual species (Table - Herbaceous Trends).

Soil: The study is part of the Curtis Creek-Goring association, and is likely part of the Goring component. These soils occur on seales. The parent material consists of colluviums and residuum derived from sandstone, quartzite, and small amounts of limestone (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). Some bare ground is associated with game and livestock trails, and is found in the interspaces of the Mountain big sagebrush population. Generally, bare ground is modest to near absent within the more grassy areas. Protective ground cover is provided by a fair amount of vegetation and litter (Table - Basic Cover). The soil erosion condition has been classified as stable since 2006.

Trend Assessments

Browse:

- **2006 to 2011 - stable (0):** The density for low sagebrush remained similar, decreasing from 9,080 plants/acre to 8,840 plants/acre. Decadence within the low sagebrush population had a minor increase from 6% to 8%. The low sagebrush population maintained poor vigor at 5%. Recruitment of low sagebrush to the population decreased slightly from 16% to 15%. The density for mountain big sagebrush decreased 37% from 1,640 plants/acre to 1,040 plants/acre, but canopy cover remained

similar. Decadence within the mountain big sagebrush population increased from 22% to 25%. Poor vigor decreased from 7% to 4% of the population.

Grass:

- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 11%, though cover decreased from 14% to 10%. Letterman needlegrass increased little in nested frequency, but decreased in cover from 6% to 5%. Thickspike wheatgrass, slender wheatgrass, and carex (*Carex sp.*) increased significantly in nested frequency. The weedy species bulbous bluegrass also increased significantly in nested frequency, but remained a minor component. Alpine fescue and prairie junegrass decreased significantly in nested frequency, and both species decreased in cover from 2% to 1%.

Forb:

- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The perennial species western yarrow and aster contributed to the majority of forb cover. Western yarrow maintained cover near 7%, while the aster species decreased in cover from 10% to 7%. The perennial species Douglas chaenactis (*Chaenactis douglasii*) increased significantly in nested frequency. Pale agoseris, tapertip onion (*Allium acuminatum*), and sulfur eriogonum (*Eriogonum umbellatum*) decreased significantly in nested frequency. All had covers that contributed modestly. The annual species annual stickseed (*Lappula occidentalis*), yellow owllover (*Orthocarpus luteus*), and Douglas knotweed increased significantly in nested frequency.

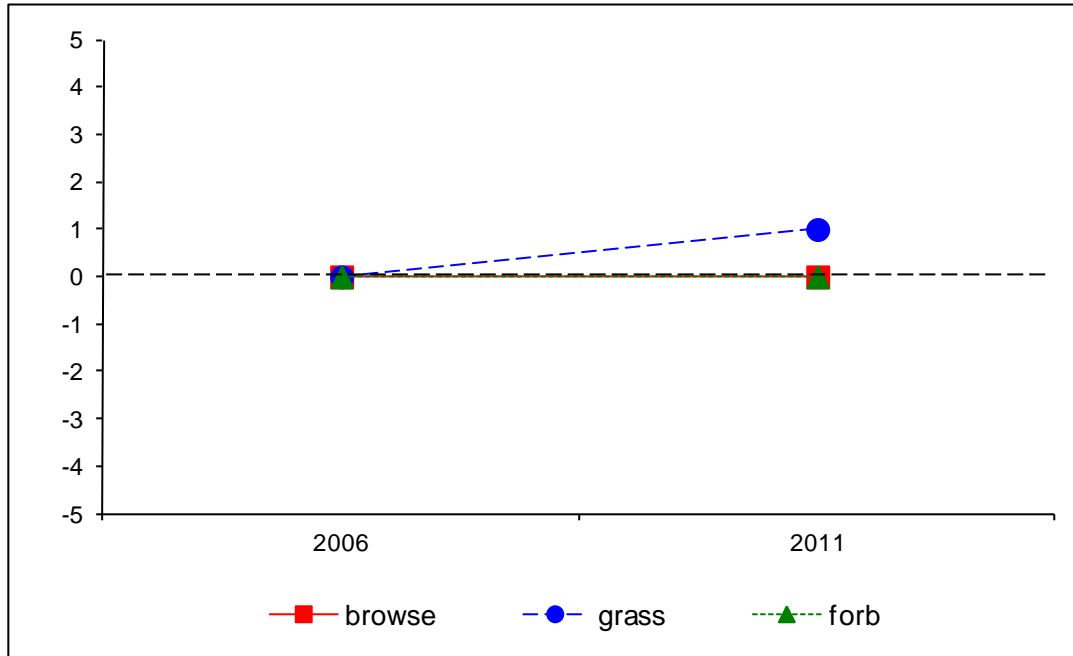
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2R, study no: 15

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
06	30.0	11.1	5.8	27.2	0.0	10.0	0.0	84.0	Excellent
11	29.2	11.3	6.4	20.0	0.0	10.0	0.0	76.9	Good

Trend Summary

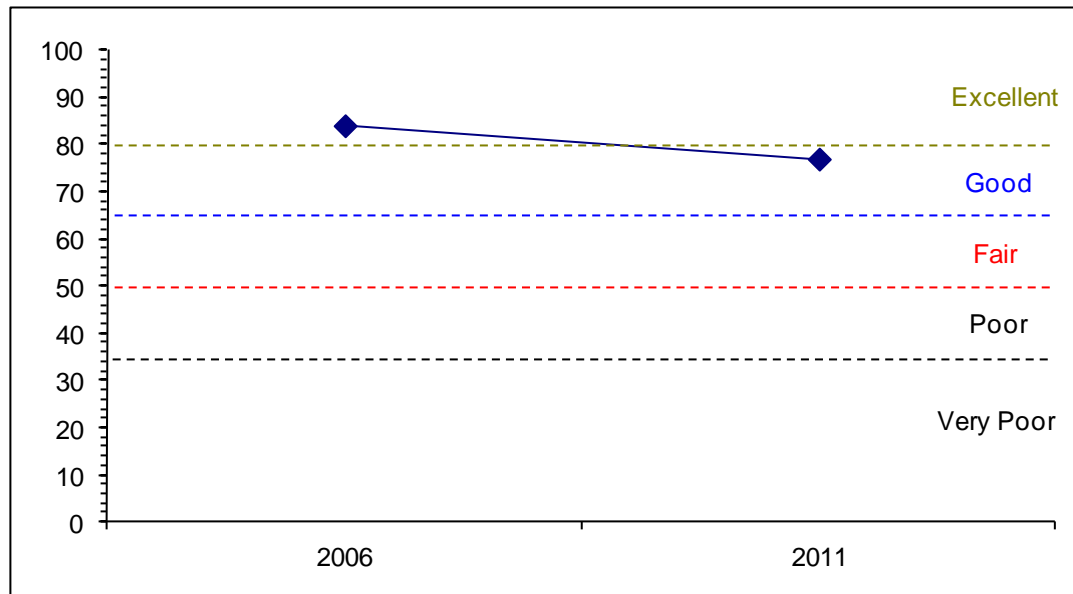
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2R Study no: 15



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 2R, Study no: 15



HERBACEOUS TRENDS--

Management unit 02R, Study no: 15

Type	Species	Nested Frequency		Average Cover %	
		'06	'11	'06	'11
G	<i>Agropyron dasystachyum</i>	a18	b46	.11	.40
G	<i>Agropyron spicatum</i>	5	4	.00	.03
G	<i>Agropyron trachycaulum</i>	a15	b60	.77	.58
G	<i>Bromus tectorum</i> (a)	-	2	-	.01
G	<i>Carex</i> sp.	a17	b27	.27	.38
G	<i>Festuca ovina</i>	b54	a28	2.05	.93
G	<i>Juncus</i> sp.	-	2	-	.00
G	<i>Koeleria cristata</i>	b101	a56	1.57	.65
G	<i>Melica bulbosa</i>	34	50	.68	.45
G	<i>Poa bulbosa</i>	a43	b103	1.48	3.25
G	<i>Poa fendleriana</i>	12	1	.21	.00
G	<i>Poa pratensis</i>	26	22	.44	.27
G	<i>Poa secunda</i>	59	59	1.12	.82
G	<i>Sitanion hystrix</i>	20	43	.31	.37
G	<i>Stipa lettermani</i>	169	193	6.00	5.07
Total for Annual Grasses		0	2	0	0.00
Total for Perennial Grasses		573	694	15.06	13.24
Total for Grasses		573	696	15.06	13.25
F	<i>Achillea millefolium</i>	250	268	7.04	7.41
F	<i>Agoseris glauca</i>	b129	a65	1.35	.32
F	<i>Allium acuminatum</i>	b76	a25	.39	.06
F	<i>Antennaria rosea</i>	-	1	-	.00
F	<i>Aster</i> sp.	230	236	9.47	7.26
F	<i>Calochortus nuttallii</i>	1	-	.00	-
F	<i>Chaenactis douglasii</i>	a-	b16	-	.15
F	<i>Collinsia parviflora</i> (a)	33	33	.16	.14
F	<i>Collomia linearis</i> (a)	13	13	.05	.02
F	<i>Comandra pallida</i>	2	8	.03	.01
F	<i>Crepis acuminata</i>	1	5	.03	.01
F	<i>Descurainia pinnata</i> (a)	-	5	-	.01
F	<i>Draba</i> sp. (a)	-	2	-	.00
F	<i>Epilobium brachycarpum</i> (a)	41	25	.18	.10
F	<i>Eriogonum umbellatum</i>	b8	a-	.36	-
F	<i>Geranium richardsonii</i>	15	7	.79	.48
F	<i>Holosteum umbellatum</i> (a)	6	3	.01	.00
F	<i>Lappula occidentalis</i> (a)	a2	b35	.03	.16
F	<i>Lomatium</i> sp.	1	-	.03	-
F	<i>Lupinus argenteus</i>	2	1	.38	.15
F	<i>Madia glomerata</i> (a)	37	52	.11	1.22
F	<i>Mertensia</i> sp.	1	-	.03	-
F	<i>Microsteris gracilis</i> (a)	21	14	.03	.02
F	<i>Navarretia intertexta</i> (a)	-	5	-	.00
F	<i>Orthocarpus luteus</i> (a)	a31	b111	.14	1.95

Type	Species	Nested Frequency		Average Cover %	
		'06	'11	'06	'11
F	<i>Orthocarpus purpureo-albus</i> (a)	1	-	.00	-
F	<i>Polygonum douglasii</i> (a)	_a 131	_b 246	1.27	2.44
F	<i>Potentilla gracilis</i>	2	-	.03	.03
F	<i>Senecio integerrimus</i>	85	95	1.03	.67
F	<i>Stellaria longipes</i>	5	13	.30	.56
F	<i>Taraxacum officinale</i>	23	32	.26	.16
F	<i>Tragopogon dubius</i> (a)	2	-	.03	-
F	<i>Veronica biloba</i> (a)	-	11	-	.18
F	<i>Viola</i> sp.	5	1	.06	.00
F	<i>Zigadenus paniculatus</i>	7	8	.06	.01
Total for Annual Forbs		318	555	2.05	6.29
Total for Perennial Forbs		843	781	21.70	17.33
Total for Forbs		1161	1336	23.76	23.62

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

BROWSE TRENDS--

Management unit 02R, Study no: 15

Type	Species	Strip Frequency		Average Cover %	
		'06	'11	'06	'11
B	<i>Amelanchier alnifolia</i>	1	1		
B	<i>Artemisia arbuscula</i>	68	67	16.84	16.07
B	<i>Artemisia tridentata vaseyana</i>	34	28	8.76	5.38
B	<i>Eriogonum heracleoides</i>	0	13	-	1.02
B	<i>Juniperus scopulorum</i>	1	1	1.16	.68
B	<i>Purshia tridentata</i>	13	12	3.49	1.49
B	<i>Rosa woodsii</i>	2	2	.15	.15
B	<i>Symphoricarpos oreophilus</i>	6	8	.30	.18
Total for Browse		125	132	30.70	24.98

CANOPY COVER, LINE INTERCEPT--

Management unit 02R, Study no: 15

Species	Percent Cover	
	'06	'11
<i>Amelanchier alnifolia</i>	.38	-
<i>Artemisia arbuscula</i>	22.10	21.00
<i>Artemisia tridentata vaseyana</i>	9.81	8.35
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.01	-
<i>Eriogonum heracleoides</i>	-	.26
<i>Juniperus scopulorum</i>	3.68	3.20
<i>Purshia tridentata</i>	3.08	2.36
<i>Rosa woodsii</i>	.28	.08
<i>Symphoricarpos oreophilus</i>	1.21	.71

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02R, Study no: 15

Species	Average leader growth (in)	
	'06	'11
Artemisia arbuscula	1.3	0.9
Artemisia tridentata vaseyana	1.7	2.3
Purshia tridentata	1.8	4.3

BASIC COVER--

Management unit 02R, Study no: 15

Cover Type	Average Cover %	
	'06	'11
Vegetation	61.28	54.91
Rock	1.12	.84
Pavement	.60	.27
Litter	37.91	43.56
Cryptogams	.52	.63
Bare Ground	20.86	12.98

PELLET GROUP DATA--

Management unit 02R, Study no: 15

Type	Quadrat Frequency		Days use per acre (ha)	
	'06	'11	'06	'11
Rabbit	-	1	-	-
Elk	1	11	8	7 (17)
Deer	5	5	3	1 (3)
Cattle	6	1	17	4 (9)

BROWSE CHARACTERISTICS--

Management unit 02R, Study no: 15

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Amelanchier alnifolia										
06	40	50	50	-	-	0	0	0	33/35	
11	20	0	100	-	-	0	0	0	38/37	
Artemisia arbuscula										
06	9080	16	78	6	960	8	0	5	12/20	
11	8840	15	77	8	1180	25	2	5	10/23	
Artemisia tridentata vaseyana										
06	1640	7	71	22	180	7	0	7	30/44	
11	1040	10	65	25	380	31	6	4	26/39	
Eriogonum heracleoides										
06	0	0	0	-	-	0	0	0	7/10	
11	1320	6	94	-	-	0	0	0	7/8	

		Age class distribution			Utilization				
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Juniperus scopulorum</i>									
06	20	100	0	-	20	0	0	0	-/-
11	20	100	0	-	-	0	0	0	-/-
<i>Purshia tridentata</i>									
06	380	0	74	26	120	16	42	11	24/52
11	300	0	87	13	-	53	7	0	26/49
<i>Rosa woodsii</i>									
06	40	50	50	-	-	0	0	0	27/19
11	60	0	100	-	-	0	0	0	20/10
<i>Symphoricarpos oreophilus</i>									
06	280	7	86	7	100	0	0	7	19/30
11	220	9	91	0	-	0	0	0	21/30

SUMMARY WILDLIFE MANAGEMENT UNIT 2 - CACHE

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Twenty eight interagency range trend studies were sampled in Unit 2 during the summer of 2011.

Eighteen of the studies [High Creek (2-1), Mouth of Blacksmith Fork (2-2), Beirdneau (2-9), Second Dam Blacksmith Fork (2-12), Hardware Plateau (2-13), Garden City Canyon (2-16), Meadowville (2-17), Right Fork Logan Canyon (2-19), Swan Creek (2-21), Flat Bottom Canyon (2-23), Mouth of Two Jump Canyon (2-25), Laketown Canyon (2-27), Twin Creek (2-38), Pole Hollow Spring (2-39), Warrens Spring (2-40), Hardware Gravel Pit (2-42), Coldwater WMA (2R-5), and Curtis Ridge (2R-15)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush, basin big sagebrush, or other mountain brush communities. Though categorized as deer winter range in this summary, the Twin Creek and Pole Hollow Spring studies are considered to be crucial deer summer range and fawning habitat. The Mouth of Two Jump Canyon and Coldwater WMA studies are considered to be elk year-long range; and the Beirdneau, Second Dam Blacksmith Fork, Hardware Plateau, Garden City Canyon, Meadowville, Right Fork Logan Canyon, Swan Creek, Flat Bottom Canyon, Laketown Canyon, Twin Creek, Pole Hollow Spring, Warren Spring, Hardware Gravel Pit, and Curtis Ridge studies are considered elk winter range.

The remaining ten studies [North Eden (2-28), Woodruff Creek (2-29), State Line (2-30), South Crawford Mountains (2-31), Wood Pass (2-32), Braizer Canyon (2-33), Otter Creek (2-34), Higgins Hollow (2-35), Woodruff Co-op (2-36), and Woodruff Longhill (2-43)] are classified as low potential deer winter range sites, and sample Wyoming big sagebrush or black sagebrush communities. The Woodruff Creek, Otter Creek, Higgins Hollow, and Woodruff Long Hill studies are also considered to be elk winter range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains (Division 5). The Northern Mountains had a historic annual mean precipitation of 19.16 inches from 1895 to 2011. The mean annual PDSI of the Northern Mountains displays a cycle of several wet years followed by several drought years, over the course of study years in the unit. Over the course of the study, wetter than normal years in the Northern Mountains included 1982-1986, 1993, 1995-1999, 2005, and 2011. Drought years included 1987-1992, 2000-2003 and 2007 (Figure 1 and Figure 2) (Time Series Data 2012).

The 1961-1990 mean annual precipitation was 8-10 in. on the South Crawford Mountains and Woodruff Co-op studies; 10-12 in. on the State Line, Otter Creek, and Higgins Hollow studies; 12-14 in. on the Meadowville, Laketown Canyon, Wood Pass, and Brazier Canyon studies; 14-16 in. on the North Eden, Woodruff Creek, and Woodruff Longhill studies; 18-20 in. on the Hardware Plateau, Garden City Canyon, Warren Spring, and Hardware Gravel Pit studies; 20-24 in. on the High Creek, Mouth of Blacksmith Fork, Second Dam Blacksmith Fork, Right Fork Logan Canyon, Swan Creek, Flat Bottom Canyon, and Pole Hollow Spring

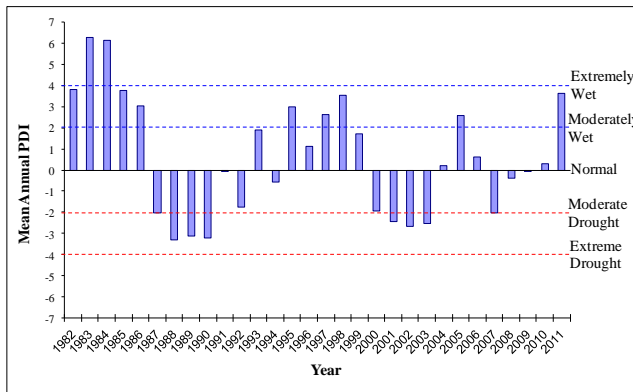


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

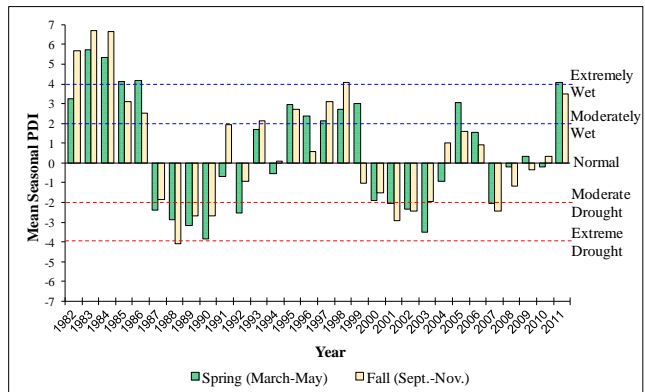


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

studies; 24-28 in. on the Beirdneau and Curtis Ridge studies; 28-32 in. on Mouth of Two Jump Canyon, Twin Creek, and Coldwater WMA studies (PRISM Climate Group 2011).

Mountain/Basin Big Sagebrush and Antelope Bitterbrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse trend for the unit has decreased over the course of the study. The decreases in trend occurred in the 1990, 2001, and 2006 sample years (Figure 9a). The dominant browse species on the majority of the mid-level potential studies is mountain big sagebrush, though basin big sagebrush was the dominant species on the Mouth of Blacksmith Fork study. The two big sagebrush species were averaged together in this summary. The addition of the Hardware Gravel Pit, Coldwater WMA, and Curtis Ridge studies after 1996 has influenced the means for the variables of big sagebrush in the unit. If these three studies are excluded, there is a definitive decline in big sagebrush on the mid-level potential studies in the unit. A wildfire removed most of the browse from the Mouth of Blacksmith Fork study sometime between 2006 and 2011, and was the primary driver of the decline in big sagebrush in 2011. The mean density big sagebrush of all the mid-level potential studies decreased significantly from 1996/1998 to 2001. Since 2001, mean density of big sagebrush has increased slightly each sample year, but has remained significantly similar (Figure 4a). Despite the changes in density, mean cover of big sagebrush increased significantly in 2006, and remained higher in 2011 (Figure 4b). The mean decadence of big sagebrush has been high since 1996/1998 despite a significant decrease in 2006 (Figure 4c). If studies established after 1996 are excluded from the sample the mean density of big sagebrush has shown a steady decrease since 1996 (Figure 5a), and mean cover has shown a steady decrease since 2001 (Figure 5b).

Antelope bitterbrush (*Purshia tridentata*) is the dominant browse species on the Beirdneau and Right Fork Logan Canyon studies, and is a common component on the High Creek, Second Dam Blacksmith Fork, Hardware Plateau, Garden City Canyon, Meadowville, Swan Creek, Twin Creek, Pole Hollow Spring, Warrens Spring, Hardware Gravel Pit, and Curtis Ridge studies. The mean antelope bitterbrush density and cover has remained fairly similar since 1996/1998 (Figure 4a and Figure 4b). Mean decadence of antelope bitterbrush was moderate from in 1996/1998 to 2006, but increased significantly in 2011 due to the inclusion of the new study Hardware Gravel Pit (Figure 4c). Low sagebrush is the dominant browse species on the Garden City Canyon and Curtis Ridge studies, but was not included in this summary. For more information on low sagebrush, refer to the discussion section of these two studies.

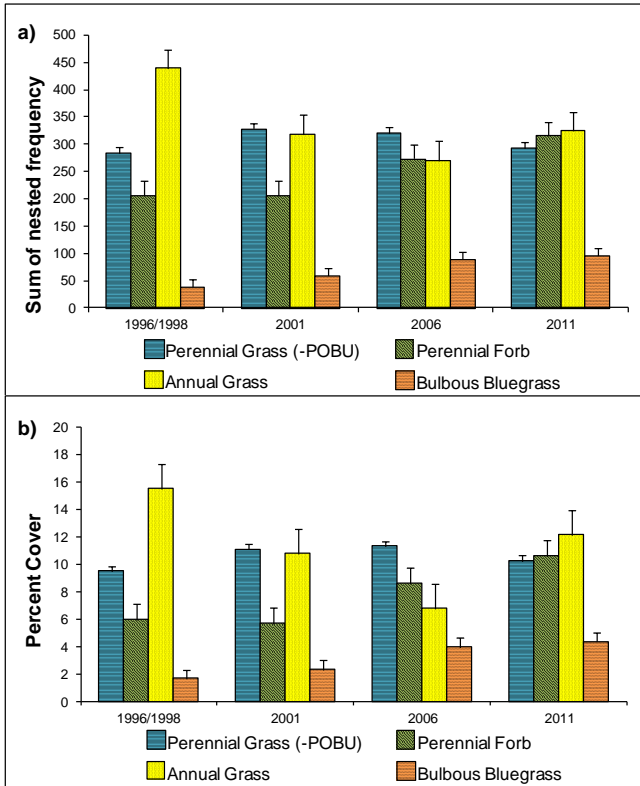


Figure 3. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass (*Poa bulbosa*) sum of nested frequency by year for WMU 2, Cache. b) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 2.

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit has increased over the course of the study years. The main increase was in 1990, with a slight increase in 2001. The median trend has remained fairly stable since 2001 (Figure 9a). Desirable perennial grass species are typically only moderately diverse and abundant on these studies. Annual grass species are prevalent and often dominate the herbaceous component. Cheatgrass (*Bromus tectorum*) is typically the most common annual grass species, but the weedy species jointed goatgrass (*Aegilops cylindrica*) and the weedy species winter rye (*Secale cereale*) are the dominant species on the Mouth of Blacksmith Fork study. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) is also common on many of the studies. The mean sum of nested frequency and cover of perennial grasses, excluding bulbous bluegrass, was significantly higher in 2001 and 2006 than in 1996/1998 and 2011. The mean sum of nested frequency and cover of annual grasses steadily decreased from 1996/1998 to 2006, but increased again in 2011. The mean nested frequency and cover of bulbous bluegrass has steadily increased since 1996/1998 (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend for the unit has decreased slightly over the course of the study. There was a slight decrease in trend in 1990 and 1996/1998, but the median trend of forbs has remained stable since 1996/1998 (Figure 9a). Perennial forbs have been more diverse and often more abundant than perennial grasses within the sampled communities. However, while some of the studies have a good composition of desirable forbs, many of the studies are dominated by weedy or low value forage species. The

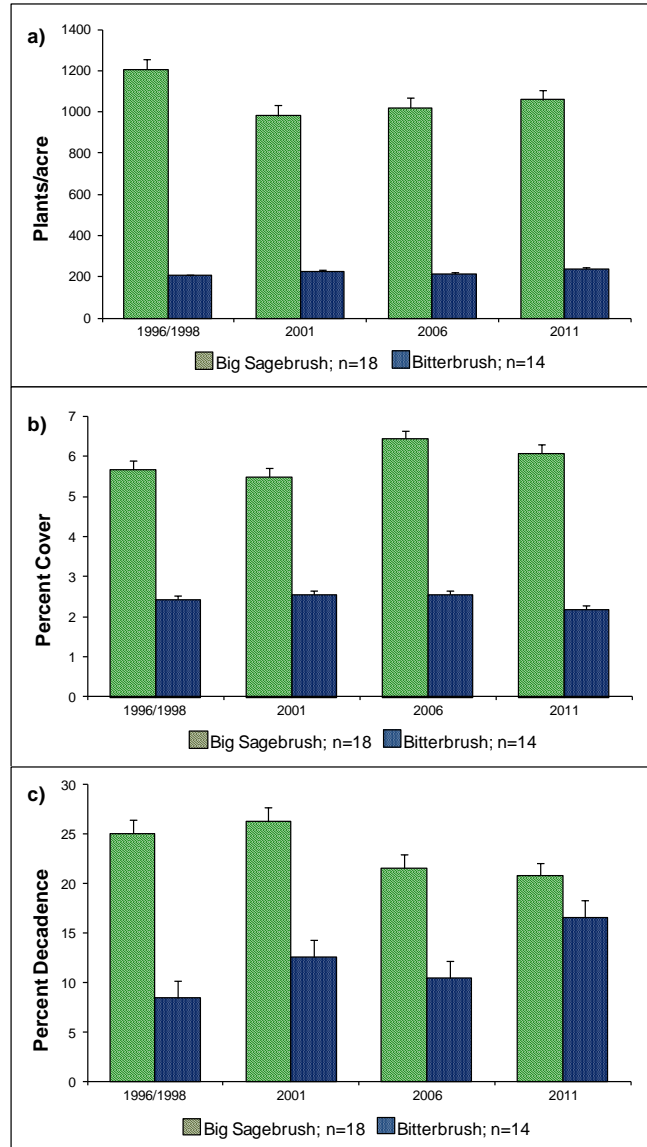


Figure 4. a) Mid-level potential sites mean density of big sagebrush (*Artemisia tridentata*) antelope bitterbrush (*Purshia tridentata*) by year for WMU 2, Cache. b) Mid-level potential sites mean cover of big sagebrush and antelope bitterbrush by year for WMU 2. c) Mid-level potential sites mean decadence of big sagebrush and antelope bitterbrush by year for WMU 2.

mean sum of nested frequency and cover of perennial forbs has steadily increased since 2001 (Figure 3a and Figure 3b).

Browse Utilization & Animal Presence: Big sagebrush plants on many of the mid-level potential studies displayed heavy use at the outset of the studies in 1984, but have displayed mostly light to moderate use throughout the subsequent study years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group transect data indicates that deer and elk both occupy these study areas. The mean abundance of sampled deer pellet groups has decreased from moderate abundance in 2001 to much lower abundance in 2011. Deer pellet groups were sampled in the highest abundance on the Hardware Plateau, Garden City Canyon, Meadowville, Swan Creek, Mouth of Two Jump Canyon, and Warren Spring studies, but deer use was much lower on many of these studies in 2011. The mean abundance of sampled elk pellet groups was light in 2001 and 2011, with more moderate use in 2006. The reduced use by both wildlife species in 2011 was most likely due to the severe winter of 2010-2011, which likely limited access to many of the sites. Elk pellet groups were sampled in the highest abundance on the Right Fork Logan Canyon and Swan Creek studies. Livestock use appears to be mostly light on the studies (Figure 10a).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has remained fairly stable since 1996, with rankings ranging from poor to very-poor-poor since 1996/1998. Attributes of preferred browse species have had poor scores, and annual grass scores have been moderately high since 1996/1998 (Table 1 and Figure 8).

Discussion: If studies established after 1996 are excluded, there has been a substantial decline in big sagebrush populations that gives some cause for concern in these mid-level potential communities. The High Creek and Pole Hollow Spring studies have driven the pattern of big sagebrush decline from 1996 to 2006 for mid-level potential studies on the unit. A wild fire on the Mouth of Blacksmith Fork study between 2006 and 2011 removed most of the browse from that study, and was the primary cause of decreases in big sagebrush in 2011. Other causes of the sagebrush decline are varied and multiple causes may have compounded effects on the mid-level potential studies in this unit.

Precipitation can have large impacts on the vegetation trends, and there have been several moderate drought periods since 1996 (Figure 1 and

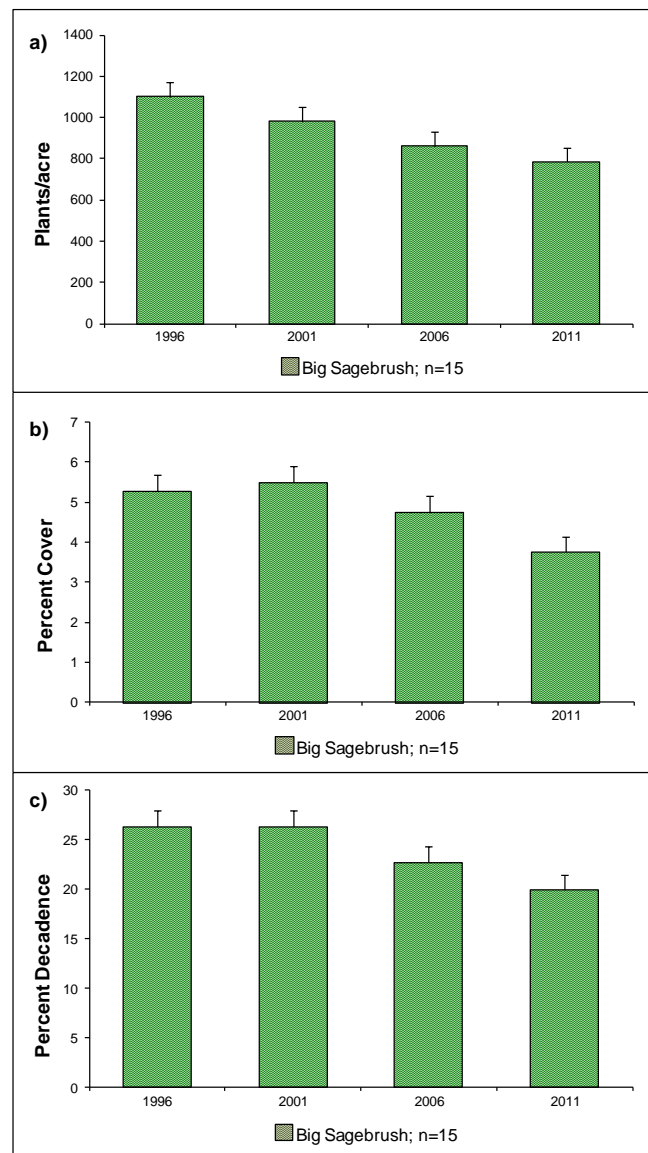


Figure 5. a) Mid-level potential sites mean density of big sagebrush (*Artemisia tridentata*), excluding studies established after 1996, by year for WMU 2, Cache. b) Mid-level potential sites mean cover of big sagebrush, excluding studies established after 1996, by year for WMU 2. c) Mid-level potential sites mean decadence of big sagebrush, excluding studies established after 1996, by year for WMU 2.

Figure 2). While lack of precipitation may have caused some stress on sagebrush plants, it does not appear to be the primary cause of the decline on the mid-level potential studies.

The abundance of weedy annual grass species, and the increase of the exotic, weedy, perennial grass bulbous bluegrass are the more likely causes of sagebrush decline. These weedy species can form dense mats of cover that compete with seedling and young sagebrush plants, which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species such as cheatgrass can also increase fuel loads and increase the chance of a catastrophic fire event. Annual grass species are present on all of the mid-level potential studies, but are not overly abundant on the Twin Creek, Pole Hollow Spring, Warrens Spring, and Curtis Ridge studies. Annual grasses have had a large increase on the Mouth of Blacksmith Fork canyon following the wildfire. Annual grasses have had decreases on the High Creek, Beirdneau, Garden City Canyon, Swan Creek, Mouth of Two Jump Canyon, Pole Hollow Spring, and Warrens Spring studies. However, decreases in annual grass species on many of the studies appears to correspond with increases in the weedy species bulbous bluegrass. Bulbous bluegrass is present on all of the mid-level potential studies except Laketown Canyon, and has shown marked increases on High Creek, Right Fork Logan Canyon, Swan Creek, Flat Bottom Canyon, Mouth of Two Jump Canyon, Twin Creek, Coldwater WMA, and Curtis Ridge studies since 1996. There was a large increase in bulbous bluegrass on the Mouth of Blacksmith Fork study from 1996 to 2006, but bulbous bluegrass decreased substantially on the site in 2011 following the wildfire.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96/98	12.0	5.9	3.1	18.5	-10.9	8.1	-0.7	36.0	Very Poor-Poor
01	11.3	5.1	1.8	18.9	-8.1	8.0	-0.6	36.3	Very Poor-Poor
06	13.2	6.6	1.8	20.7	-4.6	9.0	-0.9	45.8	Poor
11	12.5	5.2	1.8	18.1	-7.7	8.9	-0.8	38.1	Poor

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=18) by year for WMU 2, Cache. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

Wyoming Big Sagebrush and Black Sagebrush Communities (Low Potential)

Browse: The low potential site cumulative median browse trend for the unit has decreased over the course of the study. Trend decreased slightly in 1990 and again in 2006 (Figure 9b). Wyoming big sagebrush is common on all of the low potential studies, and is the dominant browse species on all of the studies except Wood Pass and Brazier Canyon, which are dominated by black sagebrush. The mean density and cover of Wyoming big sagebrush decreased significantly in 2006. There was an increase in both parameters in 2011, but most of this increase was due to the addition of the Woodruff Longhill study (Figure 7a and Figure 7b). Mean decadence of Wyoming big sagebrush has fluctuated somewhat, but has been high on the studies since 1996 (Figure 7c).

Black sagebrush is the dominant browse species on the Wood Pass and Brazier Canyon studies, with less dense populations also occurring on the North Eden and South Crawford Mountains' studies. Mean density of black sagebrush was similar from 1996 to 2006, but decreased significantly in 2011 (Figure 7a). Mean cover of black sagebrush was similar in 1996, 2006, and 2011, but was significantly higher in 2001 (Figure 7b). Mean decadence of black sagebrush was low in 1996, but has steadily increased since that time. There has been a significant increase in mean decadence from 2001 to 2011 (Figure 7c).

Herbaceous Understory: The low potential median cumulative grass trend for the unit remained relatively stable over the course of the study, but increased slightly in 2011(Figure 9b). Perennial grasses comprise the majority of the herbaceous understory on most of these studies. Grasses within these communities are

moderately diverse and abundant. Annual grass species are much less common within these low potential communities than the mid-level potential communities. Bulbous bluegrass is very rare on the sites and was not included in the summary for low potential sites. Mean sum of nested frequency of perennial grasses remained similar from 1996 to 2006, then increased significantly in 2011 (Figure 6a). Mean cover of perennial grasses was similar from 1996 to 2001, increased significantly in 2006, and remained similar in 2011 (Figure 6b).

The low potential median cumulative forb trend for the unit decreased slightly in 1990 and 1996, but increased slightly in 2001 and 2006. Trend has remained stable overall (Figure 9b). Perennial forbs are also moderately diverse, but are not as abundant as perennial grasses within the sampled communities. The mean sum of nested frequency and cover of perennial forbs was similar from 1996 to 2001, increased significantly in 2006, and remained similar in 2011 (Figure 6a and Figure 6b).

Browse Utilization & Animal Presence: Wyoming big sagebrush and black sagebrush plants on most of the low potential studies displayed moderate to heavy use at the outset of the study in 1984, but have displayed light to moderate use in subsequent sample years. Utilization of Wyoming big sagebrush was heavier on the State Line, South Crawford Mountains, and Woodruff Co-op studies in 2011, likely due to the severe winter of 2010-2011 restricting animals' access to higher elevation winter range. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of sagebrush is a

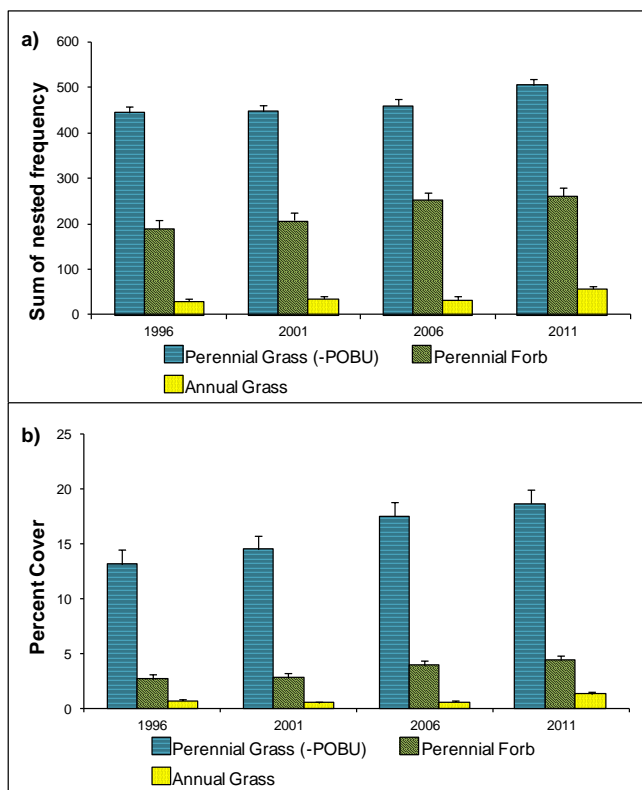


Figure 6. a) Low potential sites mean perennial grass, perennial forb, and annual grass sum of nested frequency by year for WMU 2, Cache. b) Low potential sites mean perennial grass, perennial forb, and annual grass cover by year for WMU 2.

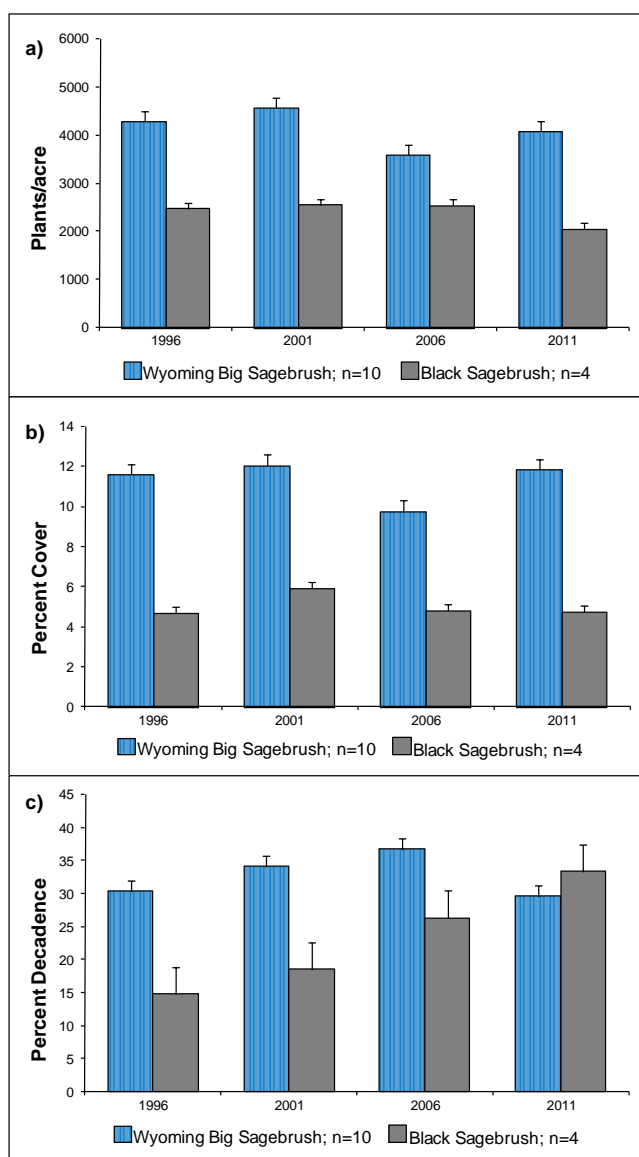


Figure 7. a) Low potential sites mean density of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and black sagebrush (*A. nova*) by year for WMU 2, Cache. b) Low potential sites mean cover of Wyoming big sagebrush and black sagebrush by year for WMU 2. c) Low potential sites mean decadence of Wyoming big sagebrush and black sagebrush by year for WMU 2.

primary concern for the low potential studies on this unit.

Pellet group transect data indicates that deer predominantly occupy these study areas. The mean abundance of sampled deer pellet groups has been high. The abundance of sampled deer pellet groups increased slightly in 2006, but decreased again in 2011. Deer pellet groups were sampled in the highest abundance on the North Eden, Woodruff Creek, South Crawford Mountains, Braizer Canyon, Otter Creek, Woodruff Co-op, and Woodruff Longhill studies. In 2011, there was a large increase in the abundance of deer pellet groups on the Stateline and Woodruff Co-op studies, but a large decrease in abundance on the North Eden and Woodruff Creek studies. These increases and decreases in presence are likely due to restricted movement of animals because of the severe winter of 2010-2011. Elk pellet groups have been sampled in low abundance on most studies, but have been sampled moderate abundance on the Wood Pass study. Cattle sign has been sampled in low abundance on most studies, but was high on the Woodruff Co-op study in 2001 (Figure 10b).

Deer Desirable Components Index (DCI): The low potential deer DCI has remained relatively stable since 1996 with a ranking of good. The DCI shows that the unit is characterized by studies with moderate browse cover and high perennial grass cover (Table 2 and Figure 8).

Discussion: The mean Wyoming big sagebrush density and cover decreased in 2006 within the low potential studies on the unit. The decrease in density was primarily driven by decreases on the Brazier Canyon, Otter Creek, and Higgins Hollow studies in 2006. The Otter Creek study was part of an aerator treatment that occurred in 2004, reducing browse on the study site. The decrease in Wyoming big sagebrush cover was primarily due to a decrease on the North Eden study, which has steadily decreased in Wyoming big sagebrush cover since 1996 despite a fairly stable density. Much of the decrease in cover on the North Eden study is due to a decrease in the average plant size, as well as an increase in decadence. Despite the decreases in Wyoming big sagebrush, it remains relatively abundant on the low potential studies within the unit.

Causes of sagebrush decline are varied and multiple causes may have compounded effects on the low potential studies in this unit. The moderate drought period from 2000 to 2004 (Figure 1 and Figure 2) has likely caused increased stress on plants, and negatively impacted these low potential studies. Annual grass species are not prevalent on most of the studies, but the weedy species cheatgrass has increased on the North Eden study since 1996. The weedy perennial species bulbous bluegrass is not common on any of the low potential studies in this unit. Perennial grass and forb species have increased on many of the studies as browse species decline, and may compete with browse establishment. This is especially the case for the seeded perennial species crested wheatgrass (*Agropyron cristatum*) which is prevalent on the Otter Creek and Woodruff Co-op studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	17.4	6.1	3.5	23.0	-0.4	5.3	0.0	55.0	Good
01	18.2	4.1	2.3	23.9	-0.3	5.5	-0.2	53.4	Good
06	15.3	3.5	2.7	24.7	-0.3	6.9	0.0	52.7	Good
11	18.1	4.9	5.7	25.6	-0.7	7.2	0.0	60.8	Good

Table 2. Low potential scale mean deer DCI scores and rankings (n=10) by year for WMU 2, Cache. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

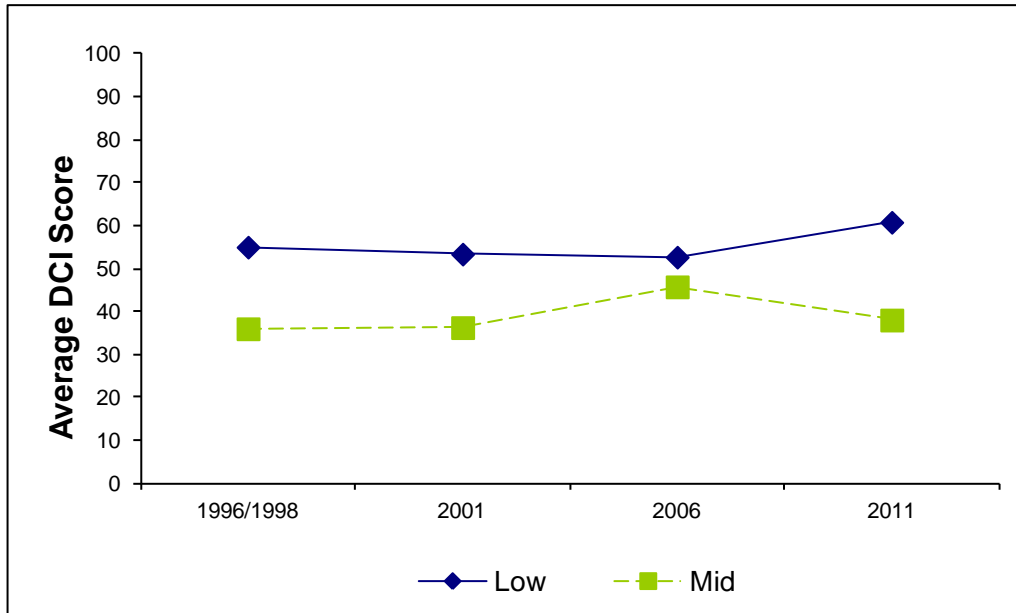


Figure 8. Mean low (n=10) and mid-level (n=18) potential scale deer DCI scores by year for WMU 2, Cache. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

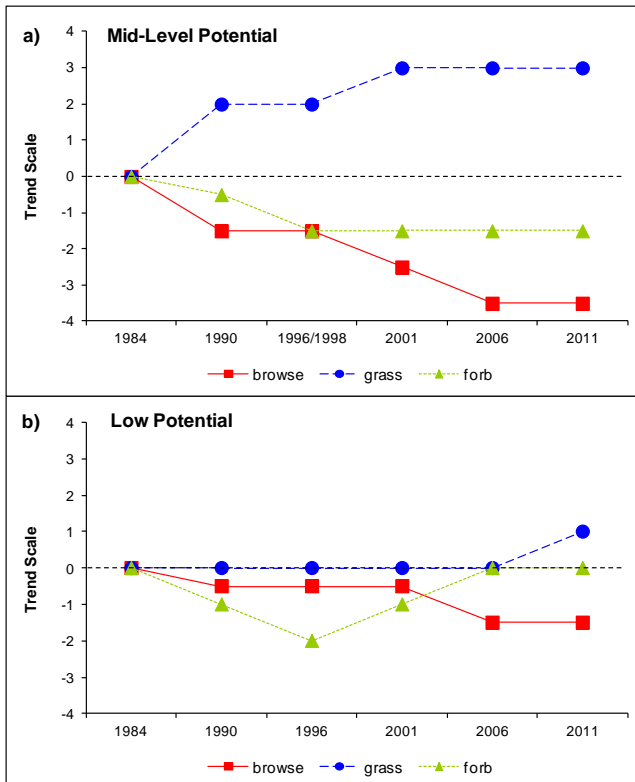


Figure 9. a) Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 2, Cache. b) low potential sites cumulative median browse, grass and forb trends by year for WMU 2.

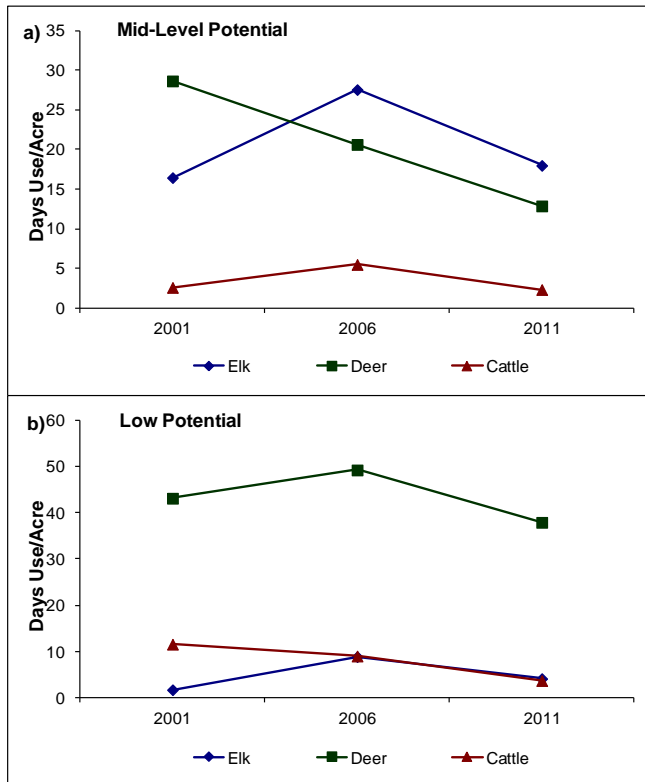
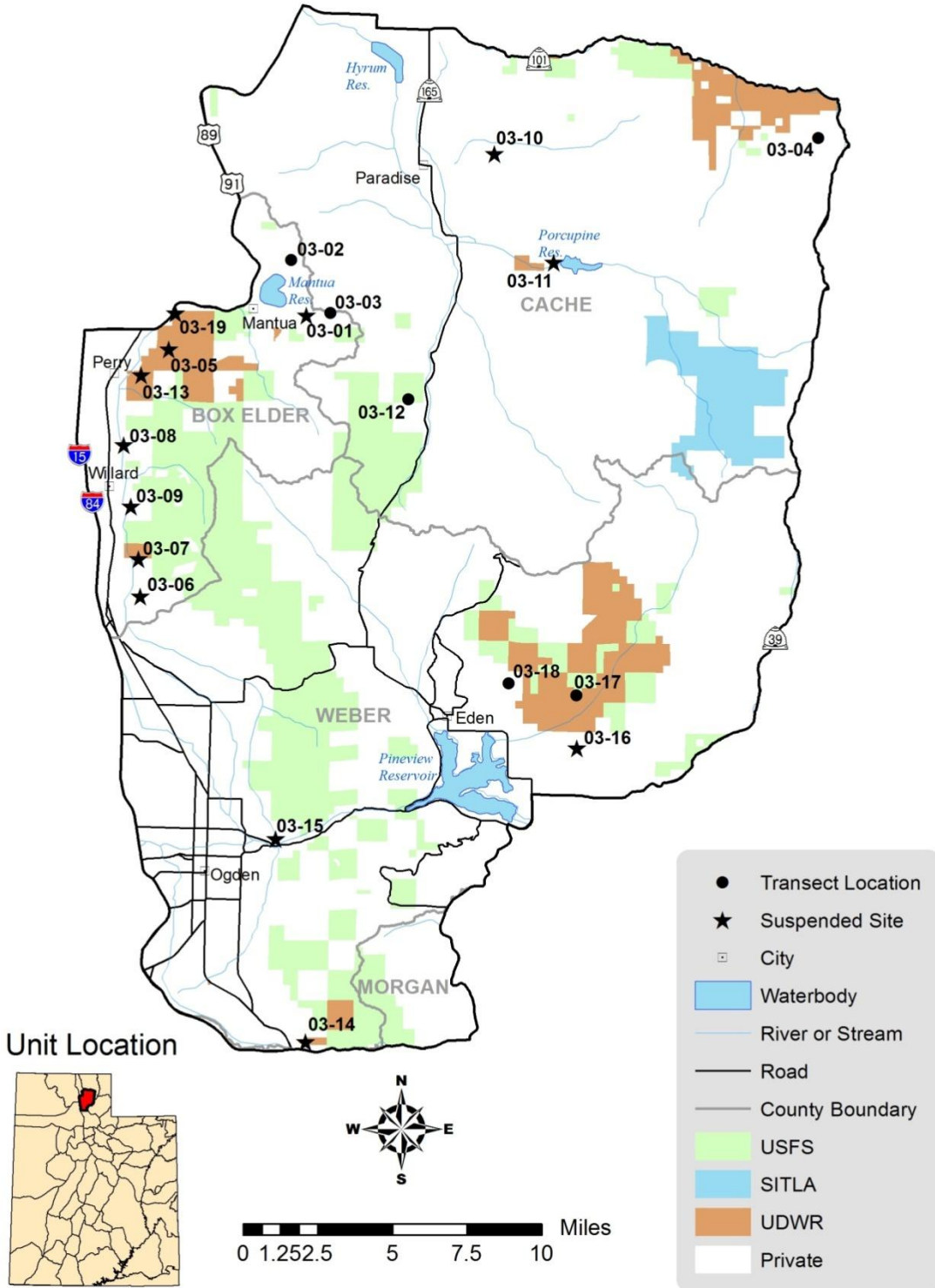


Figure 10. a) Mid-level potential sites mean animals days use/acre (n=18) by year for WMU 2, Cache. b) Low potential sites mean animal days use/acre (n=10) by year for WMU 2.

Management Unit 3



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.

Management Unit Description

The Ogden Management 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 (2006) for the unit, there is approximately 139,907 acres of deer winter range in the unit. Summer range totals 198,069 acres. A majority of the winter range (80%) and summer range (70%) is on private land. The U.S. Forest Service administers 10% of the summer range and 9% of the winter range. The Division of Wildlife Resources maintains 15% of the deer summer range and 11% 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).

Range Trend Studies

Six interagency range trend studies were sampled in Unit 3 during the summer of 2011. A total of nineteen studies have been established within Unit 3. Fourteen studies were established in 1984, and of these studies six studies [Northeast Mantua (3-2), Clay Valley (3-3), Anderson Ranch (3-4), Cook canyon (3-9), Hyrum Canyon (3-10), Porcupine Dam, and Perry Basin (3-13)] sample mountain big sagebrush communities; two studies [Threemile Canyon (3-12) and Brigham Face (3-19)] sample antelope bitterbrush communities; one study [East Mantua (3-1)] samples a juniper community; one study [Mathias Canyon (3-5)] samples a smooth sumac community; two studies [White's Orchard (3-6) and Facer Canyon (3-8)] sample basin big sagebrush communities; and one study [Mouth of Pearson's Canyon (3-7)] samples a perennial grass community. Five studies were established in 1985, and of these studies one study [Middle Fork (3-17)] samples a low sagebrush community; two studies [Geertsen Canyon (3-18) and Maple Canyon (3-16)] sample mountain big sagebrush communities; one study [Uintah Junction (3-14)] samples a Gamble oak community; and one study [Ogden Canyon (3-15)] samples a rabbitbrush community.

In 1990, one study (East Mantua) was suspended. In 1996, ten studies (Mathias Canyon, Mouth of Pearson's Canyon, Facer Canyon, Hyrum Canyon, Porcupine Dam, Perry basin, Uintah Junction, Ogden Canyon, Maple Canyon, and Brigham Face) were suspended. In 2001, two studies (White's Orchard and Cook Canyon) were suspended. These sites were suspended for various reasons and if the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see:

<http://www.wildlife.utah.gov/range>.

NORTHEAST MANTUA RESERVOIR - TREND STUDY NO. 3-2-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: Private

Elevation: 5,560 ft (5,560 m)

Aspect: West

Slope: 30%

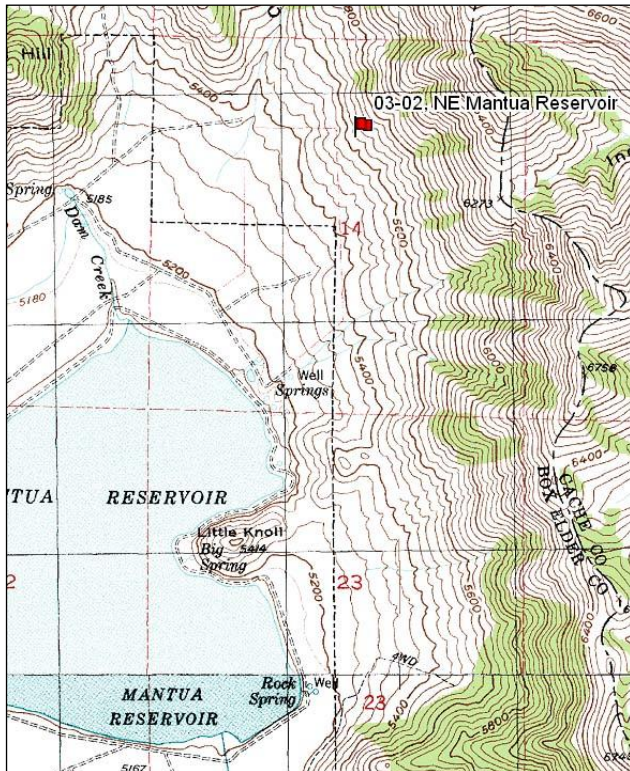
Transect bearing: 168° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (43ft)

Directions:

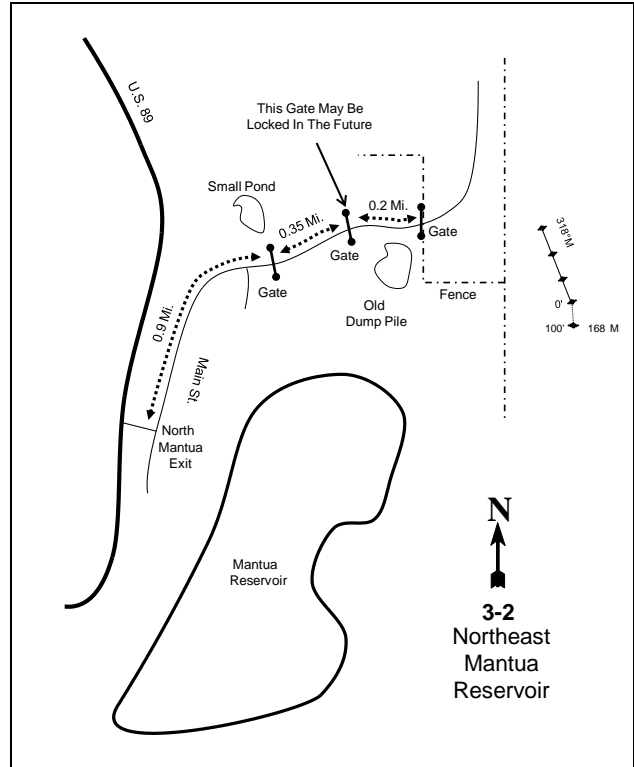
Turn east off of U.S. 89-91 at the north Mantua exit and travel east to Main Street. Turn left (north) on Main Street and proceed 0.9 miles to a gate with a small pond to the left. Proceed through the gate, stopping at another gate after 0.35 miles (this gate may be locked in the future). Proceed 0.2 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



Township: 9N Range: 1W Section: 14

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 423253 E 4597004 N

NORTHEAST MANTUA RESERVOIR - TREND STUDY NO. 3-2

Site Information

Site Description: The study samples a former mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community that has transitioned to a grass community about one mile northeast of Mantua Reservoir. The study is on private land. The Ruby gas pipeline is about a half mile to the north of the site. Deer pellet groups were sampled in moderate abundance in 2001 and 2006, but low abundance in 2011. Elk pellet groups have been sampled in low abundance since 2001. Sampled domestic livestock sign has been minimal, and livestock appear to have little impact on the immediate area (Table - Pellet Group Data).

Browse: Browse composition from 1984 to 2001 was dominated by a moderately dense population of mountain big sagebrush. However, there was a large die-off of sagebrush and density decreased substantially in 2006, with further decreases in 2011. Decadence and poor vigor were low in the early years of the study, but both measurements were high in 2006. Utilization was heavy in 1984, but has been light to moderate in other sample years. Recruitment of young sagebrush plants was good in the early part of the study, but has been poor since 2006. Antelope bitterbrush (*Purshia tridentata*) and Saskatoon serviceberry (*Amelanchier alnifolia*) were not sampled in density measurements, but occur in small numbers on and around the site. Both species receive heavy use. Other preferred browse species are rare on the site. The increaser species broom snakeweed (*Gutierrezia sarothrae*) occurred in moderate density early in the study, but has also decreased in density since 2001 and is now rare on the site (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are diverse and abundant on the site, but have become dominated by the weedy species bulbous bluegrass (*Poa bulbosa*). Bulbous bluegrass was rare at the outset of the study, but has steadily increased in frequency over the sample years. Cover of bulbous bluegrass increased substantially in 2011. The desirable species bluebunch wheatgrass (*Agropyron spicatum*) is the only other prevalent perennial grass species. The annual grass species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are also abundant on the site. The noxious weed medusahead (*Taeniatherum caput-medusae*) was sampled for the first time in 2011, but was observed in higher abundance around the study area.

A wide variety of forb species were sampled, but the forb composition is a mixture of annual and perennial forbs. The most common perennial forbs include western yarrow (*Achillea millefolium*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and wayside gromwell (*Lithospermum ruderale*). The most abundant annual species were desert alysium (*Alyssum alyssoides*), autumn willowherb (*Epilobium brachycarpum*), storksbill (*Erodium cicutarium*), and yellow salsify (*Tragopogon dubius*). The noxious weed dyer's woad (*Isatis tinctoria*) was present in low numbers (Table - Herbaceous Trends).

Soil: The soil is in the Goring-Yeates Hollow association, which occurs on alluvial fans and mountain slopes. Parent material consists of alluvium, colluvium, and residuum derived from sandstone and quartzite (Soil Survey Staff 2011). The soil has a clay texture with a slightly alkaline soil reaction (pH 7.4) (Table - Soil Analysis Data). Bare ground cover is low, with a large amount of vegetation and litter cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - up (+2):** The density of mountain big sagebrush increased by 23% from 1,731 plants/acre to 2,132 plants/acre. Recruitment of young sagebrush plants increased from 4% to 44% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence and poor vigor of sagebrush

remained similar at 14% and 4%, respectively. Recruitment of young sagebrush plants decreased to 17%, but is still considered to be good.

- **1996 to 2001 - stable (0):** Density of sagebrush remained similar at 1,840 plants/acre, and cover remained similar at 16%. Decadence increased to 26%, but poor vigor remained similar at 3%. Recruitment of young plants remained similar at 15%.
- **2001 to 2006 - down (-2):** There was a large die-off of mountain big sagebrush with a 49% decrease in density to 940 plants/acre. Cover of sagebrush decreased to 4%. Decadence increased to 55%, and poor vigor increased to 38%. Recruitment decreased to just 9% of the population.
- **2006 to 2011 - down (-2):** Sagebrush density decreased to 80 plants/acre, and had no notable cover. There was no recruitment of young plants into the population.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 87%. Bluebunch wheatgrass and Sandberg bluegrass (*Poa secunda*) increased significantly in nested frequency.
- **1990 to 1996 - down (-2):** There was a 45% decrease in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass. The weedy species bulbous bluegrass increased significantly in nested frequency.
- **1996 to 2001 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 21%, and cover increased from 5% to 7%. However, there was a significant increase in the nested frequency of the weedy species bulbous bluegrass, and cover increased from 4% to 8%. The two annual brome species decreased in combined cover from 17% to 11%, with a significant decrease in the nested frequency of Japanese chess.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 14%, and cover increased to 15%. The increase in cover is primarily due to an increase in cover of the perennial species bluebunch wheatgrass.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased by 10%, and cover increased to 20%. Bluebunch wheatgrass has increased significantly in nested frequency since 2001, and cover has increased from 7% to 19% over the same period. However, there was a significant increase in nested frequency of the weedy species bulbous bluegrass, and cover increased to 24%. The noxious weed medusahead was sampled for the first time, and occurred at higher frequency in the area surrounding the study.

Forb:

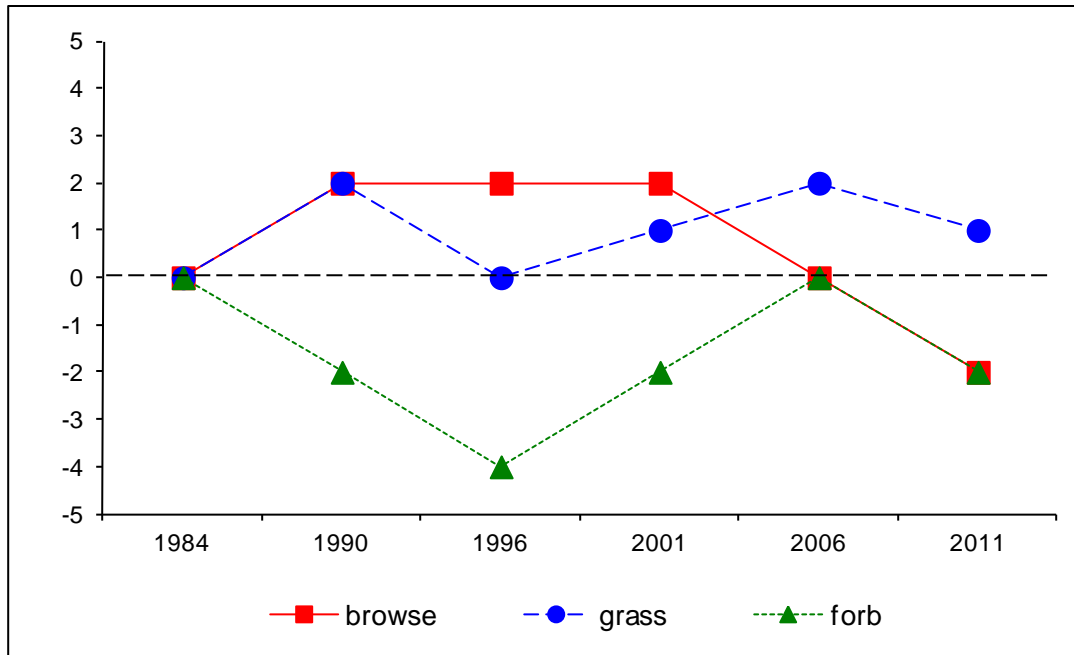
- **1984 to 1990 - down (-2):** The sum of nested frequency of perennial forbs decreased by 22%.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial forbs decreased by 25%.
- **1996 to 2001 - up (+2):** There was a 58% increase in the sum of nested frequency of perennial forbs, and cover increased from 3% to 6%. The annual forb sum of nested frequency and cover also increased substantially.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased by 22%, and cover increased to 10%. The annual forb sum of nested frequency increased substantially.
- **2006 to 2011 - down (-2):** The perennial forb sum of nested frequency decreased by 24%, but cover increased to 12%. The annual forb sum of nested frequency also decreased, but cover increased from 7% to 12%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 3, study no: 2

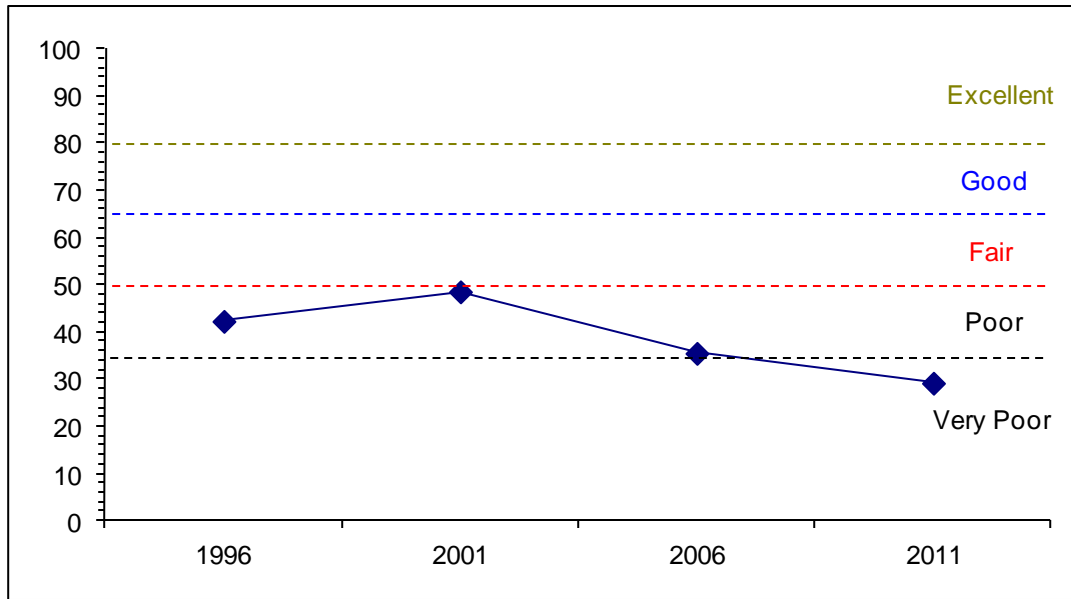
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	21.4	11.0	8.2	10.6	-13.0	6.0	-2.0	42.2	Poor
01	21.1	6.1	7.1	14.6	-8.3	10.0	-2.0	48.5	Poor-Fair
06	5.7	0.0	0.0	30.0	-8.2	10.0	-2.0	35.5	Very Poor-Poor
11	0.7	0.0	0.0	30.0	-7.5	10.0	-4.0	29.1	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 3 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 3, Study no: 2



HERBACEOUS TRENDS--
Management unit 03, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a140	bc204	ab163	ab167	abc168	c211	5.26	6.80	13.30	19.14
G	Bromus japonicus (a)	-	-	c349	b201	a139	b220	16.42	3.60	2.69	7.94
G	Bromus tectorum (a)	-	-	36	179	181	98	.86	7.52	8.30	2.08
G	Koeleria cristata	-	-	2	6	5	5	.00	.12	.18	.15
G	Melica bulbosa	a7	a3	a-	a-	b26	ab13	-	-	1.14	.10
G	Oryzopsis hymenoides	-	-	-	-	2	-	-	-	.03	-
G	Poa bulbosa	a5	a41	b79	c192	c177	d278	4.22	7.69	7.80	24.04
G	Poa fendleriana	4	-	-	-	-	-	-	-	-	-
G	Poa secunda	a20	b113	a12	a41	a42	a23	.05	.35	.76	.65
G	Taeniatherum caput-medusae	a-	a-	a-	a-	a-	b16	-	-	-	.06
Total for Annual Grasses		0	0	385	380	320	318	17.28	11.13	10.99	10.02
Total for Perennial Grasses		176	361	256	406	420	546	9.54	14.97	23.22	44.16
Total for Grasses		176	361	641	786	740	864	26.82	26.10	34.21	54.19
F	Achillea millefolium	b119	a47	a57	ab82	a44	a51	1.41	1.87	.90	2.54
F	Agoseris glauca	a-	a3	a1	a-	b13	ab6	.00	-	.05	.06
F	Allium acuminatum	2	-	-	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	a94	b205	b216	b173	.20	1.60	.83	4.32
F	Arabis sp.	-	-	-	-	4	-	-	-	.03	-
F	Artemisia ludoviciana	1	5	3	4	6	4	.15	.41	.53	.03
F	Aster chilensis	-	-	-	7	6	-	-	.30	.30	-
F	Astragalus sp.	b32	b30	a-	a8	a1	a-	-	.07	.03	-
F	Balsamorhiza sagittata	ab17	ab20	a13	a14	b32	ab20	.66	1.94	3.53	5.34
F	Calochortus nuttallii	5	-	3	10	4	3	.00	.05	.01	.01

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Camelina microcarpa (a)	-	-	-	-	-	5	-	.03	-	.03
F	Cirsium undulatum	-	-	2	-	-	-	.00	-	-	-
F	Collinsia parviflora (a)	-	-	a ⁻	a ¹	b ¹⁹	a ³	-	.00	.04	.01
F	Collomia linearis (a)	-	-	5	22	17	12	.01	.07	.05	.03
F	Comandra pallida	-	-	-	9	8	2	-	.04	.07	.03
F	Cordylanthus ramosus (a)	-	-	-	-	-	1	-	-	-	.03
F	Cryptantha sp.(a)	-	-	a ⁻	a ⁻	b ¹⁶	a ⁴	-	-	.03	.01
F	Cymopterus sp.	-	-	-	2	5	-	-	.00	.06	-
F	Draba sp. (a)	-	-	-	-	2	1	-	-	.00	.00
F	Epilobium brachycarpum (a)	-	-	b ¹⁵⁵	a ⁶⁴	c ²³²	a ⁵⁶	1.39	.21	2.00	.35
F	Eriogonum umbellatum	-	-	-	1	-	-	-	.00	-	-
F	Erodium cicutarium (a)	-	-	a ³	c ⁷⁶	d ¹³¹	b ³⁹	.03	2.55	1.75	.17
F	Galium aparine (a)	-	-	-	3	11	3	-	.03	.08	.01
F	Gilia sp. (a)	-	-	-	-	3	-	-	-	.00	-
F	Hackelia patens	a ³	c ³⁵	a ³	ab ¹¹	c ⁴⁹	bc ²⁸	.06	.16	.93	.45
F	Hedysarum boreale	-	-	-	2	-	-	-	.03	-	-
F	Helianthus annuus (a)	-	-	a ⁻	a ⁻	a ¹	b ⁸	-	-	.00	.22
F	Holosteum umbellatum (a)	-	-	a ⁻	b ¹⁵	b ¹²	a ⁻	-	.20	.03	-
F	Isatis tinctoria	3	9	18	9	20	11	.24	.08	.42	.46
F	Lactuca serriola (a)	a ⁻	a ³	a ⁻	b ³⁰	c ⁶⁸	d ¹⁹⁰	-	.24	.60	3.42
F	Lappula occidentalis (a)	-	-	5	5	10	2	.01	.39	.02	.00
F	Lithospermum ruderales	a ²	a ⁻	a ²	ab ¹¹	b ¹⁷	b ¹⁸	.18	.38	1.74	1.71
F	Lupinus argenteus	-	-	4	9	9	16	.21	.39	.63	1.02
F	Machaeranthera grindelioides	-	-	-	-	-	2	-	-	-	.00
F	Madia glomerata (a)	-	-	a ²	a ⁻	a ⁻	b ¹³	.00	-	-	.42
F	Medicago sativa	-	-	-	-	-	1	-	-	-	.03
F	Microsteris gracilis (a)	b ⁵⁴	a ⁻	a ³	a ⁶	b ³⁵	a ⁻	.00	.01	.10	-
F	Polygonum douglasii (a)	-	-	7	8	7	3	.03	.04	.01	.00
F	Ranunculus testiculatus (a)	-	-	2	5	3	-	.00	.01	.00	-
F	Rumex sp.	-	-	-	3	-	2	-	.03	-	.03
F	Senecio multilobatus	-	-	-	1	-	-	-	.03	-	-
F	Taraxacum officinale	-	-	-	-	-	1	-	-	-	.18
F	Tragopogon dubius (a)	c ¹²²	b ⁷⁴	a ¹²	c ¹⁰⁹	b ⁶⁹	c ¹²⁸	.04	2.66	1.00	2.02
F	Unknown forb-perennial	-	5	-	-	-	-	-	-	-	-
F	Verbascum thapsus	-	-	-	-	-	2	-	-	-	.03
F	Veronica biloba (a)	-	-	a ⁹	ab ²⁷	b ⁴⁶	b ⁴²	.01	.12	.15	.56
F	Wyethia amplexicaulis	b ¹⁴	a ⁻	a ³	a ⁻	a ²	a ²	.03	-	.15	.00
F	Zigadenus paniculatus	-	-	7	-	3	-	.04	.01	.03	-
Total for Annual Forbs		176	77	297	576	898	683	1.75	8.21	6.76	11.67
Total for Perennial Forbs		198	154	116	183	223	169	3.01	5.82	9.43	11.98
Total for Forbs		374	231	413	759	1121	852	4.76	14.04	16.20	23.66

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	60	55	37	3	16.34	15.71	4.01	-
B	Gutierrezia sarothrae	11	13	4	1	.36	.78	.30	-
B	Prunus virginiana	2	2	2	2	.00	.15	.38	.53
B	Purshia tridentata	1	1	1	0	.66	.85	.15	-
Total for Browse		74	71	44	6	17.37	17.49	4.85	0.53

CANOPY COVER, LINE INTERCEPT--

Management unit 03, Study no: 2

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	4.73	.68
Gutierrezia sarothrae	.20	-
Prunus virginiana	.05	.53
Purshia tridentata	.96	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 03, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	3.4	2.9	4.8

BASIC COVER--

Management unit 03, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.25	10.25	50.70	55.77	59.57	68.22
Rock	6.75	4.75	5.68	4.36	4.72	6.12
Pavement	6.50	11.75	3.84	3.82	3.36	5.46
Litter	66.00	57.25	58.45	45.47	41.06	49.81
Cryptogams	0	0	0	0	.03	0
Bare Ground	17.50	16.00	5.36	9.88	11.09	7.47

SOIL ANALYSIS DATA --

Management unit 03, Study no: 2, Study Name: Mantua Reservoir

Effective rooting depth (in)	pH	Clay			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
15.1	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	'11
Sheep	-	-	-	1
Rabbit	-	2	-	-
Elk	-	1	1	-
Deer	5	10	7	1
Cattle	2	-	-	-

Days use per acre (ha)		
'01	'06	'11
-	1 (3)	-
-	-	-
-	-	3 (7)
21 (51)	25 (63)	1 (2)
-	-	-

BROWSE CHARACTERISTICS--

Management unit 03, Study no: 2

		Age class distribution			Utilization				
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	37/37
01	0	0	0	-	-	0	0	0	30/35
06	0	0	0	-	-	0	0	0	41/40
11	0	0	0	-	-	0	0	0	26/24
<i>Artemisia tridentata vaseyana</i>									
84	1731	4	81	15	3133	19	81	4	33/36
90	2132	44	41	16	133	3	0	3	35/36
96	1860	17	69	14	20	32	0	4	27/49
01	1840	15	59	26	40	42	8	3	27/44
06	940	9	36	55	240	55	11	38	22/31
11	80	0	100	0	-	0	0	0	26/39
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	13/21
11	0	0	0	-	-	0	0	0	-/-
<i>Gutierrezia sarothrae</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	740	43	57	0	-	0	0	0	11/15
01	740	0	92	8	-	0	0	5	11/17
06	140	0	100	0	-	0	0	0	13/19
11	20	0	100	0	-	0	0	0	16/21

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Prunus virginiana</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	60	100	0	-	-	0	0	0	20/13	
01	120	0	100	-	-	0	0	0	-/-	
06	200	100	0	-	-	60	0	0	30/7	
11	160	25	75	-	-	75	0	0	32/33	
<i>Purshia tridentata</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	20	0	100	0	-	0	100	0	75/98	
01	20	0	0	100	-	0	0	0	-/-	
06	20	0	100	0	-	0	100	0	44/66	
11	0	0	0	0	-	0	0	0	21/33	

CLAY VALLEY - TREND STUDY NO. 3-3-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Stony Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: Private

Elevation: 6,420 ft (1,957 m)

Aspect: Southeast

Slope: 28%

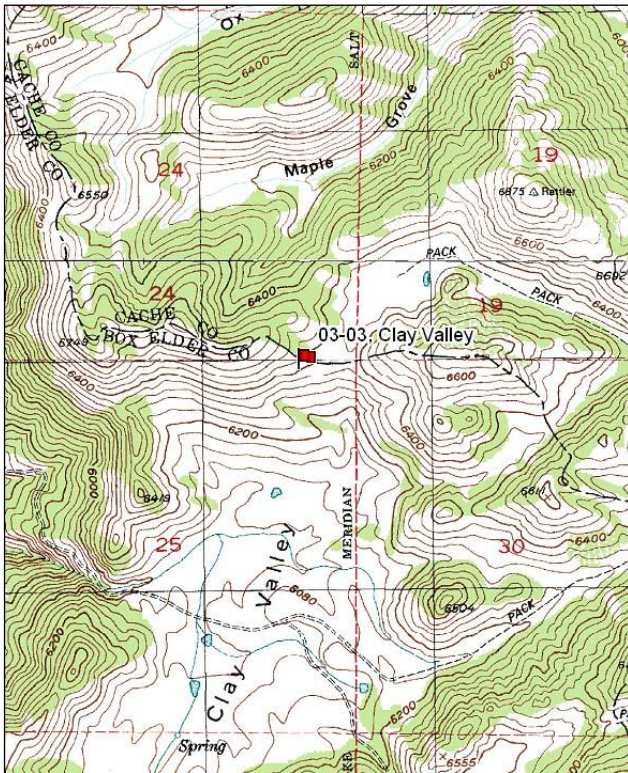
Transect bearing: 163° magnetic

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

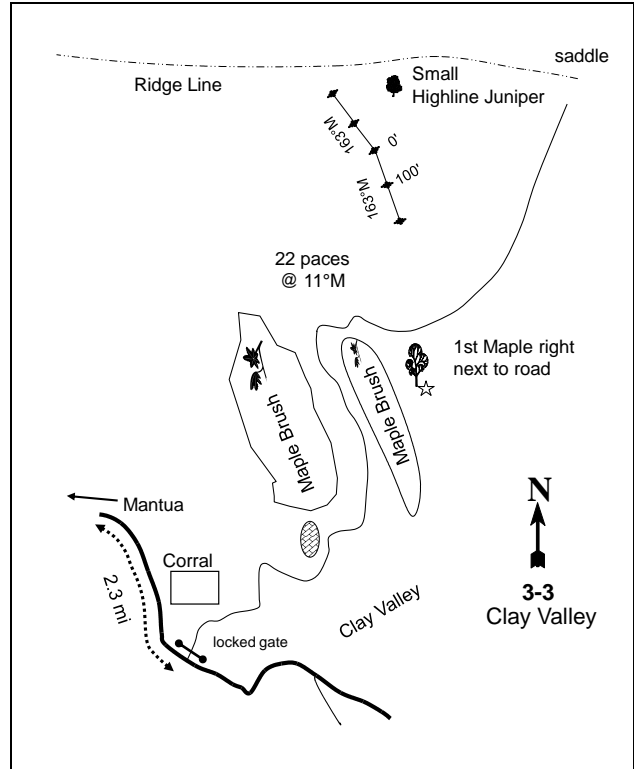
Directions:

From the 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 the switchback to the first lone maple on the 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

GPS: NAD 83, UTM 12S 425363 E 4594164 N

CLAY VALLEY - TREND STUDY NO. 3-3

Site Information

Site Description: The study is located in the foothills above Clay Valley, east of Mantua. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. The area is privately owned and is considered crucial winter range. The area is grazed by sheep from May to early June to control dyer's woad. Cattle graze the property, 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 Highway 89 in Sardine Canyon between 1996 and 2001 that forces the deer to winter more in the area. Since then, deer presence has been higher on the site. Deer pellet groups were sampled in high abundance in 2001, moderate abundance in 2006, and low abundance in 2011. Deer presence was likely lighter in 2011 due to the severe winter of 2010-2011, which forced deer to lower elevations. Elk pellet groups have been sampled in low abundance since 2001. Sampled cattle and sheep sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The key browse species is mountain big sagebrush, which provides nearly all of the browse cover on the site (Table - Browse Trends). The sagebrush is a moderately dense population of mostly lightly to moderately used plants. There was a large decrease in density in 2006, but the remaining population appeared healthy. Decadence has been mostly low to moderate, and poor vigor has been low in the population. Decadence appears to be highest farther up the hillside along the transect. Recruitment of young plants has been mostly good over the course of the study. Mountain snowberry (*Symphoricarpos oreophilus*) is scattered over the site, but has increased in abundance since 1996. Other shrubs such as white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*), and broom snakeweed (*Gutierrezia sarothrae*) are sparsely distributed throughout the area (Table - Browse Characteristics). There is a dense stand of bigtooth maple (*Acer grandidentatum*) trees at the base of the hill from the study.

Herbaceous Understory: Perennial grasses are diverse and abundant on the site. The two most abundant species are bluebunch wheatgrass (*Agropyron spicatum*) and the weedy species bulbous bluegrass (*Poa bulbosa*). Other less abundant perennial species include Sandberg bluegrass (*P. secunda*), Kentucky bluegrass (*P. pratensis*), and oniongrass (*Melica bulbosa*). Two annual brome species, cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*), also occur on the site. Annual grass cover was very high in 1996, but has been more moderate since 2001. Slightly lower on the slope is a large abundance of slender wheatgrass (*Agropyron trachycaulum*), crested wheatgrass (*A. cristatum*), mountain brome (*Bromus carinatus*), smooth brome (*B. inermis*), subalpine needlegrass (*Stipa columbiana*), and Great Basin wildrye (*Elymus cinereus*). Grasses show evidence of light to negligible grazing use. Forbs are diverse and have increased in abundance over the course of the study. Weedy forb species are common, but the perennial forb silvery lupine (*Lupinus argenteus*) has provided the majority of forb cover since 2001. The noxious weed dyer's woad (*Isatis tinctoria*) is found on the site. However over the last 15 years the land owners have forced sheep into patches of dyer's woad, which has kept it from greatly expanding (Table - Herbaceous Trends).

Soil: The soil is in the Yeates Hollow-Goring association, which occurs on mountains and alluvial fans. Parent material consists of alluvium, colluvium, and residuum derived from sandstone and quartzite (Soil Survey Staff 2011). The soils have a clay loam texture and a soil reaction that is slightly acidic (pH 6.3). Organic matter is relatively high at over 5% (Table - Soil Analysis Data). Gravel is abundant throughout the profile. Protective cover provided by vegetation and litter is abundant and prevents all but minor erosion. Bare ground is rare and usually associated with cattle trails (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was a slight increase in the density of mountain big sagebrush from 3,531 plants/acre to 3,798 plants/acre. Poor vigor remained low at 4%, but decadence increased from 11% to 42%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of mountain big sagebrush decreased to 18%, similar to 1984 values. Plants displaying poor vigor remained similar at 2%. Recruitment of young sagebrush plants increased from 0% to 23% of the population.
- **1996 to 2001 - stable (0):** The density of mountain big sagebrush decreased by 10% from 2,900 plants/acre to 2,620 plants/acre, but cover increased from 17% to 24%. Most of the decrease in density was due to a decrease in the recruitment of young plants, which decreased to 2%. Decadence remained the same at 18%, and poor vigor increased slightly to 5%.
- **2001 to 2006 - down (-2):** Mountain big sagebrush density decreased by 38% to 1,620 plants/acre, and cover decreased to 10%. There were also a large number of dead plants sampled. Recruitment of young plants increased to 20% of the population. Decadence increased slightly to 23%, and poor vigor increased to 11%.
- **2006 to 2011 - stable (0):** Density of mountain big sagebrush remained similar at 1,580 plants/acre, though cover increased slightly to 11%. Recruitment of young sagebrush plants increased to 29% of the population. There appeared to be more recruitment on the belts lower on the hillside. Decadence decreased to 13%, but poor vigor remained similar at 11%. Decadence was more prevalent in the plants on the belts higher on the hill.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased two-fold. There was a significant increase in the nested frequency of bluebunch wheatgrass and Sandberg bluegrass.
- **1990 to 1996 - slightly down (-1):** The perennial grass sum of nested frequency, excluding bulbous bluegrass, decreased by 15%. There was a significant increase in the nested frequency of the weedy species bulbous bluegrass, which dominated the site in cover in 1996. The annual species Japanese chess and cheatgrass were included in the sample for the first time in 1996, and were also prevalent. Bluebunch wheatgrass also increased significantly in nested frequency, but is not as abundant as the less desirable species.
- **1996 to 2001 - slightly up (+1):** The perennial grass sum of nested frequency, excluding bulbous bluegrass, increased by 11%, and cover increased from 12% to 16%. The weedy species bulbous bluegrass had a significant increase in nested frequency, and cover increased from 13% to 19%. The weedy annual species Japanese chess decreased significantly in nested frequency, and cover decreased from 13% to 1%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 15%, and cover increased to 19%. There was a significant decrease in the nested frequency of bulbous bluegrass, and cover decreased to 8%. Japanese chess and cheatgrass both increased significantly in nested frequency, and cover of annual grasses increased from 2% to 6%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 24%, but cover increased to 27%. Most of the decrease in frequency of perennial grasses was due to a significant decrease in the nested frequency of Sandberg bluegrass. Bluebunch wheatgrass has increased significantly since 2001, and provided the majority of the grass cover in 2011.

Forb:

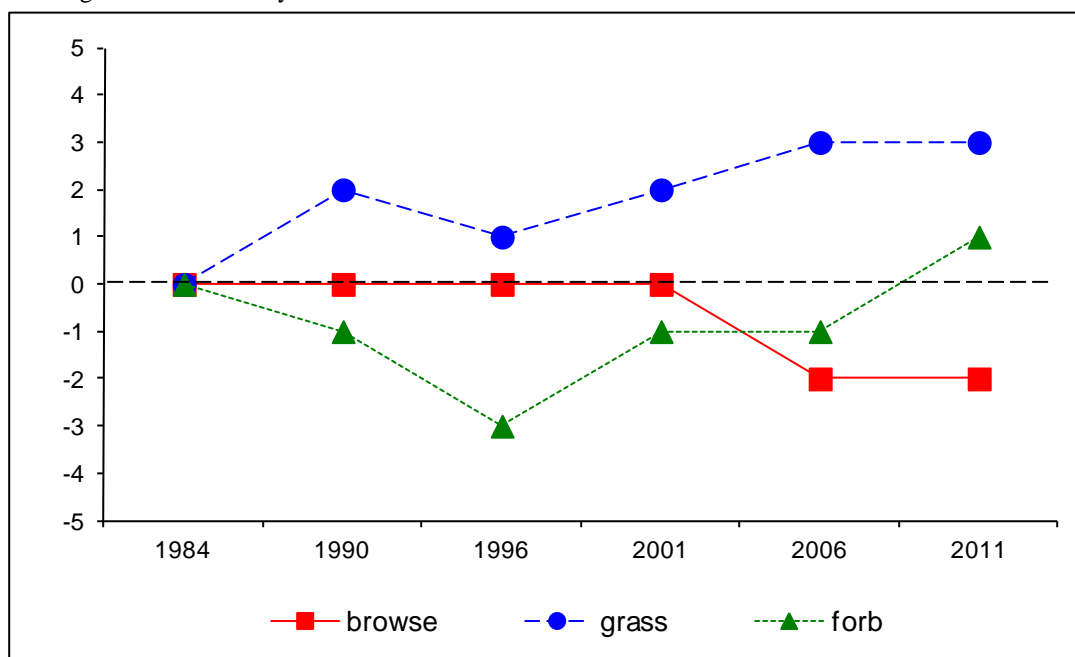
- **1984 to 1990 - slightly down (-1):** The sum of nested frequency of perennial forbs increased by 28%, but most of the increase was due to a significant increase in the noxious weed dyer's woad. The annual forb sum of nested frequency also increased substantially.
- **1990 to 1996 - down (-2):** The perennial forb sum of nested frequency decreased by 72%, though dyer's woad decreased significantly. Annual forbs remained prevalent on the site.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased two-fold, and cover increased from 2% to 10%. Much of this increase was due to a significant increase in the nested frequency of silvery lupine. Silvery lupine became the dominant forb on the site.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial forbs remained similar, though cover increased to 14%. There was a significant increase in the nested frequency of silvery lupine, with a subsequent increase in cover. The noxious weed dyer's woad also increased significantly, but cover remained low at 1%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 27%, and cover increased to 16%. The annual forb sum of nested frequency and cover also increased substantially.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 3, study no: 3

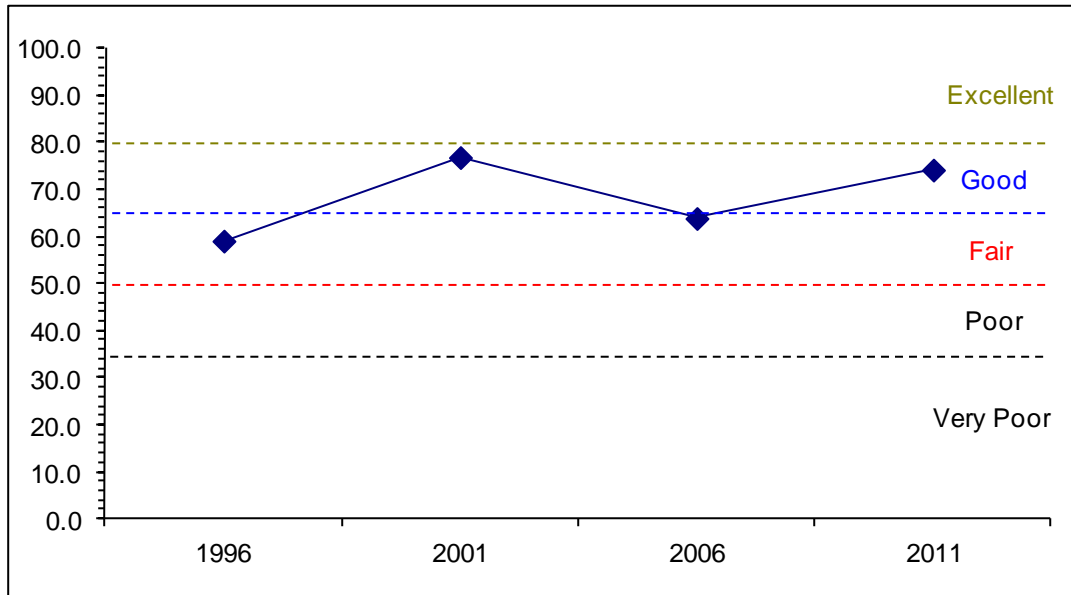
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	20.8	9.6	11.5	24.3	-9.6	4.5	-2.0	59.1	Fair
01	29.3	9.6	1.0	30.0	-1.1	10.0	-2.0	76.8	Good
06	12.5	8.1	10.0	30.0	-4.8	10.0	-2.0	63.9	Fair-Good
11	13.8	11.1	14.5	30.0	-3.2	10.0	-2.0	74.1	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 3 Study no: 3



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 3, Study no: 3



HERBACEOUS TRENDS--
 Management unit 03, Study no: 3

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a28	b87	c156	c176	cd182	d211	8.15	11.82	13.86	25.30
G	Agropyron trachycaulum	2	2	-	1	-	6	-	.00	.00	.24
G	Bromus carinatus	-	3	-	-	-	7	-	-	-	.18
G	Bromus japonicus (a)	-	-	c293	a64	b176	b185	12.51	.86	3.59	2.40
G	Bromus tectorum (a)	-	-	a25	a29	b103	a39	.31	.64	2.76	1.92
G	Koeleria cristata	1	-	-	-	2	1	-	-	.06	.03
G	Melica bulbosa	ab44	ab36	a15	a28	b63	ab37	.22	.17	2.33	.35
G	Poa bulbosa	a18	a63	b213	c307	b202	b196	12.98	19.38	7.78	9.21
G	Poa pratensis	bcd79	d97	ab44	cd86	abc50	a17	1.30	3.42	1.33	.50
G	Poa secunda	a20	b129	b87	a41	b89	a14	2.44	.68	1.47	.25
G	Stipa columbiana	-	-	-	3	-	-	-	.15	.01	-
Total for Annual Grasses		0	0	318	93	279	224	12.83	1.50	6.36	4.32
Total for Perennial Grasses		192	417	515	642	588	489	25.12	35.64	26.87	36.08
Total for Grasses		192	417	833	735	867	713	37.95	37.15	33.24	40.40
F	Achillea millefolium	c99	bc87	ab51	abc51	a43	a42	.89	1.21	1.51	1.70
F	Agoseris glauca	b50	b37	a10	ab32	a8	b34	.02	.26	.03	.13
F	Allium acuminatum	b44	a14	a-	a3	a11	a4	-	.03	.03	.05
F	Alyssum alyssoides (a)	-	-	ab25	a11	b36	c92	.05	.06	.12	.44
F	Arabis sp.	-	-	-	-	-	-	-	.00	-	-
F	Aster sp.	1	-	-	-	-	-	-	-	-	-
F	Astragalus sp.	b20	b28	a-	a-	a-	a6	-	-	-	.01
F	Calochortus nuttallii	5	6	-	-	-	3	-	-	-	.01
F	Camelina microcarpa (a)	-	-	3	-	12	8	.00	-	.10	.04

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Cirsium undulatum</i>	a3	b23	ab16	ab11	a8	a5	.77	.30	.10	.06
F	<i>Collinsia parviflora</i> (a)	-	-	a1	a9	b59	a15	.00	.01	.15	.17
F	<i>Collomia linearis</i> (a)	-	-	b28	a1	c83	c110	.08	.00	.41	4.40
F	<i>Crepis acuminata</i>	3	-	1	-	-	-	.00	-	-	-
F	<i>Cryptantha</i> sp.	a-	a-	a3	a3	b25	a12	.03	.00	.16	.07
F	<i>Cryptantha</i> sp.(a)	-	-	a-	a-	b43	b52	-	-	.24	.26
F	<i>Descurainia pinnata</i> (a)	-	-	a-	a-	a3	b17	-	-	.00	.20
F	<i>Draba</i> sp. (a)	-	-	a1	ab10	ab15	b18	.00	.02	.03	.04
F	<i>Epilobium brachycarpum</i> (a)	-	-	ab39	a6	bc55	c86	.35	.04	.20	.89
F	<i>Erodium cicutarium</i> (a)	-	-	-	5	15	-	-	.06	.13	-
F	<i>Galium aparine</i> (a)	-	-	b11	a-	b14	c90	.10	-	.08	3.05
F	<i>Geranium</i> sp.	3	-	3	-	-	-	.01	-	-	-
F	<i>Gilia</i> sp. (a)	-	-	-	1	-	4	-	.00	-	.00
F	<i>Grindelia squarrosa</i>	-	2	-	4	-	-	-	.53	-	-
F	<i>Hackelia patens</i>	-	-	-	-	2	6	-	-	.03	.06
F	<i>Helianthus annuus</i> (a)	-	5	13	3	-	14	.10	.00	-	.37
F	<i>Holosteum umbellatum</i> (a)	-	-	a41	a35	b84	c130	.22	.15	.16	.96
F	<i>Isatis tinctoria</i>	ab9	c109	ab6	a5	b31	ab14	.04	.03	1.04	.36
F	<i>Lactuca serriola</i> (a)	a-	c75	a1	a3	b32	d194	.00	.00	.17	4.69
F	<i>Lappula occidentalis</i> (a)	-	-	1	1	-	-	.00	.00	-	-
F	<i>Lupinus argenteus</i>	a23	a33	a21	b118	c186	c152	.47	7.05	11.05	12.86
F	<i>Madia glomerata</i> (a)	a-	ab11	ab19	a3	ab12	b28	.21	.00	.07	.46
F	<i>Microsteris gracilis</i> (a)	a9	a-	a6	a-	b56	a6	.03	-	.14	.04
F	<i>Phlox longifolia</i>	-	2	-	-	-	-	-	-	-	-
F	<i>Polygonum douglasii</i> (a)	-	-	35	-	26	25	.10	-	.10	.09
F	<i>Senecio multilobatus</i>	b53	a7	a-	a8	a9	a5	-	.02	.02	.10
F	<i>Taraxacum officinale</i>	3	13	1	-	9	6	.00	-	.01	.06
F	<i>Tragopogon dubius</i> (a)	a11	c117	a13	b63	a14	b46	.08	1.63	.16	.57
F	Unknown forb-annual (a)	-	-	-	-	5	-	-	-	.01	-
F	Unknown forb-perennial	a-	b25	a-	a-	a-	a-	-	-	-	-
F	<i>Verbascum thapsus</i>	-	-	-	-	-	2	-	-	-	.03
F	<i>Veronica biloba</i> (a)	-	-	a-	a-	b17	c54	-	-	.09	2.11
F	<i>Vicia americana</i>	-	-	-	-	-	4	-	-	-	.03
F	<i>Viola</i> sp.	a-	b19	a-	a-	a-	a-	-	-	-	-
Total for Annual Forbs		20	208	237	151	581	989	1.36	2.02	2.42	18.85
Total for Perennial Forbs		316	405	112	235	332	295	2.26	9.46	14.00	15.56
Total for Forbs		336	613	349	386	913	1284	3.62	11.48	16.42	34.42

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	'11	'96	'01	'06	'11
B	Acer grandidentatum	1	1	1	1	.03	.15	.15	.15
B	Artemisia tridentata vaseyana	78	73	58	45	16.62	23.46	10.02	11.02
B	Chrysothamnus nauseosus albicaulis	2	2	1	1	.03	-	.00	.03
B	Chrysothamnus viscidiflorus viscidiflorus	2	3	3	1	.03	.00	-	.15
B	Gutierrezia sarothrae	1	0	0	2	-	-	-	.03
B	Juniperus osteosperma	1	1	1	1	.53	.03	.15	.06
B	Symphoricarpos oreophilus	6	9	14	13	.21	1.50	3.45	3.67
Total for Browse		91	89	78	64	17.45	25.14	13.78	15.11

CANOPY COVER, LINE INTERCEPT--

Management unit 03, Study no: 3

Species	Percent Cover		
	'01	'06	'11
Acer grandidentatum	.60	.36	.80
Artemisia tridentata vaseyana	-	12.38	10.01
Chrysothamnus nauseosus albicaulis	-	.31	.45
Juniperus osteosperma	1.39	1.26	1.96
Symphoricarpos oreophilus	-	3.08	4.75

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 03, Study no: 3

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.1	3.0	1.2

BASIC COVER--

Management unit 03, Study no: 3

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.00	14.25	58.50	67.65	65.38	71.15
Rock	3.75	1.75	.58	.28	.28	.13
Pavement	3.50	10.75	3.86	1.87	1.83	.76
Litter	76.25	61.50	66.88	55.39	46.95	52.42
Cryptogams	.50	0	.07	.15	.04	0
Bare Ground	13.00	11.75	2.17	5.49	10.38	4.75

SOIL ANALYSIS DATA --

Management unit 03, Study no: 3, Study Name: Clay Basin

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.3	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	'11
Sheep	1	-	2	-
Elk	3	-	-	4
Deer	7	22	16	1
Cattle	4	1	2	1

Days use per acre (ha)		
'01	'06	'11
-	12 (30)	-
3 (8)	1 (3)	2 (5)
61 (150)	32 (78)	3 (8)
2 (5)	2 (4)	2 (4)

BROWSE CHARACTERISTICS--

Management unit 03, Study no: 3

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Acer grandidentatum</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	20	100	0	-	-	0	0	0	22/29
01	20	0	100	-	-	0	0	0	-/-
06	20	100	0	-	-	0	0	0	-/-
11	20	0	100	-	-	0	0	0	54/52
<i>Artemisia tridentata vaseyana</i>									
84	3531	2	87	11	-	34	13	4	29/43
90	3798	0	58	42	-	12	2	4	39/38
96	2900	23	59	18	100	7	0	2	22/41
01	2620	2	81	18	40	18	0	5	27/42
06	1620	20	57	23	760	33	7	11	28/43
11	1580	29	58	13	1400	9	1	11	21/37
<i>Chrysothamnus nauseosus albicaulis</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	40	0	50	50	-	0	0	0	32/60
01	40	0	50	50	-	0	0	50	29/41
06	40	0	100	0	-	0	0	0	26/43
11	20	0	100	0	-	0	0	0	20/32
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	40	0	50	50	-	0	0	50	12/24
01	80	0	75	25	-	0	0	25	15/24
06	60	0	100	0	-	0	0	0	13/23
11	40	50	50	0	-	0	0	0	20/27

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	13/20	
01	0	0	0	-	-	0	0	0	8/118	
06	0	0	0	-	-	0	0	0	11/14	
11	120	0	100	-	-	0	0	0	10/10	
<i>Juniperus osteosperma</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	-/-	
11	20	0	100	-	-	0	0	0	-/-	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	140	0	57	43	-	14	14	29	22/47	
01	240	0	100	0	-	25	0	0	61/48	
06	380	0	100	0	-	5	0	0	28/55	
11	380	11	89	0	-	5	0	0	29/53	

ANDERSON RANCH - TREND STUDY NO. 3-4-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: Private

Elevation: 6,000 ft (1,829 m)

Aspect: South

Slope: Near Level

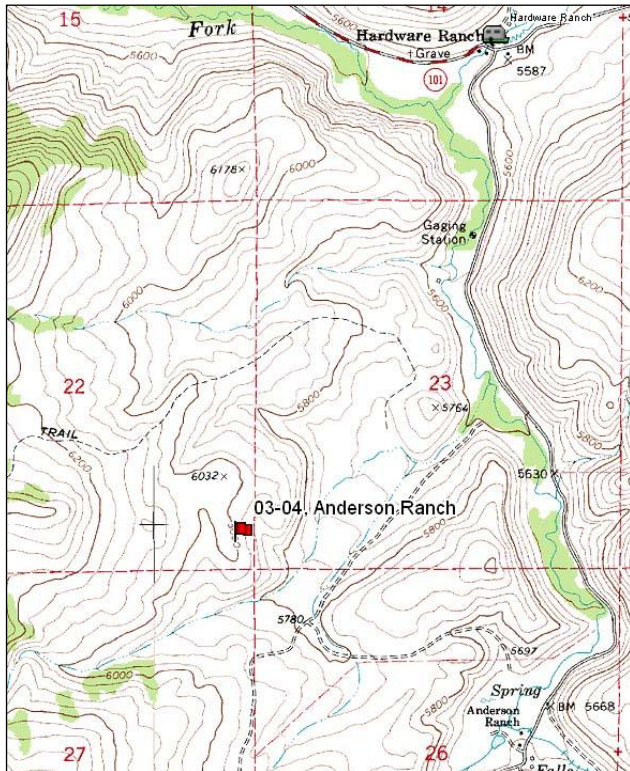
Transect bearing: 168° magnetic

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

Directions:

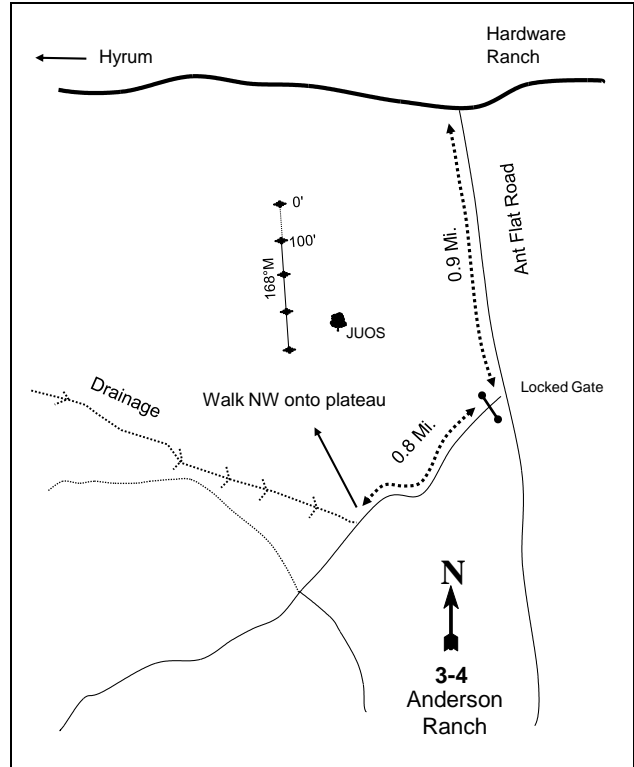
From Hardware Ranch, travel south on the Ant Flat Road for 0.9 miles. Turn right and go through a locked gate. Cross the Blacksmith Fork River and then proceed up the canyon 0.8 to where the drainage and road separate. Walk approximately 1500 ft. at 310 degrees to the 0 foot stake. The 0-foot stake is marked by browse tag #7932. The baseline bearing is 168 degrees magnetic.

Map Name: Hardware Ranch



Township: 10N Range: 3E Section: 22

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 451663 E 4603594 N

ANDERSON RANCH - TREND STUDY NO. 3-4

Site Information

Site Description: The study is located on what was formerly called the Anderson Ranch, but is now part of the Coldwater Ranch. The study is within deer and elk winter range in the upper Blacksmith Fork Canyon. The plant community is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and grasses. The landowner treated the area with an aerial application of 2,4-D in June of 2011, which impacted the health of many of the browse species. Deer pellet groups were sampled in high abundance in 2001, but moderately high abundance since 2006. Elk pellet groups have been sampled in high abundance since 2001. Sampled sheep sign has been moderate, and cattle sign has been minimal since 2001. Sheep and deer pellet numbers may have some overlap due to the difficulty in distinguishing between the two species. Sage-grouse sign has also been low in abundance (Table - Pellet Group Data).

Browse: The key browse species on the site are antelope bitterbrush and mountain big sagebrush, and combined provide the majority of the browse cover (Table - Browse Trends). Both species occur with scattered populations. Utilization of bitterbrush has been moderate to heavy in most years, but was light in 2011. Mountain big sagebrush displayed heavy utilization in 1984, but use has been mostly light to moderate in the other sample years. Decadence of both species was high at the outset of the study, decreased steadily to low rates in 1996, but again steadily increased to moderate levels in 2011. The most abundant shrub is stickleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). This species appears to be stable with a predominantly mature population. Poor vigor for all three species was low over most study years, but all species showed extremely poor vigor in 2011. The poor vigor in 2011 was primarily due to a 2,4-D treatment in June of that year, which had caused much of the new leader growth to twist. Other browse species are rare on the site (Table - Browse Characteristics).

Herbaceous Understory: Understory composition is dominated by perennial grasses, most notably bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), and the weedy species bulbous bluegrass (*P. bulbosa*). Bulbous bluegrass has steadily increased in nested frequency and cover since 1996. The annual grasses Japanese chess (*Bromus japonicus*) and cheatgrass (*B. tectorum*) were first included in the sample in 1996, and were abundant in that year, but have been less prevalent since 2001. Considering elevation and annual precipitation, the forb composition is not very abundant and composition is poor. Annual forb species are predominant in the forb composition. The most common perennial forb is western yarrow (*Achillea millefolium*). Most forbs are occasional in their occurrence and provide relatively little forage (Table - Herbaceous Trends).

Soil: The soil is in the Ant Flat series, which occurs on mountain slopes. Parent material consists of residuum and colluvium derived from sandstone and shale. These soils are classified as deep, well drained, and slightly permeable (Soil Survey Staff 2011). 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. Soils have an extremely rocky and compacted clay loam texture with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is low with an abundance of vegetation and litter cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - up (+2):** Density of bitterbrush increased 15% from 865 plants/acre to 998 plants/acre, and density of mountain big sagebrush increased more than two-fold from 399 plants/acre to 998 plants/acre. Decadence of bitterbrush decreased from 92% to 67%, and decadence of sagebrush decreased from 67% to 20%. Recruitment of young bitterbrush plants increased from 0% to 20%, and recruitment of young sagebrush increased from 0% to 27%.

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of bitterbrush and sagebrush decreased to 0%. Recruitment of young bitterbrush decreased to 6%, but recruitment of young sagebrush remained similar at 25%.
- **1996 to 2001 - stable (0):** Density of bitterbrush and sagebrush remained similar at 340 plants/acre and 420 plants/acre, respectively. Cover of bitterbrush increased slightly from 4% to 5%, and sagebrush cover increased from 4% to 5%. Decadence of bitterbrush increased to 6%, and decadence of sagebrush increased to 19%. Recruitment of young bitterbrush increased to 12%, and recruitment of young sagebrush decreased to 14%.
- **2001 to 2006 - up (+2):** Density of bitterbrush increased 24% to 420 plants/acre, and cover increased to 6%. Density of sagebrush increased 48% to 620 plants/acre, but cover remained similar at 5%. Decadence of bitterbrush increased to 19%, but decadence of sagebrush decreased to 13%. Recruitment of young bitterbrush remained similar at 10%, but recruitment of young sagebrush plants increased to 26%.
- **2006 to 2011 - down (-2):** Bitterbrush density decreased by 43% to 240 plants/acre, and cover decreased to 3%. Density of sagebrush remained similar at 600 plants/acre, but cover increased slightly to 7%. Plants displaying poor vigor increased dramatically from 5% to 92% in bitterbrush, and from 3% to 100% in sagebrush. Decadence increased to 33% in bitterbrush, and to 27% in sagebrush. Recruitment of young plants decreased to 0% in bitterbrush, and 7% in sagebrush.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 14%, with a significant increase in the nested frequency of Sandberg bluegrass.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 24%. The weedy species bulbous bluegrass was sampled for the first time at moderate abundance. The annual species Japanese chess and cheatgrass were included in the sample for the first time, and were sampled in moderately high abundance.
- **1996 to 2001 - stable (0):** The sum of nested frequency and cover of perennial grasses, excluding bulbous bluegrass, remained similar. There was a significant increase in the nested frequency of the weedy species bulbous bluegrass, and cover increased from 2% to 3%. The nested frequencies of Japanese chess and cheatgrass decreased significantly, and combined cover decreased from 8% to 2%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased from 19% to 26%. However, there was a significant increase in the nested frequency of the weedy species bulbous bluegrass, and cover increased to 15%.
- **2006 to 2011 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 18%, but cover remained similar at 27%. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 15% to 25%.

Forb:

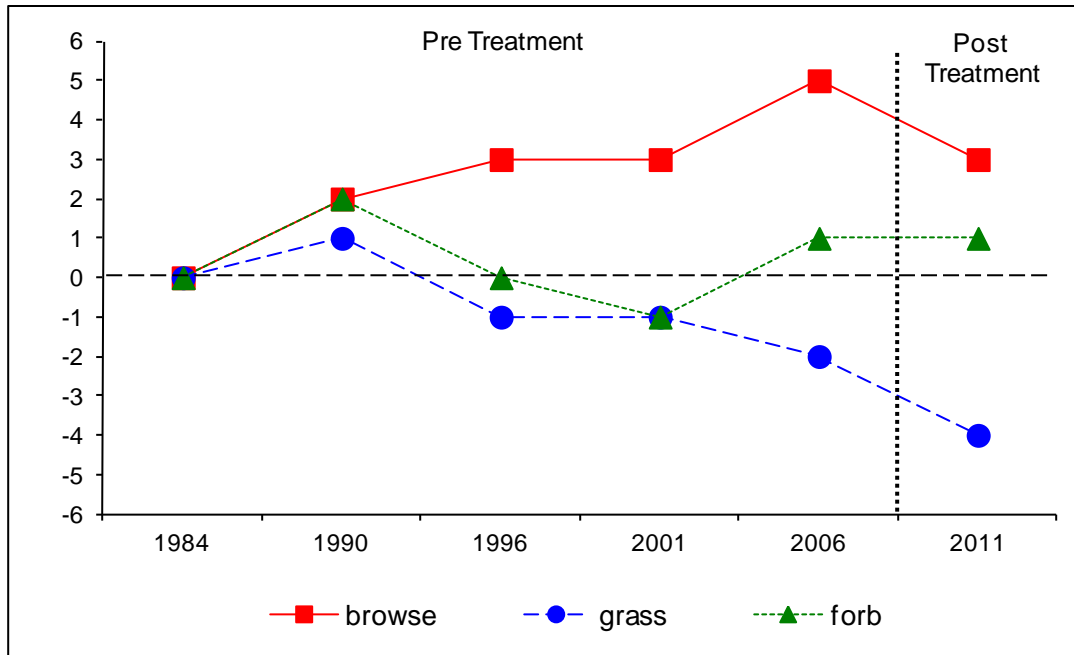
- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased 22%.
- **1990 to 1996 - down (-2):** The perennial forb sum of nested frequency decreased 62%.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 26%, but forbs were already rare and provided only 1% cover.
- **2001 to 2006 - up (+2):** There was a two-fold increase in the sum of nested frequency of perennial forbs, and cover increased to 2%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial forbs remained similar, but cover increased slightly to 4%. The sum of nested frequency of annual forbs increased by 57%, and cover increased from 3% to 5%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 3, study no: 4

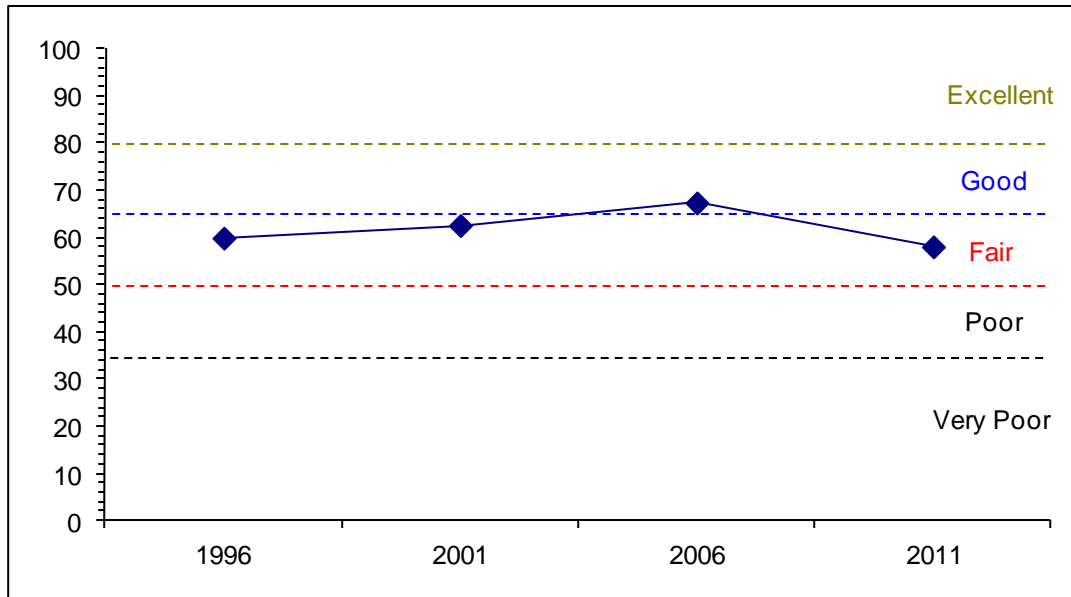
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	10.5	15.0	7.4	30.0	-5.8	2.9	0.0	59.9	Fair
01	14.2	11.3	6.5	30.0	-1.2	1.8	0.0	62.6	Fair
06	15.5	10.2	8.1	30.0	-0.8	4.3	0.0	67.3	Good
11	12.6	6.5	2.5	30.0	-0.7	7.1	0.0	58.0	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 3, Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 3, Study no: 4



HERBACEOUS TRENDS--
 Management unit 03, Study no: 4

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron smithii</i>	a ⁻	a ⁻	a ⁻	a ⁻	b ¹⁹	c ¹¹¹	-	-	.16	3.59
G	<i>Agropyron spicatum</i>	b ²⁷¹	b ²⁷⁶	b ²⁶⁷	b ²³⁷	b ²²⁴	a ¹³²	12.89	12.87	16.86	7.20
G	<i>Bromus japonicus</i> (a)	-	-	c ¹⁸⁶	b ⁸¹	a ²⁰	a ³⁶	5.14	.85	.12	.10
G	<i>Bromus tectorum</i> (a)	-	-	b ¹¹⁴	a ⁴⁶	a ³⁵	a ⁵⁰	2.62	.73	.91	.87
G	<i>Elymus cinereus</i>	-	-	2	3	2	4	.53	.85	1.00	.88
G	<i>Hordeum jubatum</i>	4	5	-	-	-	-	-	-	-	-
G	<i>Koeleria cristata</i>	ab ⁵²	b ⁵³	ab ²⁸	ab ³²	b ⁴²	a ¹⁶	.79	.55	.94	.28
G	<i>Poa bulbosa</i>	a ⁻	a ⁻	b ⁵²	b ⁸⁵	c ²²⁵	d ³⁰⁰	1.55	2.82	15.37	25.17
G	<i>Poa pratensis</i>	-	-	-	4	10	10	-	.04	.04	.21
G	<i>Poa secunda</i>	b ²⁰²	c ²⁶⁷	b ¹⁶⁰	bc ²¹³	b ¹⁶²	a ¹⁰⁴	3.42	4.59	7.33	14.96
G	<i>Stipa comata</i>	-	-	-	1	-	-	-	.00	-	-
G	<i>Stipa lettermani</i>	-	-	-	-	1	1	-	-	.00	.00
Total for Annual Grasses		0	0	300	127	55	86	7.76	1.59	1.03	0.97
Total for Perennial Grasses		529	601	509	575	685	678	19.20	21.74	41.72	52.31
Total for Grasses		529	601	809	702	740	764	26.96	23.33	42.76	53.29
F	<i>Achillea millefolium</i>	c ¹⁹¹	b ⁸⁴	ab ⁴⁹	ab ⁵⁵	ab ⁵⁶	a ⁴¹	.60	.42	1.07	1.41
F	<i>Agoseris glauca</i>	a ⁻	c ¹²⁶	a ¹	a ²	b ²⁵	ab ¹⁵	.00	.00	.08	.07
F	<i>Allium acuminatum</i>	bc ²³	a ⁴	a ⁻	a ¹	ab ⁶	c ³²	-	.00	.03	.24
F	<i>Alyssum alyssoides</i> (a)	-	-	b ¹¹⁴	a ⁶⁷	a ³⁹	a ⁴⁹	.32	.18	.08	.35
F	<i>Antennaria rosea</i>	-	-	-	2	4	-	-	.03	.03	-
F	<i>Arabis drummondii</i>	a ⁻	a ¹	b ⁹	a ⁻	a ¹	a ⁻	.02	-	.00	-
F	<i>Aster chilensis</i>	-	1	3	3	2	2	.00	.03	.01	.00
F	<i>Astragalus convallarius</i>	a ⁻	b ¹⁷	ab ¹⁰	a ²	b ¹⁸	ab ⁹	.05	.03	.13	.09

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Calochortus nuttallii</i>	3	-	-	1	-	-	-	.00	-	-
F	<i>Cirsium undulatum</i>	12	12	14	7	12	10	.39	.24	.38	.63
F	<i>Collinsia parviflora</i> (a)	-	-	b60	b58	b58	a18	.11	.16	.17	.06
F	<i>Collomia linearis</i> (a)	-	-	a9	a4	b80	c140	.02	.01	.19	3.01
F	<i>Comandra pallida</i>	-	-	-	-	-	3	-	-	-	.03
F	<i>Cordylanthus</i> sp. (a)	-	-	b19	a-	ab13	a3	.30	-	.57	.01
F	<i>Crepis acuminata</i>	a-	b10	a-	a-	ab5	b9	-	-	.09	.24
F	<i>Cryptantha</i> sp.	-	6	-	-	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	a3	a-	a-	b28	.00	-	-	.05
F	<i>Draba</i> sp. (a)	-	-	a-	a3	a11	b128	-	.00	.02	.40
F	<i>Epilobium brachycarpum</i> (a)	-	-	a13	a19	b46	a1	.03	.16	.18	.00
F	<i>Erigeron</i> sp.	-	-	-	3	4	-	-	.06	.03	-
F	<i>Eriogonum cernuum</i> (a)	-	-	1	-	-	-	.00	-	-	-
F	<i>Eriogonum umbellatum</i>	-	3	1	2	2	1	.03	.00	.15	.15
F	<i>Erodium cicutarium</i> (a)	-	-	a7	b50	b42	b65	.07	1.65	.76	.33
F	<i>Galium aparine</i> (a)	-	-	-	-	-	3	-	-	-	.03
F	<i>Holosteum umbellatum</i> (a)	-	-	b76	a29	a17	b87	.28	.44	.10	.38
F	<i>Lactuca serriola</i> (a)	-	-	-	3	3	-	-	.01	.03	-
F	<i>Lappula occidentalis</i> (a)	-	-	a2	a11	a-	b48	.00	.03	-	.57
F	<i>Lithospermum ruderale</i>	a-	a-	b10	a-	a1	a-	.24	-	.03	-
F	<i>Lomatium triternatum</i>	-	-	-	-	9	11	-	-	.01	.10
F	<i>Lupinus argenteus</i>	9	7	8	3	6	9	.06	.04	.05	.33
F	<i>Microsteris gracilis</i> (a)	-	-	b44	a4	a3	a8	.08	.01	.01	.02
F	<i>Orthocarpus tolmiei</i> (a)	-	-	-	-	-	-	-	.03	-	-
F	<i>Phlox longifolia</i>	-	5	-	-	9	8	-	-	.01	.02
F	<i>Polygonum douglasii</i> (a)	-	-	bc32	a5	c43	ab21	.07	.01	.11	.08
F	<i>Ranunculus testiculatus</i> (a)	-	-	9	-	6	-	.01	-	.01	-
F	<i>Senecio multilobatus</i>	-	-	-	-	-	5	-	-	-	.21
F	<i>Taraxacum officinale</i>	-	9	-	-	-	-	-	-	-	-
F	<i>Tragopogon dubius</i> (a)	ab21	a3	a9	b33	a17	a2	.05	.34	.24	.03
F	<i>Trifolium gymnocarpon</i>	-	-	4	-	-	-	.01	-	-	-
F	<i>Trifolium</i> sp.	-	-	-	-	2	-	-	-	.00	-
F	Unknown forb-perennial	-	2	-	-	-	-	-	-	-	-
F	<i>Veronica biloba</i> (a)	-	-	1	-	6	-	.00	-	.01	-
F	<i>Zigadenus paniculatus</i>	-	3	-	-	-	-	-	-	-	-
Total for Annual Forbs		21	3	399	286	384	601	1.39	3.07	2.49	5.35
Total for Perennial Forbs		238	290	109	81	162	155	1.42	0.88	2.15	3.56
Total for Forbs		259	293	508	367	546	756	2.82	3.95	4.65	8.91

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	19	15	22	25	3.47	5.05	4.53	6.81
B	Chrysothamnus viscidiflorus viscidiflorus	66	57	65	57	4.69	3.65	4.42	3.28
B	Eriogonum heracleoides	0	1	0	0	-	-	-	-
B	Gutierrezia sarothrae	9	1	6	0	.24	-	.15	-
B	Purshia tridentata	15	16	14	12	4.09	5.25	6.25	2.61
B	Ribes sp.	0	0	1	1	-	-	.38	.15
B	Tetradymia canescens	2	4	6	5	-	-	.03	.18
Total for Browse		111	94	114	100	12.50	13.97	15.76	13.04

CANOPY COVER, LINE INTERCEPT--

Management unit 03, Study no: 4

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	5.86	8.76
Chrysothamnus viscidiflorus viscidiflorus	5.76	4.13
Gutierrezia sarothrae	-	.05
Purshia tridentata	8.66	4.75
Ribes sp.	-	.56
Tetradymia canescens	.43	.38

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 03, Study no: 4

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.3	2.4	4.7
Purshia tridentata	4.2	4.3	1.3

BASIC COVER--

Management unit 03, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	6.25	19.75	43.24	47.43	61.08	61.86
Rock	1.00	.75	.86	.36	.49	.36
Pavement	1.25	0	.95	.93	1.17	2.83
Litter	70.75	50.75	51.29	52.27	36.35	37.90
Cryptogams	5.50	7.00	12.98	6.75	5.71	1.02
Bare Ground	15.25	21.75	10.92	14.55	10.28	7.59

SOIL ANALYSIS DATA --

Management unit 03, Study no: 4, Study Name: Anderson Ranch

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.5	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	4	3	1	-	20 (50)	27 (68)	-
Rabbit	5	8	11	2	-	-	-
Grouse	-	1	-	-	9 (22)	-	-
Elk	23	10	13	17	32 (79)	38 (94)	52 (127)
Deer	38	53	47	25	140 (346)	55 (136)	38 (94)
Cattle	2	-	-	2	-	1 (2)	5 (13)

BROWSE CHARACTERISTICS--

Management unit 03, Study no: 4

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	36/51	
<i>Artemisia tridentata vaseyana</i>										
84	399	0	33	67	-	0	100	0	28/35	
90	998	27	53	20	-	20	0	0	28/31	
96	400	25	75	0	160	65	0	0	35/50	
01	420	14	67	19	-	29	0	0	33/50	
06	620	26	61	13	500	23	23	3	36/54	
11	600	7	67	27	120	7	0	100	32/51	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	2465	19	81	0	-	0	0	0	12/13	
90	3398	20	76	4	-	6	0	2	13/17	
96	3120	3	96	2	20	8	0	0	15/23	
01	2380	3	85	13	-	2	0	.84	12/20	
06	2620	7	86	7	-	4	3	4	15/23	
11	2020	14	68	18	-	8	0	77	11/19	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Eriogonum heracleoides</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	4/10	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	440	5	95	-	-	0	0	0	7/9	
01	20	0	100	-	-	0	0	0	4/5	
06	140	0	100	-	-	0	0	0	10/16	
11	0	0	0	-	-	0	0	0	14/29	
<i>Juniperus scopulorum</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	66	0	100	-	-	0	0	0	134/81	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Purshia tridentata</i>										
84	865	0	8	92	-	8	92	8	32/37	
90	998	20	13	67	-	33	33	13	15/26	
96	320	6	94	0	-	44	25	0	29/55	
01	340	12	82	6	-	12	53	6	36/62	
06	420	10	71	19	-	48	14	5	37/62	
11	240	0	67	33	-	8	0	92	39/62	
<i>Ribes sp.</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	48/22	
11	20	0	100	-	-	0	0	100	63/33	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	15/16	
01	0	0	0	-	-	0	0	0	19/28	
06	0	0	0	-	-	0	0	0	24/24	
11	0	0	0	-	-	0	0	0	23/44	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Tetradymia canescens										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	40	0	100	0	-	0	0	0	18/33	
01	80	0	100	0	-	0	0	0	17/33	
06	180	33	22	44	-	0	0	44	21/34	
11	140	29	57	14	-	14	0	29	13/25	

THREEMILE CANYON - TREND STUDY NO. 3-12-11

Vegetation Type: Bitterbrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Stony Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: USFS

Elevation: 6,100 ft (1,859 m)

Aspect: South

Slope: 45%

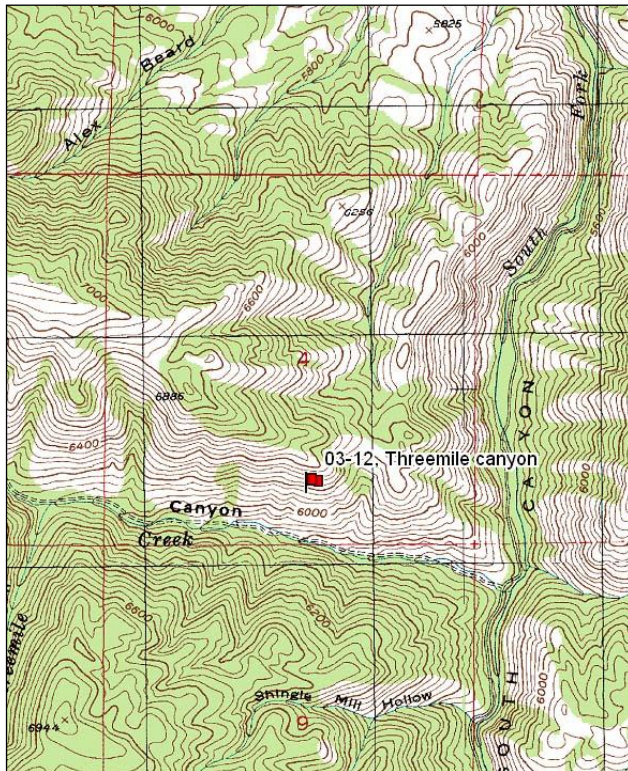
Transect bearing: 159° magnetic

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

Directions:

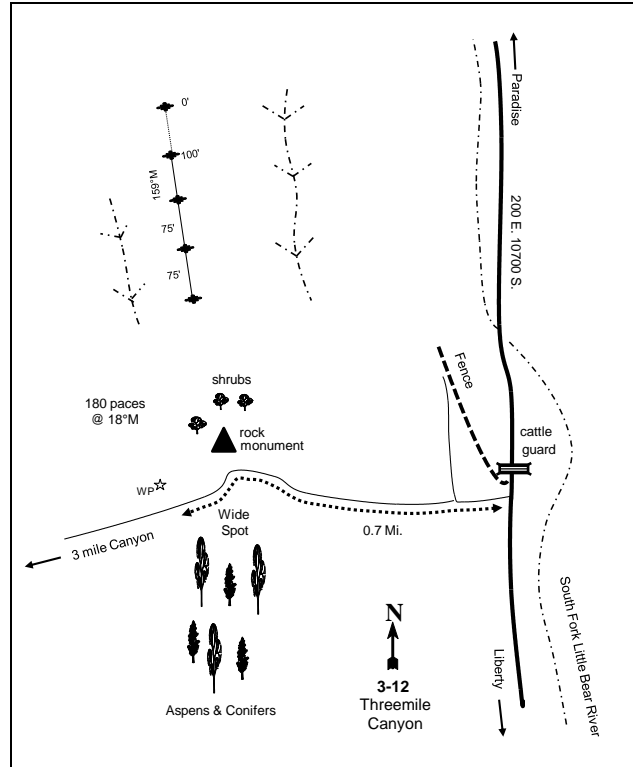
From 200 East and 10700 South in Avon, proceed south (towards Liberty) on a dirt road for 7.0 miles. Cross the cattle guard and turn immediately right (west). Travel 0.7 miles up Threemile Canyon and stop adjacent to a green and white witness post on the right side of road. Walk 180 paces at 18 degrees 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



Township: 8N Range: 1E Section: 4

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 429564 E 4589493 N

THREEMILE CANYON - TREND STUDY NO. 3-12

Site Information

Site Description: This study samples a sparse antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community on a steep, south facing side hill in Threemile Canyon, a tributary of the South Fork of the Little Bear River. Deer and elk pellet groups have been sampled in low abundance since 2005 (Table - Pellet Group Data).

Browse: Browse composition primarily consists of a moderately dense stand of antelope bitterbrush, interspersed with a low density stand of mountain big sagebrush. Bitterbrush provides nearly all of the browse cover on the site (Table - Browse Trends). Utilization of bitterbrush has been mostly moderate, with some heavy use. Decadence of bitterbrush was high at the outset of the study, but decreased in 1996 and has been low since that time. Recruitment of young bitterbrush plants has been poor in most sample years. Mountain big sagebrush density steadily decreased from 1984 to 2006, with no sagebrush plants sampled in 2006. Decadence of sagebrush was high throughout those sample years. In 2011, a small population of mostly young sagebrush plants was sampled, and decadence was low. Utilization of sagebrush was moderate to heavy at the outset of the study, but has been mostly light since 1996. Mountain snowberry (*Symphoricarpos oreophilus*), Woods rose (*Rosa woodsii*), and Saskatoon serviceberry (*Amelanchier alnifolia*) are also present in low numbers (Table - Browse Characteristics).

Herbaceous Understory: Grasses are abundant on the site, but the grass composition is dominated by weedy species. The annual grass species Japanese chess (*Bromus japonicus*) and cheatgrass (*B. tectorum*) are prevalent. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) was rare at the outset of the study, but has steadily increased over the course of the study and is now one of the dominant species on the site. The native perennial species bluebunch wheatgrass (*Agropyron spicatum*) is the only other grass species that provides substantial cover. Bluebunch wheatgrass has maintained a fairly stable frequency over the course of the study. Forbs are fairly diverse and abundant, but are dominated by annual or weedy species such as tall annual willowherb (*Epilobium brachycarpum*), prickly lettuce (*Lactuca serriola*), and yellow salsify (*Tragopogon dubius*). The noxious weed dyer's woad (*Isatis tinctoria*) is also found on the site. Arrowleaf balsamroot (*Balsamorhiza sagittata*) is perhaps the most desirable forb, but it occurs only occasionally (Table - Herbaceous Trends).

Soil: The soil is in the Sheep Creek series, which occurs on mountain slopes. Parent material consists of residuum and colluvium derived from limestone, sandstone, and quartzite. The soils are classified as moderately deep, well drained soils (Soil Survey Staff 2011). Soils have a clay loam texture with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). This soil often has a calcareous accumulation at approximately 22 inches depth. Rocks are common on the surface and within the profile. Bare ground cover is low, with a large amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** Bitterbrush density decreased 22% from 599 plants/acre to 465 plants/acre, and sagebrush density decreased 67% from 999 plants/acre to 332 plants/acre. Decadence of bitterbrush and sagebrush remained high at 43% and 50%, respectively.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of bitterbrush decreased to 5%, but decadence in the small population of sagebrush remained similar at 44%. Recruitment of young bitterbrush plants increased to 12% of the population.

- **1996 to 2001 - slightly down (-1):** Density of bitterbrush decreased 15% to from 820 plants/acre to 700 plants/acre, but cover remained similar at 8%. Decadence of bitterbrush increased to 17%, and recruitment of young plants decreased to 3%.
- **2001 to 2006 - slightly up (+1):** The density of bitterbrush increased 17% to 820 plants/acre, and cover remained similar at 8%. Decadence of bitterbrush decreased to 7%, but recruitment of young plants remained low at 5%.
- **2006 to 2011 - down (-2):** Bitterbrush density decreased 22% to 640 plants/acre, but cover increased slightly to 10%. Decadence decreased to 0%, and recruitment of young plants remained similar at 3%.

Grass:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 10%. Bluebunch wheatgrass decreased significantly in nested frequency, while the weedy species bulbous bluegrass increased significantly.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 19%. Annual grasses were included in the sample for the first time, and were shown to dominate the site providing 26% cover.
- **1996 to 2001 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, though cover increased from 5% to 10%. The weedy species bulbous bluegrass increased significantly in nested frequency on the site, and cover increased from near 0% to 2%. Annual grasses still dominated the site, and increased in cover to 30%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased by 31%, but cover remained similar at 10%. Bluebunch wheatgrass increased significantly in nested frequency, and cover increased from 8% to 9%. However, bulbous bluegrass also increased significantly in nested frequency, and cover increased from 2% to 3%. Japanese chess decreased significantly in nested frequency, and cover decreased from 8% to 1%. Nested frequency of cheatgrass remained similar, but cover decreased from 22% to 10%.
- **2006 to 2011 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 26%, though cover remained similar. Bulbous bluegrass increased significantly in nested frequency, and cover increased to 9%.

Forb:

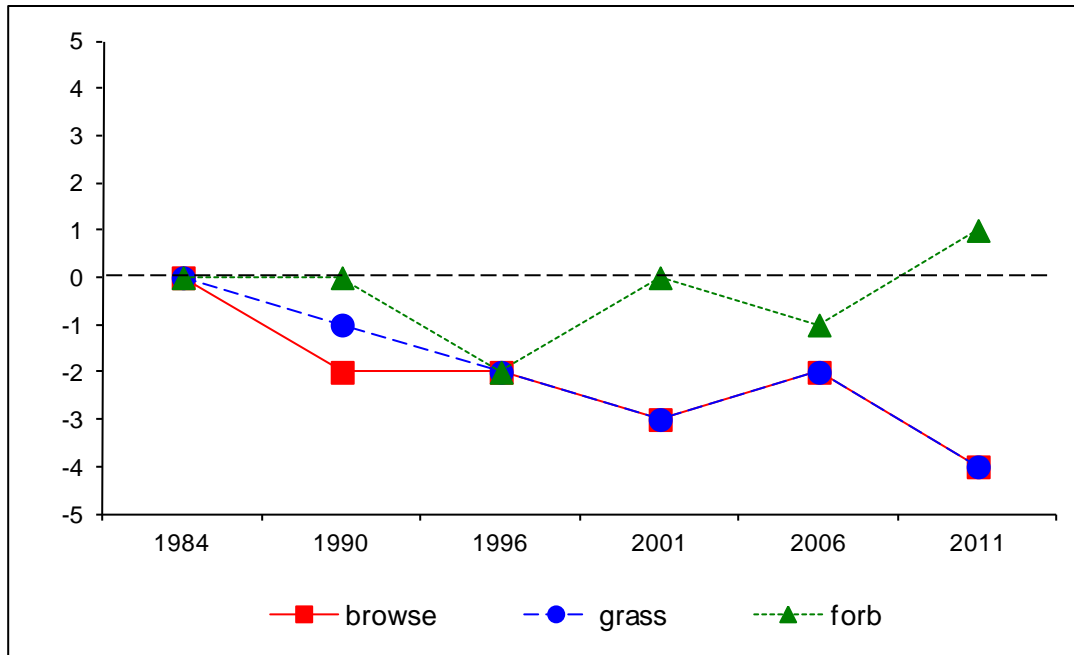
- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial forbs remained similar. The annual forb sum of nested frequency increased substantially.
- **1990 to 1996 - down (-2):** There was a 27% decrease in the sum of nested frequency of perennial forbs. The sum of nested frequency of annual forbs again increased markedly.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased 36%, and cover increased from 5% to 7%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs increased 25%, and cover increased to 9%. However, much of this increase was due to an increase in the nested frequency of the noxious weed, dyer's woad, and the weedy species stickseed (*Hackelia patens*). The sum of nested frequency of annual forbs increased substantially, and cover increased from 7% to 13%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 31%, and cover increased to 11%. There was a significant decrease in the noxious weed dyer's woad. The sum of nested frequency of annual forbs remained similar, but cover increased to 30%. The increase in cover of annual forbs is primarily due to a large increase in cover of tall annual willowherb.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 3, study no: 12

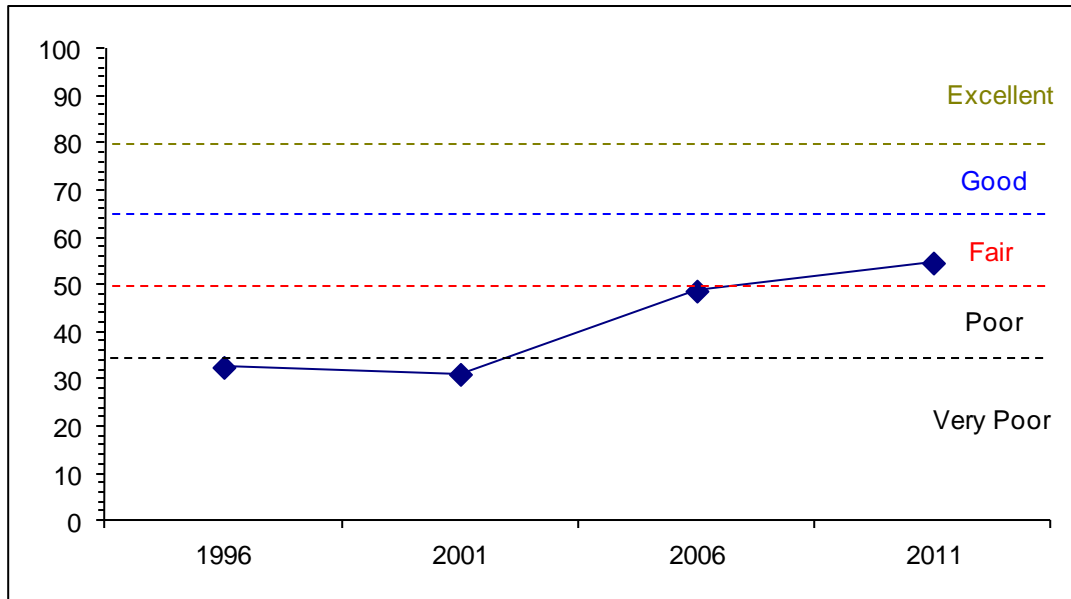
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.8	13.0	6.3	13.0	-19.8	9.2	-2.0	32.5	Very Poor
01	11.6	9.9	1.6	19.9	-20.0	10.0	-2.0	31.0	Very Poor
06	12.5	13.0	2.4	20.6	-7.8	10.0	-2.0	48.7	Poor-Fair
11	15.2	14.9	1.8	21.6	-7.0	10.0	-2.0	54.6	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 3 Study no: 12



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 3, Study no: 12



HERBACEOUS TRENDS--
 Management unit 03, Study no: 12

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron intermedium	-	-	-	-	-	2	-	-	-	.03
G	Agropyron spicatum	c220	ab164	a120	a131	bc178	ab151	4.64	7.90	9.40	10.60
G	Bromus japonicus (a)	-	-	c354	b205	a90	a128	20.07	8.06	.52	1.87
G	Bromus tectorum (a)	-	-	a209	b276	b300	a192	6.28	22.38	9.89	7.45
G	Carex sp.	-	-	-	3	-	2	-	.00	-	.00
G	Elymus cinereus	a-	a1	b22	ab13	ab8	a-	1.63	1.83	.36	-
G	Poa bulbosa	a-	b18	b11	c75	d121	e178	.12	1.57	2.61	8.46
G	Poa secunda	a-	b32	ab18	ab18	b30	a4	.20	.20	.55	.15
Total for Annual Grasses		0	0	563	481	390	320	26.36	30.44	10.41	9.32
Total for Perennial Grasses		220	215	171	240	337	337	6.60	11.52	12.92	19.26
Total for Grasses		220	215	734	721	727	657	32.96	41.97	23.34	28.59
F	Achillea millefolium	a-	a-	ab6	ab6	a2	b11	.03	.06	.15	.30
F	Agoseris glauca	bc34	abc19	a5	a1	ab17	c46	.01	.01	.10	.63
F	Allium acuminatum	a17	a-	a-	a-	a4	b26	-	-	.01	.36
F	Alyssum alyssoides (a)	-	-	ab88	ab109	a50	b97	.30	1.23	.18	1.76
F	Artemisia ludoviciana	25	30	29	56	31	52	.88	3.27	1.70	3.44
F	Aster chilensis	-	-	1	1	-	3	.06	.00	-	.21
F	Balsamorhiza sagittata	14	16	6	14	11	16	1.75	2.82	2.75	3.09
F	Calochortus nuttallii	-	8	-	2	9	7	-	.00	.04	.04
F	Camelina microcarpa (a)	-	-	1	5	6	4	.00	.04	.02	.00
F	Chaenactis douglasii	-	-	-	-	-	3	-	-	-	.00
F	Cirsium sp.	a1	b29	a13	a2	a5	a2	.37	.06	.42	.03
F	Collinsia parviflora (a)	-	-	a3	a1	b54	a3	.00	.00	.13	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Collomia linearis</i> (a)	-	-	b44	a10	b67	a11	.18	.02	.28	.02
F	<i>Crepis acuminata</i>	a-	b29	ab21	a6	ab7	ab18	.22	.09	.45	.97
F	<i>Epilobium brachycarpum</i> (a)	-	-	b104	a18	c166	c193	.91	.04	3.18	11.44
F	<i>Erodium cicutarium</i> (a)	-	-	a-	b10	c83	b34	-	.13	1.60	.21
F	<i>Galium aparine</i> (a)	-	-	a3	a-	b34	b48	.03	-	.20	1.88
F	<i>Hackelia patens</i>	a-	a-	a-	a6	b41	a8	-	.06	.80	.33
F	<i>Holosteum umbellatum</i> (a)	-	-	a7	b77	b104	a11	.02	.33	.35	.45
F	<i>Isatis tinctoria</i>	a-	a4	a7	ab16	b32	a13	.16	.22	1.38	.35
F	<i>Lactuca serriola</i> (a)	a-	a43	b99	bc113	c133	d254	1.13	2.82	2.46	9.07
F	<i>Lappula occidentalis</i> (a)	-	-	a2	b18	ab12	b18	.00	.06	.03	.14
F	<i>Lesquerella</i> sp.	-	-	-	2	-	-	-	.00	-	-
F	<i>Lithospermum ruderale</i>	-	-	12	6	5	1	1.06	.45	.93	.03
F	<i>Lomatium grayi</i>	-	1	-	-	6	1	-	-	.16	.03
F	<i>Madia glomerata</i> (a)	-	-	-	-	17	8	-	-	1.14	.19
F	<i>Melilotus officinalis</i>	a-	a-	a-	a-	a-	b13	-	-	-	.66
F	<i>Microsteris gracilis</i> (a)	-	-	a-	a-	c41	b22	-	-	.15	.09
F	<i>Polygonum douglasii</i> (a)	-	-	-	1	6	6	.00	.00	.01	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	3	4	-	-	.00	.00	-
F	<i>Senecio multilobatus</i>	b41	a-	a-	a2	a-	a3	-	.00	-	.15
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	-	5	3	-	-	.48	.03
F	<i>Tragopogon dubius</i> (a)	a32	d185	d195	b76	bc95	c139	5.07	2.05	2.01	2.11
F	Unknown forb-perennial	-a	a-	a-	b16	a-	a-	-	.13	-	-
F	<i>Veronica biloba</i> (a)	-	-	a21	a45	c170	b102	.70	.14	1.11	2.74
Total for Annual Forbs		32	228	567	486	1047	953	8.38	6.90	13.40	30.22
Total for Perennial Forbs		132	136	100	136	170	223	4.57	7.21	8.94	10.66
Total for Forbs		164	364	667	622	1217	1176	12.96	14.11	22.34	40.89

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	'11	'96	'01	'06	'11
B	<i>Artemisia tridentata vaseyana</i>	8	5	0	3	.41	-	-	.15
B	<i>Mahonia repens</i>	2	2	2	2	.15	.03	.18	.18
B	<i>Purshia tridentata</i>	25	27	26	25	8.01	7.73	8.06	9.63
B	<i>Rosa woodsii</i>	5	4	5	6	.24	.03	.30	.48
Total for Browse		40	38	33	36	8.81	7.79	8.55	10.44

CANOPY COVER, LINE INTERCEPT--

Management unit 03, Study no: 12

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	-	.38
Mahonia repens	.18	-
Purshia tridentata	11.78	14.78
Rosa woodsii	.43	.33

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 03, Study no: 12

Species	Average leader growth (in)		
	'01	'06	'11
Purshia tridentata	3.9	3.1	2.9

BASIC COVER--

Management unit 03, Study no: 12

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.50	9.00	56.96	62.90	55.22	75.00
Rock	15.25	12.75	5.47	8.76	14.80	8.39
Pavement	10.25	17.00	.50	5.16	3.67	8.97
Litter	49.75	40.50	64.06	33.45	35.54	41.84
Cryptogams	.75	0	0	0	.03	0
Bare Ground	20.50	20.75	4.86	7.33	14.36	3.37

SOIL ANALYSIS DATA --

Management unit 03, Study no: 12, Study Name: Threemile Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
16.1	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Elk	1	-	-	-	2 (5)	1 (2)	-
Deer	5	13	5	1	26 (65)	13 (33)	2 (5)
Cattle	-	1	-	-	-	-	-
Grouse	-	-	-	-	-	-	9
							Groups/Acre

BROWSE CHARACTERISTICS--

Management unit 03, Study no: 12

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	29/34	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	42/42	
11	0	0	0	-	-	0	0	0	44/48	
<i>Artemisia tridentata vaseyana</i>										
84	999	0	57	43	-	13	87	0	26/32	
90	332	0	50	50	-	70	10	30	21/17	
96	180	11	44	44	-	22	0	0	18/22	
01	100	0	60	40	-	0	0	20	19/22	
06	0	0	0	0	-	0	0	0	28/43	
11	100	60	40	0	20	0	0	0	20/29	
<i>Mahonia repens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	320	0	100	-	-	0	0	0	6/6	
01	440	5	95	-	-	0	0	0	-/-	
06	620	0	100	-	-	0	0	0	3/5	
11	40	50	50	-	-	0	0	0	5/6	
<i>Purshia tridentata</i>										
84	599	0	56	44	-	0	100	0	30/48	
90	465	0	57	43	-	21	36	7	25/48	
96	820	12	83	5	20	51	15	0	32/59	
01	700	3	80	17	-	37	17	0	34/57	
06	820	5	88	7	-	61	22	2	32/53	
11	640	3	97	0	-	50	6	3	30/62	
<i>Rosa woodsii</i>										
84	332	50	50	0	-	0	0	0	7/4	
90	1099	100	0	0	-	0	0	0	-/-	
96	420	38	62	0	-	33	0	0	12/11	
01	340	41	59	0	-	0	0	0	17/12	
06	400	0	100	0	-	0	0	0	23/23	
11	320	0	94	6	-	0	0	0	20/15	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Symphoricarpos oreophilus										
84	231	43	43	14	-	14	29	0	18/43	
90	99	100	0	0	-	33	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	37/51	
11	0	0	0	0	-	0	0	0	41/81	

MIDDLE FORK - TREND STUDY NO. 3-17-11

Vegetation Type: Low Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: DWR

Elevation: 5,900 ft (1,798 m)

Aspect: Southwest

Slope: 20%

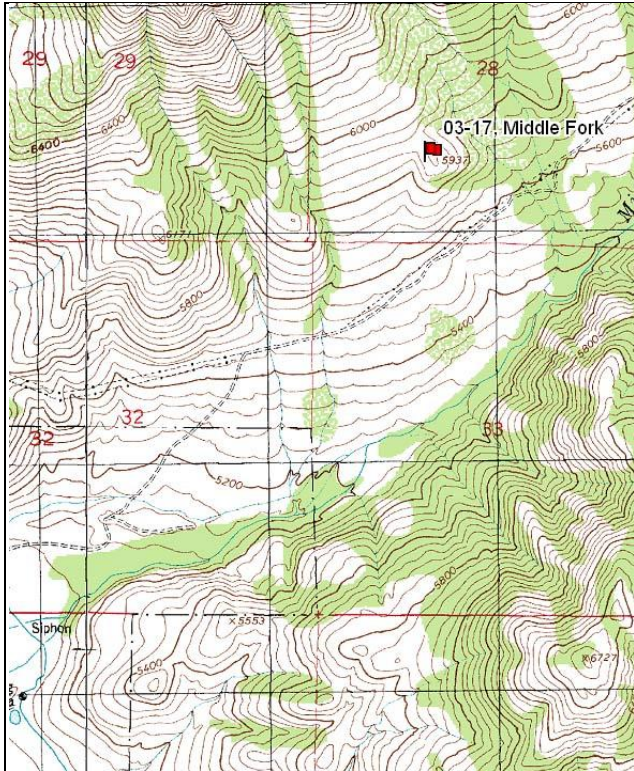
Transect bearing: 165° magnetic

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

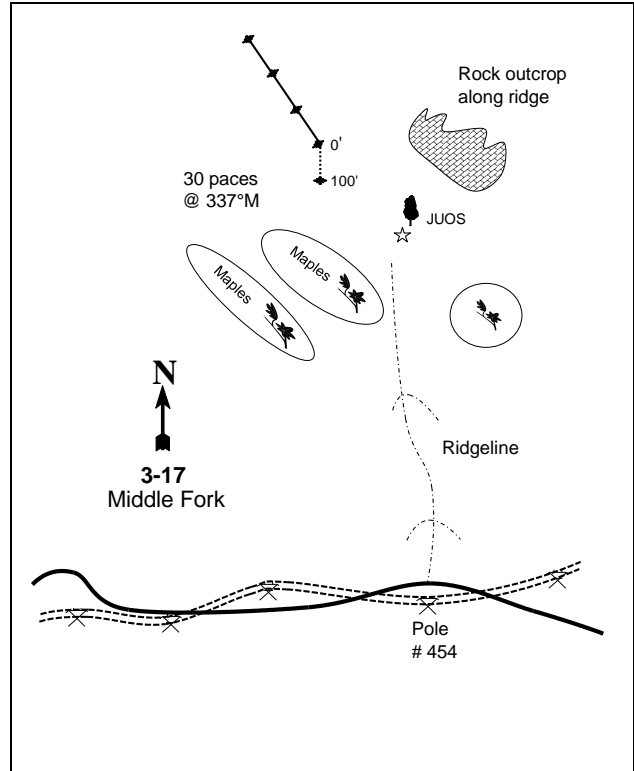
Directions:

From 5500 East and 2200 North in Eden, proceed 0.4 miles to a bend. Continue east another 1.9 miles 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 to the left side, and 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

GPS: NAD 83, UTM 12S 438630 E 4573507 N

MIDDLE FORK - TREND STUDY NO. 3-17

Site Information

Site Description: The study samples a low sagebrush (*Artemisia arbuscula*) and grass community overlooking the Middle Fork of the Ogden River. The study lies within the Division of Wildlife Resources (DWR) Middle Fork Wildlife Management Area (WMA). Although it was heavily grazed to some extent in the past, there have been no signs of livestock use since 1996. Deer pellet groups were sampled in low abundance in 2001 and 2006, but moderate abundance in 2011. Elk pellet groups have been sampled in low abundance since 2001. A cow elk carcass was found to the south of the site in 2011. Moose and grouse pellet groups have also been noted on the site (Table - Pellet Group Data). A sharp-tail grouse was seen near the site in 2011.

Browse: The most abundant browse species is low sagebrush, which provides nearly all of the browse cover on the site (Table - Browse Trends). The low sagebrush population is comprised of a dense stand of mostly mature plants. Utilization of low sagebrush has been mostly light to moderate since the outset of the study. Decadence was high in the population in 1990, but has been more moderate in other sample years. Recruitment of young plants has fluctuated throughout the sample years, but has been fairly good. Other more valuable species in terms of preference for wildlife are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and Utah serviceberry (*Amelanchier utahensis*). However, these species are found in small numbers, and are not abundant enough to be considered key species. These species have been moderately to heavily utilized over the course of the study (Table - Browse Characteristics). High competition from a dense, weedy understory likely makes establishment of seedlings very difficult. An open stand of bigtooth maple (*Acer grandidentatum*) near the site provides fair resting cover, but thermal cover would be limited in the winter.

Herbaceous Understory: Grasses are moderately abundant and diverse, but are dominated by the weedy species bulbous bluegrass (*Poa bulbosa*). Bulbous bluegrass has provided over half of the grass cover since 1996, and nested frequency has increased significantly over the course of the study. The native perennial bluebunch wheatgrass (*Agropyron spicatum*) is fairly abundant, and has maintained a fairly stable nested frequency throughout the study. Other perennial grass species are far less common. The annual grasses cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) were common when first included in the sample in 1996, but have decreased since that time and were rare in 2011. Forbs are also fairly abundant and diverse. The composition is fair with pacific aster (*Aster chilensis*), carrotleaf leptotaenia (*Lomatium dissectum*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and mulesears (*Wyethia amplexicaulis*) providing the majority of the forb cover (Table - Herbaceous Trends).

Soil: The soil is in the Durfee series, which occurs on mountain slopes and mountainsides. Parent material consists of colluvium derived from sandstone and quartzite. These soils are classified as deep and well drained (Soil Survey Staff 2011). The soil texture is a clay loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). There is a large amount of vegetation, litter, rock, pavement, and cryptogam cover, keeping bare ground cover very low (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** Density of low sagebrush increased slightly from 6,865 plants/acre to 7,198 plants/acre. However, decadence increased from 10% to 53%, and poor vigor increased from 14% to 20%. Recruitment of young plants decreased from 16% to 1%.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence, poor vigor, and recruitment of young low sagebrush returned to 1984 levels at 11%, 11%, and 21%, respectively.

- **1996 to 2001 - up (+2):** The density of low sagebrush increased 29% from 6,620 plants/acre to 8,560 plants/acre, and cover increased 12% to 13%. Decadence remained similar at 13%, poor vigor decreased to 5%, and recruitment of young plants remained similar at 19%.
- **2001 to 2006 - slightly down (-1):** The low sagebrush density decreased 12% to 7,560 plants/acre, but cover increased to 15%. Decadence increased to 21%, and poor vigor increased to 12%. Recruitment of young plants decreased to 6%.
- **2006 to 2011 - slightly down (-1):** The density of low sagebrush decreased 14% to 6,500 plants/acre, and cover decreased to 10%. Decadence remained similar at 17%, and poor vigor at 8%. Recruitment of young plants remained similar at 6%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 21%, with a significant increase in the nested frequency of Sandberg bluegrass (*Poa secunda*). Though not included in the sample, it was noted that annual brome species were abundant.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 45%. There was a significant decrease in the nested frequency of the desirable species bluebunch wheatgrass and Sandberg bluegrass, and a significant increase in the nested frequency of the weedy species bulbous bluegrass. Bulbous bluegrass became the dominant grass species in both frequency and cover. Annual grasses were included in the sample for the first time in 1996, and occurred at moderate levels.
- **1996 to 2001 - slightly up (+1):** The perennial grass sum of nested frequency, excluding bulbous bluegrass, increased by 39%, and cover increased from 6% to 14%. Most of the increase in frequency was due to a significant increase in the nested frequency of Sandberg bluegrass. The weedy species bulbous bluegrass increased significantly in nested frequency, and cover increased from 9% to 21%. Cheatgrass and Japanese chess decreased significantly, and annual grass cover decreased from 3% to 1%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 15%, and cover decreased to 12%. Most of the decrease was due to a significant decrease in the nested frequency of Sandberg bluegrass. Bulbous bluegrass nested frequency remained similar, but cover decreased to 12%.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, though cover increased slightly to 28%. Bulbous bluegrass nested frequency remained similar, but cover increased to 16%.

Forb:

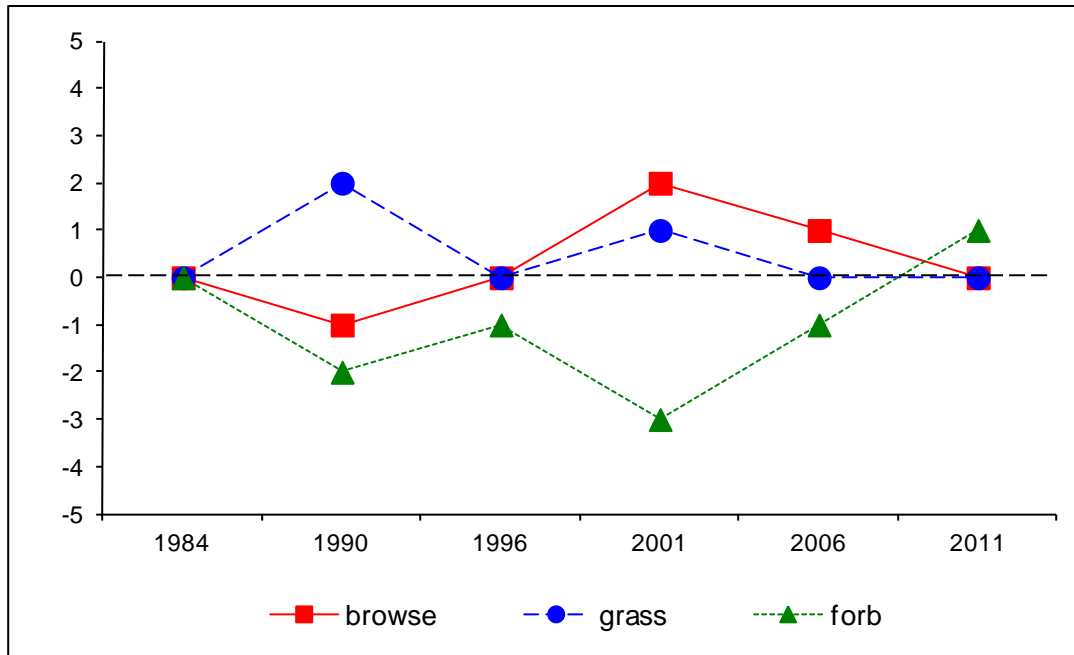
- **1984 to 1990 - down (-2):** The sum of nested frequency of perennial forbs decreased 27%.
- **1990 to 1996 - slightly up (+1):** The perennial forb sum of nested frequency increased 13%.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased 28%, though cover increased from 7% to 9%.
- **2001 to 2006 - up (+2):** There was a 42% increase in the sum of nested frequency of perennial forbs, and cover increased to 11%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 47%, and cover increased to 15%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 3, study no: 17

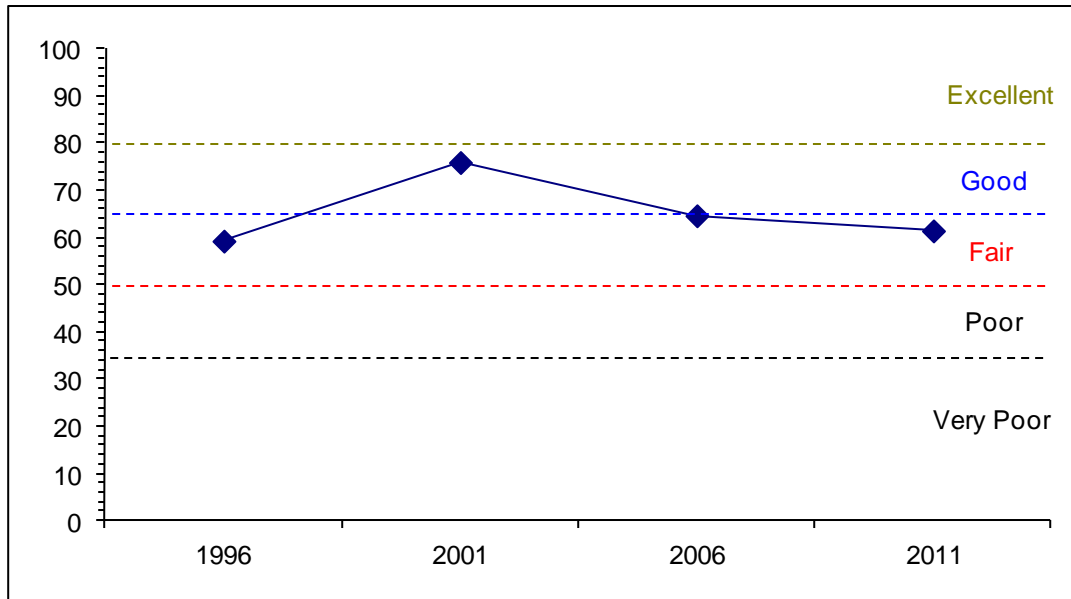
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.6	12.1	9.9	12.7	-2.0	10.0	0.0	59.2	Fair
01	16.7	11.2	9.7	28.8	-0.6	10.0	0.0	75.9	Good
06	18.3	8.7	3.0	24.7	0.0	10.0	0.0	64.6	Fair-Good
11	14.7	9.9	2.6	24.2	-0.1	10.0	0.0	61.4	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 3 Study no: 17



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 3, Study no: 17



HERBACEOUS TRENDS--
 Management unit 03, Study no: 17

Type	Species	Nested Frequency					Average Cover %				
		'85	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a ⁻	a ⁻	a ¹⁰	a ⁸	b ⁴⁶	a ¹⁵	.09	.07	1.77	.40
G	Agropyron spicatum	b ²³³	b ²⁵⁴	a ¹⁷³	ab ²¹⁶	a ¹⁸¹	ab ²²⁰	4.50	9.06	8.59	6.92
G	Agropyron trachycaulum	-	-	-	6	2	1	-	.13	.03	.00
G	Bromus japonicus (a)	-	-	c ²¹¹	b ⁴²	a ⁵	a ³	1.26	.17	.01	.00
G	Bromus tectorum (a)	-	-	c ¹³²	b ⁵³	a ⁶	ab ²⁹	1.42	.60	.02	.07
G	Dactylis glomerata	-	-	-	15	1	-	-	1.55	.00	-
G	Danthonia californica	-	-	-	1	9	9	-	.03	.21	1.16
G	Danthonia unispicata	a ⁻	a ⁻	a ⁻	a ⁻	a ⁹	b ²⁸	-	-	.12	2.92
G	Koeleria cristata	-	-	2	-	-	-	.00	-	-	-
G	Melica bulbosa	b ⁴²	ab ²⁶	ab ²⁸	a ⁸	a ¹⁰	ab ²⁰	.20	.07	.20	.15
G	Poa bulbosa	a ⁴	a ³⁰	b ²⁶⁵	c ³¹⁵	bc ²⁹¹	c ³⁰⁸	9.23	20.61	12.34	15.62
G	Poa pratensis	a ⁻	a ⁻	a ⁻	a ⁻	a ¹	b ²³	-	.00	.00	.13
G	Poa secunda	b ¹⁵⁵	c ²³⁹	a ³²	b ¹⁴³	a ⁴²	a ²⁹	.53	3.48	.79	.19
G	Stipa lettermani	a ¹	a ¹	c ⁴³	a ⁻	bc ³⁷	ab ¹²	1.00	-	.58	.21
Total for Annual Grasses		0	0	343	95	11	32	2.69	0.77	0.03	0.07
Total for Perennial Grasses		435	550	553	712	629	665	15.58	35.03	24.67	27.73
Total for Grasses		435	550	896	807	640	697	18.27	35.81	24.70	27.80
F	Achillea millefolium	ab ⁹	a ³	b ¹⁹	ab ⁹	ab ⁸	ab ¹⁴	.31	.16	.16	.26
F	Agoseris glauca	ab ²⁰	b ³³	ab ²¹	a ¹¹	ab ³⁴	ab ³⁵	.13	.07	.22	.57
F	Allium sp.	b ³⁸	a ⁻	a ⁻	a ³	a ¹⁵	c ¹²⁸	-	.00	.07	1.48
F	Ambrosia sp.	-	-	-	-	-	-	-	-	-	.03
F	Arabis sp.	-	-	1	-	1	10	.00	-	.00	.02
F	Artemisia ludoviciana	b ⁷¹	b ⁴⁵	a ⁵	a ¹¹	a ²⁰	a ²¹	.06	.33	.65	.84

Type	Species	Nested Frequency						Average Cover %			
		'85	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Aster chilensis</i>	c69	c70	a21	bc46	ab33	ab36	.92	2.21	1.50	1.32
F	<i>Astragalus beckwithii</i>	-	-	3	-	-	-	.03	-	-	-
F	<i>Balsamorhiza macrophylla</i>	-	-	-	-	1	2	-	-	.15	.38
F	<i>Balsamorhiza sagittata</i>	b18	ab6	a1	a4	ab10	a4	.21	.45	1.66	1.44
F	<i>Borago officinalis</i>	8	-	-	-	-	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	5	2	-	-	-	14	-	-	-	.02
F	<i>Castilleja sp.</i>	-	4	1	2	9	4	.03	.06	.10	.19
F	<i>Cirsium sp.</i>	10	10	5	3	8	1	.04	.03	.30	.00
F	<i>Collinsia parviflora (a)</i>	-	-	1	5	14	4	.00	.02	.03	.01
F	<i>Collomia linearis (a)</i>	-	-	a23	a10	a3	b52	.71	.05	.00	.79
F	<i>Comandra pallida</i>	7	4	7	-	3	9	.18	-	.03	.04
F	<i>Crepis acuminata</i>	3	-	-	-	3	-	-	-	.03	-
F	<i>Descurainia pinnata (a)</i>	-	-	-	3	-	6	-	.00	-	.06
F	<i>Draba sp. (a)</i>	-	-	a41	a45	b93	c134	.12	.14	.21	.80
F	<i>Epilobium brachycarpum (a)</i>	-	-	a-	a-	b30	a8	-	-	.11	.02
F	<i>Erigeron strigosus</i>	-	-	11	5	3	-	.22	.01	.00	-
F	<i>Eriogonum cernuum (a)</i>	-	-	-	-	-	-	-	-	-	-
F	<i>Erodium cicutarium (a)</i>	-	-	a1	bc21	ab7	c41	.00	.34	.01	.23
F	<i>Galium aparine (a)</i>	-	-	ab1	a-	bc15	c20	.00	.00	.08	.30
F	<i>Grindelia squarrosa</i>	-	-	4	-	-	-	.03	-	-	-
F	<i>Hackelia patens</i>	a-	b26	ab7	ab4	ab5	a1	.19	.06	.22	.03
F	<i>Holosteum umbellatum (a)</i>	-	-	14	-	1	3	.16	-	.00	.00
F	<i>Lactuca serriola (a)</i>	-	9	2	1	-	13	.00	.00	-	.16
F	<i>Lappula occidentalis (a)</i>	-	-	-	2	1	-	-	.03	.00	-
F	<i>Lomatium dissectum</i>	a-	a2	b33	b31	b51	b50	.37	1.47	1.52	1.48
F	<i>Lupinus argenteus</i>	1	5	3	4	4	6	.15	.63	.15	.38
F	<i>Machaeranthera spp</i>	a-	a-	b57	a-	a-	a-	.23	-	-	-
F	<i>Madia glomerata (a)</i>	-	-	-	-	13	8	-	-	.10	.76
F	<i>Microsteris gracilis (a)</i>	-	-	-	1	4	5	-	.00	.01	.01
F	<i>Phlox longifolia</i>	-	-	-	1	-	-	-	.00	-	-
F	<i>Polygonum douglasii (a)</i>	-	-	ab14	a-	b26	a8	.03	-	.09	.02
F	<i>Senecio integerrimus</i>	3	3	-	-	-	-	-	-	-	-
F	<i>Taraxacum officinale</i>	-	-	8	12	-	7	.08	.02	-	.16
F	<i>Tragopogon dubius (a)</i>	a4	a11	c169	b81	a20	b95	2.69	1.62	.21	.84
F	Unknown forb-perennial	29	-	-	-	-	-	-	-	-	-
F	<i>Verbascum blattaria</i>	-	-	-	-	2	-	-	-	.03	-
F	<i>Viola sp.</i>	a-	a-	a-	a1	b9	ab2	-	.00	.05	.00
F	<i>Wyethia amplexicaulis</i>	ab14	a10	c44	c35	c40	bc37	3.80	3.68	3.55	6.26
Total for Annual Forbs		4	20	266	169	227	397	3.74	2.23	0.87	4.03
Total for Perennial Forbs		305	223	251	182	259	381	7.02	9.23	10.45	14.95
Total for Forbs		309	243	517	351	486	778	10.77	11.47	11.33	18.98

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	'11	'96	'01	'06	'11
B	Acer grandidentatum	2	1	1	1	1.25	1.70	1.37	.96
B	Artemisia arbuscula	92	88	92	86	11.80	13.00	14.63	10.32
B	Artemisia tridentata vaseyana	7	1	0	12	1.49	.38	-	1.39
B	Gutierrezia sarothrae	9	17	15	9	.26	.53	.28	.10
B	Purshia tridentata	1	1	1	1	-	-	-	.06
Total for Browse		111	108	109	109	14.81	15.62	16.29	12.84

CANOPY COVER, LINE INTERCEPT--

Management unit 03, Study no: 17

Species	Percent Cover	
	'06	'11
Acer grandidentatum	2.90	6.19
Artemisia arbuscula	19.75	15.41
Artemisia tridentata vaseyana	-	1.48
Gutierrezia sarothrae	.73	.36

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 03, Study no: 17

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia arbuscula	1.4	0.6	0.9

BASIC COVER--

Management unit 03, Study no: 17

Cover Type	Average Cover %					
	'85	'90	'96	'01	'06	'11
Vegetation	9.25	12.00	48.04	56.20	45.90	51.35
Rock	14.50	15.75	19.16	19.40	21.18	22.39
Pavement	2.75	9.50	2.04	2.82	6.87	3.98
Litter	55.50	56.50	57.15	45.01	36.81	35.20
Cryptogams	1.00	.50	.52	1.67	1.75	2.05
Bare Ground	17.00	5.75	.34	2.26	3.52	2.25

SOIL ANALYSIS DATA --

Management unit 03, Study no: 17, Study Name: Middle Fork

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.8	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	'11
Rabbit	1	-	1	-
Moose	-	-	1	-
Elk	25	9	12	11
Deer	8	4	14	16
Cattle	-	1	-	2

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	-	-
7 (18)	13 (31)	15 (38)
15 (36)	13 (33)	28 (69)
-	-	-

BROWSE CHARACTERISTICS--

Management unit 03, Study no: 17

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Acer grandidentatum										
85	999	93	7	-	199	0	0	0	14/10	
90	666	100	0	-	-	0	0	0	-/-	
96	40	50	50	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	-/-	
11	20	0	100	-	-	0	0	0	47/71	
Amelanchier utahensis										
85	599	78	0	22	-	44	56	11	-/-	
90	799	67	0	33	-	92	0	8	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	46/33	
11	0	0	0	0	-	0	0	0	25/48	
Artemisia arbuscula										
85	6865	16	75	10	66	0	0	14	10/14	
90	7198	1	46	53	133	47	6	20	12/18	
96	6620	21	67	11	1260	34	.60	11	13/21	
01	8560	19	68	13	-	14	.46	5	12/26	
06	7560	6	74	21	460	11	1	12	13/24	
11	6500	6	78	17	140	5	21	8	11/25	
Artemisia tridentata vaseyana										
85	532	0	75	25	-	0	0	0	26/19	
90	465	0	57	43	-	14	0	14	29/41	
96	200	10	90	0	-	30	0	0	26/47	
01	120	33	67	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	340	0	82	18	-	41	0	6	29/37	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
85	133	0	100	0	-	0	0	0	12/9	
90	66	0	100	0	-	0	0	0	9/11	
96	400	50	50	0	920	0	0	0	9/11	
01	760	0	100	0	-	0	0	0	9/25	
06	760	18	79	3	20	0	0	0	9/12	
11	380	0	95	5	-	0	0	0	8/11	
<i>Purshia tridentata</i>										
85	132	0	50	50	-	0	100	0	8/24	
90	332	40	20	40	-	40	0	20	11/31	
96	40	0	100	0	-	100	0	0	20/54	
01	20	0	100	0	-	100	0	0	14/55	
06	20	100	0	0	-	0	0	0	24/40	
11	20	0	100	0	-	100	0	0	22/67	
<i>Quercus gambelii</i>										
85	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	

GEERTSEN CANYON - TREND STUDY NO. 3-18-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: DWR

Elevation: 5,600 ft (1,707 m)

Aspect: Southwest

Slope: 25%

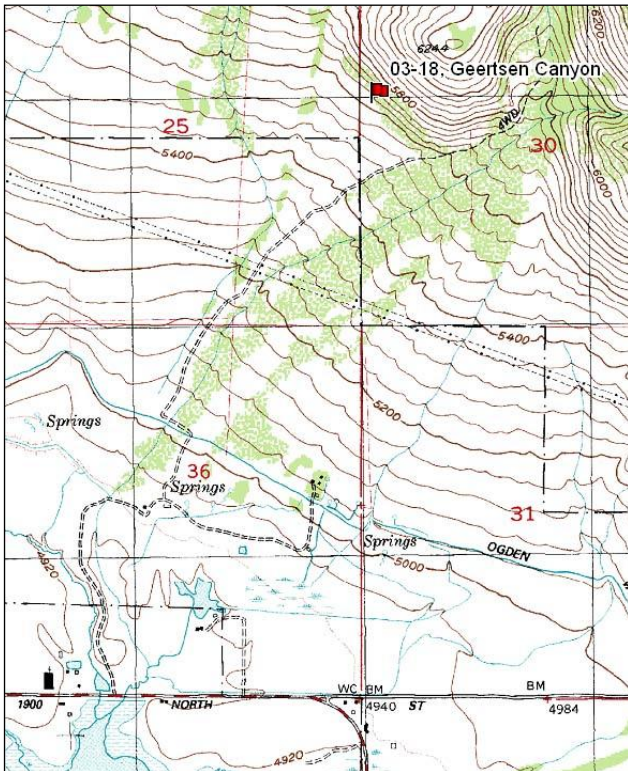
Transect bearing: 161° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft). Rebar: belt 1 on 1ft., belt 2 on 0ft., belt 3 on 2ft., belt 5 on 3ft. No rebar on belt 4.

Directions:

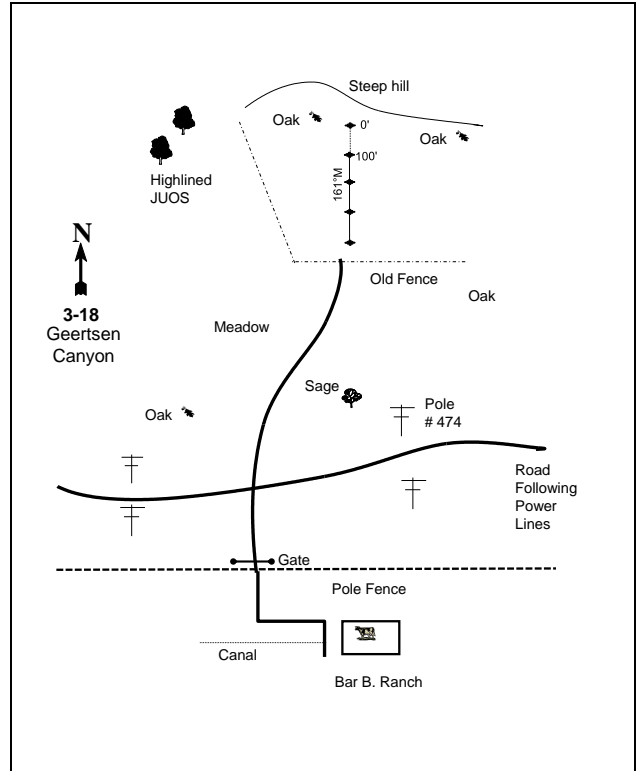
From the intersection of 5500 East and 2200 North in Eden, go south for 0.35 miles, then turn left and go 0.75 miles east to the Huntsville Stake Center. Continue east 0.2 miles to the gate of Bar B Ranch. Turn left through the gate and go 0.9 miles north up the ranch road past a farm house on the left 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



Township: 7N Range: 2E Section: 30

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 434988 E 4574173 N

Site Information

Site Description: The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community located on a hillside north of the mouth of Geertsen Canyon. The study is located within the Wolf Creek conservation easement that is managed by the Division of Wildlife Resources (DWR) for wildlife and recreation. The Geertsen Hollow area is known for 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. Deer pellet groups were sampled in low abundance in 2001 and 2011, with moderate abundance in 2001. Elk pellet groups have been sampled in low abundance since 2001. A small herd of elk were on the site when it was read in 2011. The area has been heavily grazed by horses and cattle in the past, but sampled livestock sign has been low since 2001 (Table - Pellet Group Data). Wild turkeys were seen on the hike into the study in 2001.

Browse: Browse species are not a major component on the site, and provide limited forage. Mountain big sagebrush is the only key browse species, and sagebrush cover has ranged from just 2% to 3% since 1996 (Table - Browse Trends). The sagebrush population is comprised of a low density stand, with a rather prostrate growth form. Density has steadily decreased since 1996. Recruitment of young sagebrush plants was high at the outset of the study, but has been poor since 2001. Sagebrush recruitment may be difficult with the shallow, rocky soils, and with competition from weedy annuals. Utilization has been light to moderate over the course of the study. Decadence of sagebrush was high in 1990, moderate in 2006, but low in the other sample years. Poor vigor was high in 1990 and 2006, but has been low in the other sample years (Table - Browse Characteristics). Gambel oak (*Quercus gambelii*) and bigtooth maple (*Acer grandidentatum*) are found further up the slope and along the creek. Some of the oak and Utah juniper (*Juniperus osteosperma*) nearby have been high-lined.

Herbaceous Understory: The herbaceous vegetation accounts for most of the cover on the site, but composition is extremely poor with weedy species dominating the site. The weedy grass species bulbous bluegrass (*Poa bulbosa*) has been the most abundant species on the site since 1985. This species alone has accounted for more than 40% of the total vegetation cover since 1996. Other, more high-yielding, long-lived perennial species are few in abundance. These include bluebunch wheatgrass (*Agropyron spicatum*), thickspike wheatgrass (*A. dasystachyum*), Kentucky bluegrass (*Poa pratensis*), and Letterman needlegrass (*Stipa lettermani*). The annual species Japanese chess (*Bromus japonicus*) has been very abundant since 1996, but cheatgrass (*B. tectorum*) has been far less common. Forb composition is extremely poor. Many of the common forbs are considered weedy, although they may provide some big game forage in the spring. Weedy increasers include ragweed (*Ambrosia psilostachya*), pacific aster (*Aster chilensis*), storksbill (*Erodium cicutarium*), tarweed (*Madia glomerata*), curlycup gumweed (*Grindelia squarrosa*), yellow salsify (*Tragopogon dubius*), and moth mullen (*Verbascum blattaria*). The noxious weed dyer's woad (*Isatis tinctoria*) has been sampled in several sample years, but is present in small numbers (Table - Herbaceous Trends). 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.

Soil: The soil is in the Yeates Hollow series, which occurs on alluvial fans, benches, and mountainsides. Parent material consists of colluvium and/or slope alluvium over residuum weathered from conglomerate. These soils are classified as deep, well drained, and slightly permeable (Soil Survey Staff 2011). The soil has a sandy clay loam to clay loam texture and is slightly acidic in reactivity (pH 6.2) (Table - Soil Analysis Data). Soils are extremely rocky on the surface and throughout the profile. Bare ground cover is low with a high amount of vegetation cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** Density of mountain big sagebrush decreased 43% from 1,998 plants/acre to 1,132 plants/acre. Decadence increased from 10% to 77%, and poor vigor increased from 3% to 71%. Recruitment of young plants decreased from 27% to 12% of the population.
- **1990 to 1996 - up (+2):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 6%, and poor vigor decreased to 6%. Most of the sampled population were young plants, which comprised 61% of the population.
- **1996 to 2001 - down (-2):** Mountain big sagebrush density decreased 45% from 1,860 plants/acre to 1,020 plants/acre, though cover remained similar at around 3%. Most of the decrease in density was due to a substantial decrease in the recruitment of young plants, which was 0%. Decadence increased slightly to 16%, but poor vigor remained the same at 6%.
- **2001 to 2006 - slightly down (-1):** There was a small decrease in density of sagebrush to 980 plants/acre, and cover decreased to 2%. Decadence increased to 35%, and poor vigor increased to 41%. Recruitment of young plants remained low at just 4% of the population.
- **2006 to 2011 - down (-2):** Density of mountain big sagebrush decreased by 31% to 680 plants/acre, but cover increased to 3%. Decadence decreased to 12%, and poor vigor decreased to 15%. There was no new recruitment of young plants.

Grass:

- **1984 to 1990 - stable (0):** Perennial grasses, excluding bulbous bluegrass, are very rare on the site. The site is dominated by the weedy species bulbous bluegrass.
- **1990 to 1996 - stable (0):** There was an increase in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, but desirable perennial grasses remained rare and bulbous bluegrass continued to dominate the site.
- **1996 to 2001 - stable (0):** Perennial grasses, excluding bulbous bluegrass, remained rare on the site. Nested frequency of the weedy species bulbous bluegrass remained similar, but cover increased from 32% to 43%. There was a significant decrease in the nested frequency of the annual grass Japanese chess, and cover of annual grasses decreased from 8% to 3%.
- **2001 to 2006 - stable (0):** There was a slight increase in the sum of nested frequency or cover of perennial grasses, excluding bulbous bluegrass, and cover increased from 1% to 2%. However, desirable perennial grass species remained rare. Japanese chess increased significantly in nested frequency, and annual grass cover increased to 6%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass increased slightly, and cover increased to 3%. However, desirable perennial grass species are still a minor component. Bulbous bluegrass nested frequency remained similar, but cover decreased from 42% to 31%. This weedy species remained dominant on the site. There was a significant decrease in the nested frequency of Japanese chess, and annual grass cover decreased to 4%.

Forb:

- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial forbs decreased 48%. However, much of the decrease was due to a decrease in weedy species with a significant decrease in the nested frequency of ragweed, and a large decrease in the nested frequency of pacific aster.
- **1990 to 1996 - slightly down (-1):** The perennial forb sum of nested frequency increased nearly three-fold, but the increase was almost entirely due to increases in the nested frequency of weedy species.
- **1996 to 2001 - slightly up (+1):** There was a 43% decrease in the sum of nested frequency of perennial forbs, and cover decreased from 11% to 7%. Most of the decrease is due to decreases in

weedy species. However, annual and perennial weedy species continue to dominate the forb component.

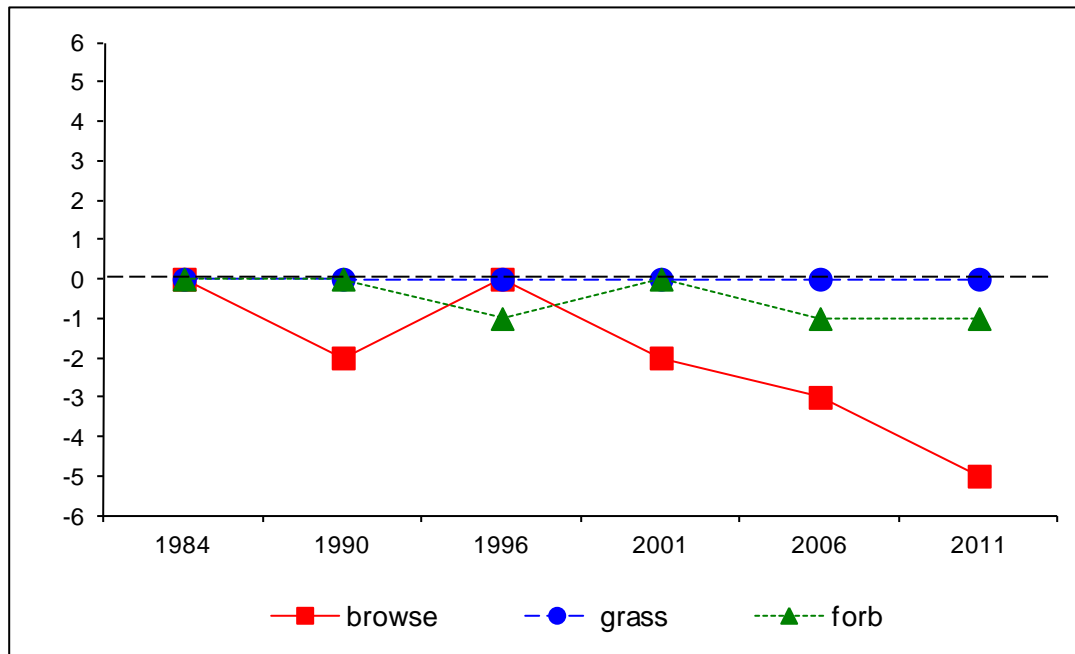
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs increased 54%, and cover increased to 22%. Increases in weedy species provided these increases.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, and cover remained similar at 21%. Weedy annual and perennial forb species continue to dominate the site.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 3, study no: 18

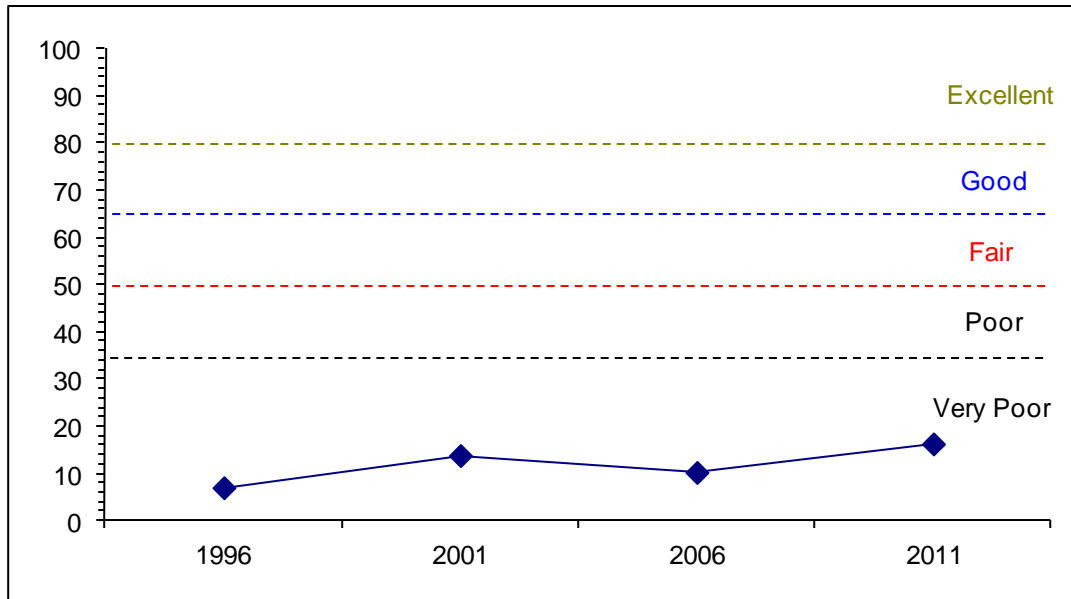
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	2.8	0.0	0.0	2.4	-6.2	10.0	-2.0	7.0	Very Poor
01	3.6	0.0	0.0	2.8	-2.6	10.0	0.0	13.8	Very Poor
06	2.4	0.0	0.0	4.2	-4.3	10.0	-2.0	10.2	Very Poor
11	3.7	0.0	0.0	5.4	-2.8	10.0	0.0	16.3	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 3 Study no: 18



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 3, Study no: 18



HERBACEOUS TRENDS--
Management unit 03, Study no: 18

Type	Species	Nested Frequency						Average Cover %			
		'85	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	3	-	1	-	2	2	.00	-	.00	.03
G	Agropyron spicatum	-	11	2	5	8	6	.18	.44	.59	.09
G	Bromus inermis	-	-	-	-	5	5	-	-	.18	.03
G	Bromus japonicus (a)	-	-	c328	a211	b269	a216	8.00	3.34	5.65	3.07
G	Bromus tectorum (a)	-	-	a29	a9	ab25	b62	.29	.07	.11	.69
G	Danthonia californica	-	-	-	4	4	16	-	.06	.18	.40
G	Danthonia unispicata	-	-	-	-	4	4	-	-	.15	.04
G	Juncus sp.	-	-	-	-	-	3	-	-	-	.03
G	Melica bulbosa	-	-	-	-	4	-	-	-	.03	-
G	Poa bulbosa	366	355	365	361	354	357	32.20	42.65	41.71	31.01
G	Poa pratensis	a-	a-	a5	b15	ab11	a3	.03	.08	.06	.38
G	Poa secunda	5	14	14	18	10	8	.02	.40	.12	.04
G	Stipa lettermani	a-	a-	a28	a11	a18	b46	.96	.42	.74	1.64
Total for Annual Grasses		0	0	357	220	294	278	8.29	3.42	5.77	3.76
Total for Perennial Grasses		374	380	415	414	420	450	33.41	44.06	43.79	33.71
Total for Grasses		374	380	772	634	714	728	41.71	47.48	49.57	37.48
F	Achillea millefolium	a12	ab13	b32	ab14	a7	a1	.38	.31	.51	.03
F	Agoseris glauca	a1	a5	a3	a1	ab6	b20	.00	.00	.05	.17
F	Allium sp.	ab12	a-	a-	a-	a2	b17	-	-	.00	.05
F	Ambrosia psilostachya	b97	a11	b125	b102	c239	c254	2.45	1.58	9.12	14.55
F	Arabis sp.	-	-	-	-	-	3	-	-	-	.00
F	Artemisia ludoviciana	39	24	35	41	24	36	.79	1.74	1.08	.95
F	Aster chilensis	ab171	a121	b199	ab170	b205	b203	4.63	3.09	7.36	3.56

Type	Species	Nested Frequency						Average Cover %			
		'85	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Astragalus beckwithii</i>	-	-	-	-	3	-	-	-	.18	-
F	<i>Calochortus nuttallii</i>	a-	a-	a-	a-	a-	b ⁵	-	.00	-	.01
F	<i>Cirsium</i> sp.	-	-	2	-	-	-	.00	-	-	-
F	<i>Collomia linearis</i> (a)	-	-	10	6	1	-	.21	.04	.03	-
F	<i>Comandra pallida</i>	-	-	-	3	-	-	-	.03	-	-
F	<i>Crepis acuminata</i>	-	-	-	-	-	-	-	.03	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	a-	b ⁴¹	c ¹⁶³	b ⁴⁷	-	.10	1.10	.25
F	<i>Erigeron strigosus</i>	10	-	3	10	3	11	.03	.05	.15	.09
F	<i>Eriogonum umbellatum</i>	-	1	-	-	-	-	-	-	-	-
F	<i>Erodium cicutarium</i> (a)	b ¹⁹	a-	b ²⁹	e ³⁰¹	c ¹⁷⁶	d ²¹⁶	.23	16.00	1.84	3.65
F	<i>Galium</i> sp.	-	-	-	-	2	3	-	-	.00	.03
F	<i>Grindelia squarrosa</i>	a-	a ¹	b ³⁰	a-	b ⁴⁰	b ²⁷	.50	-	1.54	.80
F	<i>Helianthus annuus</i> (a)	-	-	a-	a-	a ³	b ¹⁶	-	-	.00	.64
F	<i>Isatis tinctoria</i>	-	-	1	-	3	-	.06	-	.03	-
F	<i>Lactuca serriola</i> (a)	-	-	ab ⁴⁵	b ⁶⁶	a ²⁰	c ¹¹⁸	.20	1.44	.27	1.38
F	<i>Lappula occidentalis</i> (a)	-	-	b ¹⁹	a-	ab ⁸	a ³	.21	-	.02	.00
F	<i>Lomatium ambiguum</i>	a-	ab ⁵	a ¹	ab ⁶	b ¹⁴	ab ⁶	.00	.18	1.17	.09
F	<i>Machaeranthera canescens</i>	-	-	190	-	-	-	1.07	-	-	-
F	<i>Madia glomerata</i> (a)	-	-	b ²⁶⁹	a ⁵⁵	b ²³¹	a ⁹²	3.99	.24	7.11	2.23
F	<i>Melilotus officinalis</i>	-	-	-	3	5	3	-	.03	.15	.00
F	<i>Navarretia intertexta</i> (a)	-	-	a-	a-	a ²	b ¹⁵	-	-	.00	.05
F	<i>Phlox longifolia</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Polygonum douglasii</i> (a)	-	-	2	-	3	-	.00	-	.00	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	2	-	-	-	.00	-	-
F	<i>Rumex crispus</i>	-	-	2	1	-	3	.03	.04	-	.03
F	<i>Taraxacum officinale</i>	-	-	-	4	-	-	-	.01	-	-
F	<i>Tragopogon dubius</i> (a)	a ²⁶	a ⁵	b ¹²⁶	a ¹²	a ³³	a ²¹	1.43	.11	.29	.12
F	Unknown forb-annual	b ¹⁶⁶	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Verbascum blattaria</i>	a ³	a-	b ³³	ab ¹⁶	ab ²¹	a ⁵	.79	.20	.91	.41
F	<i>Veronica biloba</i> (a)	-	-	-	-	4	-	-	-	.33	-
F	<i>Viola</i> sp.	-	-	-	-	-	1	-	-	-	.00
Total for Annual Forbs		211	5	500	483	644	528	6.29	17.94	11.04	8.35
Total for Perennial Forbs		345	181	656	373	574	598	10.77	7.33	22.31	20.80
Total for Forbs		556	186	1156	856	1218	1126	17.06	25.28	33.35	29.15

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	'11	'96	'01	'06	'11
B	<i>Artemisia tridentata vaseyana</i>	41	30	26	22	2.25	2.86	1.93	2.97
B	<i>Gutierrezia sarothrae</i>	12	0	6	5	.24	-	.53	.30
Total for Browse		53	30	32	27	2.49	2.86	2.46	3.27

CANOPY COVER, LINE INTERCEPT--

Management unit 03, Study no: 18

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	3.68	4.05
Gutierrezia sarothrae	.16	.16

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 03, Study no: 18

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.5	2.9	1.6

BASIC COVER--

Management unit 03, Study no: 18

Cover Type	Average Cover %					
	'85	'90	'96	'01	'06	'11
Vegetation	16.75	7.75	62.06	70.66	73.15	63.86
Rock	11.25	10.25	11.92	13.47	16.10	15.65
Pavement	4.25	4.25	.96	.93	.66	2.20
Litter	48.50	65.50	35.29	32.29	19.60	17.26
Cryptogams	1.00	.25	.04	0	.23	.01
Bare Ground	18.25	12.00	1.08	1.07	1.68	10.83

SOIL ANALYSIS DATA --

Management unit 03, Study no: 18, Study Name: Geersten Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
5.6	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			
	'96	'01	'06	'11
Rabbit	-	-	-	1
Elk	27	2	5	6
Deer	4	11	4	1
Cattle	4	7	4	1

Days use per acre (ha)		
'01	'06	'11
-	-	-
13 (31)	5 (13)	12 (30)
15 (36)	25 (61)	5 (13)
3 (7)	13 (32)	6 (14)

BROWSE CHARACTERISTICS--
Management unit 03, Study no: 18

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
85	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	58/75	
11	0	0	0	-	-	0	0	0	68/91	
<i>Artemisia tridentata vaseyana</i>										
85	1998	27	63	10	66	3	0	3	19/22	
90	1132	12	12	77	-	24	0	71	12/16	
96	1860	61	32	6	140	22	3	6	18/38	
01	1020	0	84	16	-	57	2	6	17/24	
06	980	4	61	35	40	31	16	41	16/26	
11	680	0	88	12	-	38	18	15	17/34	
<i>Gutierrezia sarothrae</i>										
85	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	740	24	76	-	60	0	0	0	11/16	
01	0	0	0	-	-	0	0	0	-/-	
06	120	0	100	-	-	0	0	0	13/20	
11	180	0	100	-	-	0	0	0	12/15	
<i>Rosa woodsii</i>										
85	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	22/21	
11	0	0	0	-	-	0	0	0	15/15	

SUMMARY WILDLIFE MANAGEMENT UNIT 3 - OGDEN

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Six interagency range trend studies were sampled in Unit 3 during the summer of 2011. All six of the studies [Northeast Mantua Reservoir (3-2), Clay Valley (3-3), Anderson Ranch (3-4), Threemile Canyon (3-12), Middle Fork (3-17), and Geertsen Canyon (3-18)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush, antelope bitterbrush (*Purshia tridentata*), or black sagebrush communities. All of the studies are categorized as crucial deer and elk winter range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains (Division 5). Western Utah had a historic annual mean precipitation of 19.16 inches from 1895 to 2011. The mean annual PDSI of the Northern Mountains displays a cycle of several wet years followed by several drought years, over the course of study years in the unit. Over the course of the study, wetter than normal years in the Northern Mountains included 1982-1986, 1993, 1995-1999, 2005, and 2011. Drought years included 1987-1992, 2000-2003 and 2007 (Figure 1 and Figure 2) (Time Series Data 2012). The 1961-1990 mean annual precipitation range was 18-20 in. on the Anderson Ranch study; 28-32 in. on the Northeast Mantua Reservoir study; 32-36 in. on the Clay Valley, Three Mile Canyon, and Geertsen Canyon studies; and 36-40 in. on the Middle Fork study (PRISM Climate Group 2011).

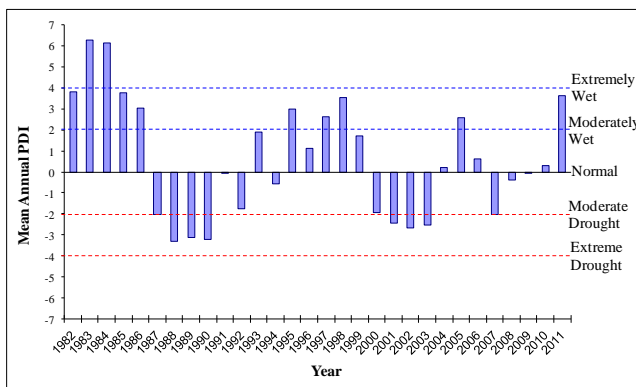


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

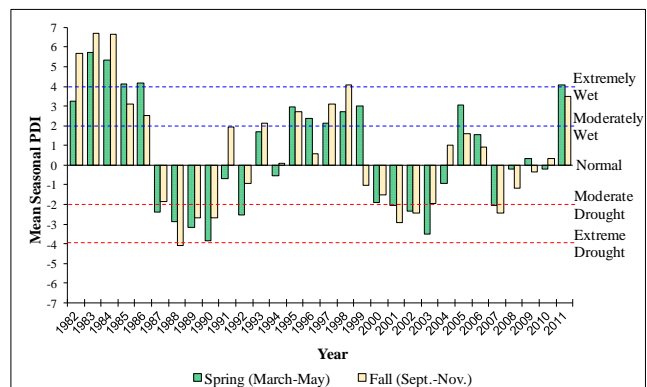


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

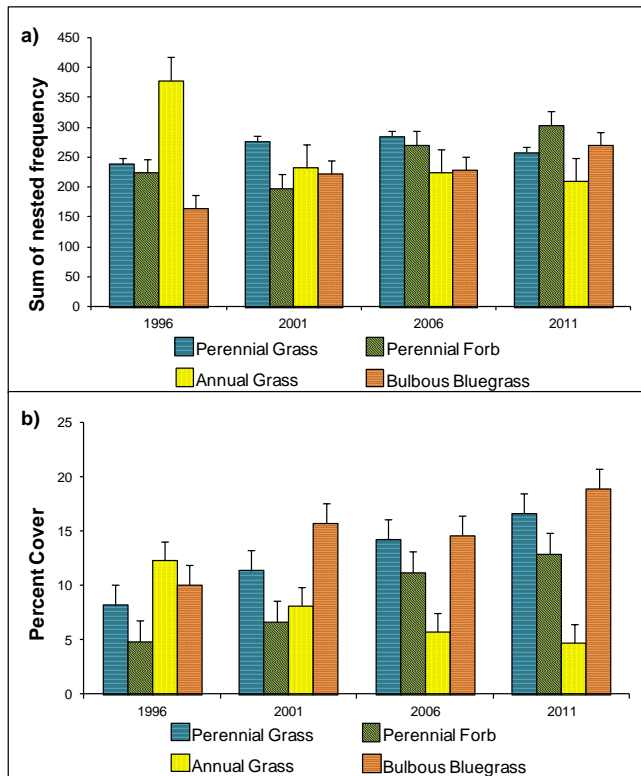


Figure 3. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass (*Poa bulbosa*) sum of nested frequency by year for WMU 3, Ogden. b) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 3.

Mountain Big Sagebrush and Black Sagebrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse trend for the unit has decreased since the outset of the studies in 1984. Most of the decrease in trend came in the 2006 and 2011 sample years (Figure 6). The dominant browse species on the majority of the mid-level potential studies is mountain big sagebrush. The mean density of mountain big sagebrush has steadily decreased since 1996, and was significantly lower in 2011 than in 1996 (Figure 4a). The mean cover of mountain big sagebrush decreased significantly in 2006, and remained at reduced levels in 2011 (Figure 4b). The mean decadence of mountain big sagebrush has been moderate to high, with significantly higher decadence in 2001 and 2006 than in 1996 and 2011 (Figure 4c).

Antelope bitterbrush is the dominant browse species on the Threemile Canyon study and a co-dominant browse species on the Anderson Ranch study. It also occurs in very low densities on the Northeast Mantua Reservoir and Middle Fork studies. Because it bitterbrush occurred in such low density on these two studies, they were not included in the summary for decadence. The mean bitterbrush density and cover has remained similar since 1996 (Figure 4a and Figure 4b). Mean decadence of bitterbrush was low in 1996, but has steadily increased to more moderate rates in 2011. Decadence of bitterbrush was particularly high on the Anderson Ranch study, which had been treated with an aerial application of 2,4-D in June of 2011 (Figure 4c). Low sagebrush (*Artemisia arbuscula*) is the dominant browse species on the Middle Fork study, but did not

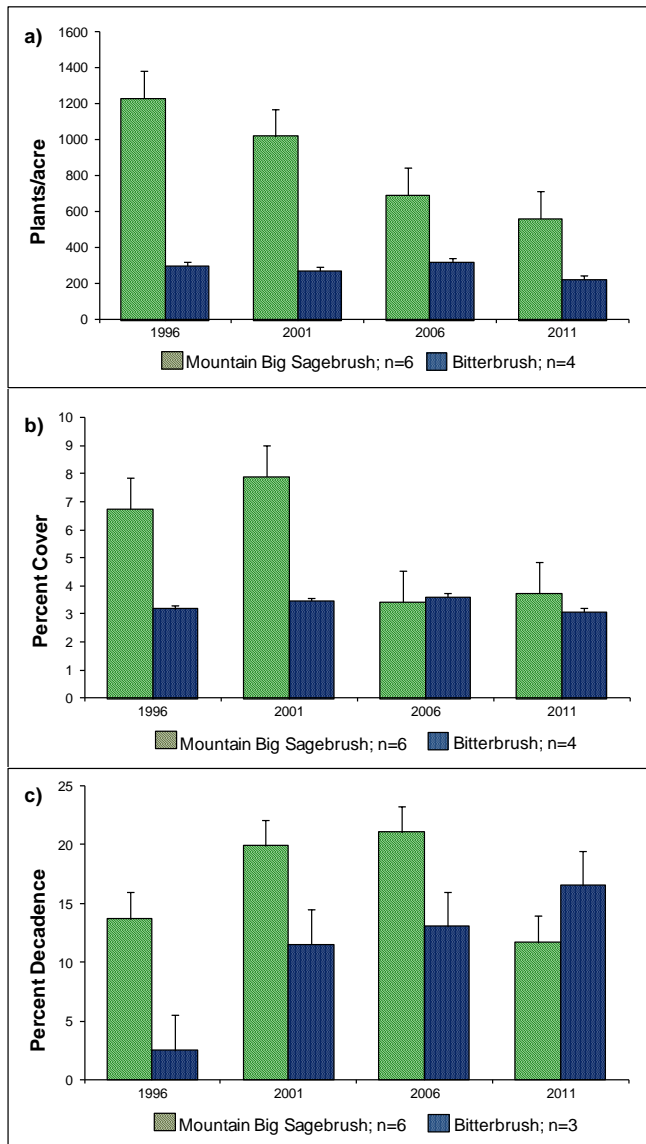


Figure 4. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) by year for WMU 3, Ogden. b) Mid-level potential sites mean cover of mountain big sagebrush and antelope bitterbrush by year for WMU 3. c) Mid-level potential sites mean decadence of mountain big sagebrush and antelope bitterbrush, excluding Northeast Mantua Reservoir and Middle Fork, by year for WMU 3.

occur on any other studies in the unit. For further information on the trends of low sagebrush, refer to the discussion section for the Middle Fork study.

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit has fluctuated somewhat, but has remained fairly stable over the course of the study years. There was an increase in trend in 1990, but trend decreased again in 1996. Trend increased slightly in 2001 and 2006, but decreased slightly in 2011 (Figure 6). Grasses within these communities are typically diverse and abundant. Annual grass species, comprised primarily of cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*), are common on most of the studies. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) is common, and has steadily increased in mean nested frequency and cover since 1996. Mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased significantly in 2001, but decreased significantly again in 2011. Despite the fluctuations in the mean sum of nested frequency, mean cover of perennial grasses has steadily increased since 1996. The mean nested frequency of annual grasses decreased significantly in 2001, and mean cover has steadily decreased since 1996 (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend for the unit decreased from 1984 to 1996, but has steadily increased from 1996 to 2011 (Figure 6). Perennial forbs are also diverse and abundant within the sampled communities, but the forb composition is often dominated by weedy or low value forage species. The mean sum of nested frequency and cover of perennial forbs has increased substantially since 1996 (Figure 3a and Figure 3b).

Browse Utilization & Animal Presence: Mountain big sagebrush plants on most of the mid-level potential studies have displayed mostly light to moderate use throughout the study years. Utilization of mountain big sagebrush was heavy on the Northeast Mantua Reservoir, Anderson Ranch, and Threemile Canyon studies at the outset of the studies in 1984, but use has been light to moderate in subsequent sample years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of mountain big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group transect data indicates that deer predominantly occupy these study areas. The mean abundance of sampled deer pellet groups on the unit has steadily decreased from high abundance use in 1996 to more moderate abundance in 2011. Deer pellet groups were sampled in the highest abundance on the Clay Valley and Anderson Ranch studies, but abundance was much lower on all of the studies except the Middle Fork study in 2011. The reduced presence was most likely due to the severe winter of 2010-2011, which likely limited access to the sites. Elk pellet groups were sampled in much lower abundance on all of the studies in this unit. Elk pellet groups were sampled in the highest abundance on the Anderson Ranch study. Livestock sign was also sampled in low abundance on the studies where it occurred (Figure 7).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has remained fairly stable since 1996, with rankings ranging from poor to poor-fair throughout the sample years. Attributes of preferred browse species have decreased slightly since 1996, but perennial grass cover has increased and annual grass cover has decreased (Table 1 and Figure 5). Bulbous bluegrass is excluded from the perennial grass cover scores.

Discussion: The decline of mountain big sagebrush populations on these important winter ranges gives reason for concern. The Northeast Mantua Reservoir, Clay Valley, and Geertsen Canyon studies have driven the pattern of mountain big sagebrush decline for mid-level potential studies on the unit. Causes of sagebrush decline are varied and multiple causes may have compounded effects on the mid-level potential studies in this unit.

Precipitation can have large impacts on the vegetation trends, and there have been several moderate drought periods since 1996 (Figure 1 and Figure 2). While lack of precipitation may have caused some stress on sagebrush plants, it does not appear to be the primary cause of the decline on the mid-level potential studies.

The abundance of weedy annual grass and forb species, and the increase of the exotic, weedy, perennial grass bulbous bluegrass are the more likely causes of sagebrush decline. These weedy species can form dense mats of cover that compete with seedling and young sagebrush plants, which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event. Annual grass species are present on all of the mid-level potential studies, but are most prevalent on the Northeast Mantua Reservoir, Threemile Canyon, and Geertsen Canyon studies. Annual grasses have shown decreases on the Northeast Mantua Reservoir, Clay Valley, Anderson Ranch, Threemile Canyon, Middle Fork, and Geertsen Canyon studies since 1996. However, decreases in annual grasses appear to correspond with increases in the weedy species bulbous bluegrass. Bulbous bluegrass is prevalent on all of the mid-level potential studies in this unit, and has shown marked increases on the Northeast Mantua Reservoir, Anderson Ranch, and Threemile Canyon studies since 1996. There has been a slight decrease of bulbous bluegrass on the Clay Valley study.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	14.2	10.1	7.2	15.5	-9.4	7.1	-1.3	43.3	Poor
01	16.1	8.0	4.3	21.0	-5.6	8.6	-1.0	51.4	Poor-Fair
06	11.2	6.7	3.9	23.2	-4.3	9.1	-1.3	48.4	Poor-Fair
11	10.1	7.1	3.6	23.5	-3.6	9.5	-1.3	48.9	Poor-Fair

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=6) by year for WMU 3, Ogden. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

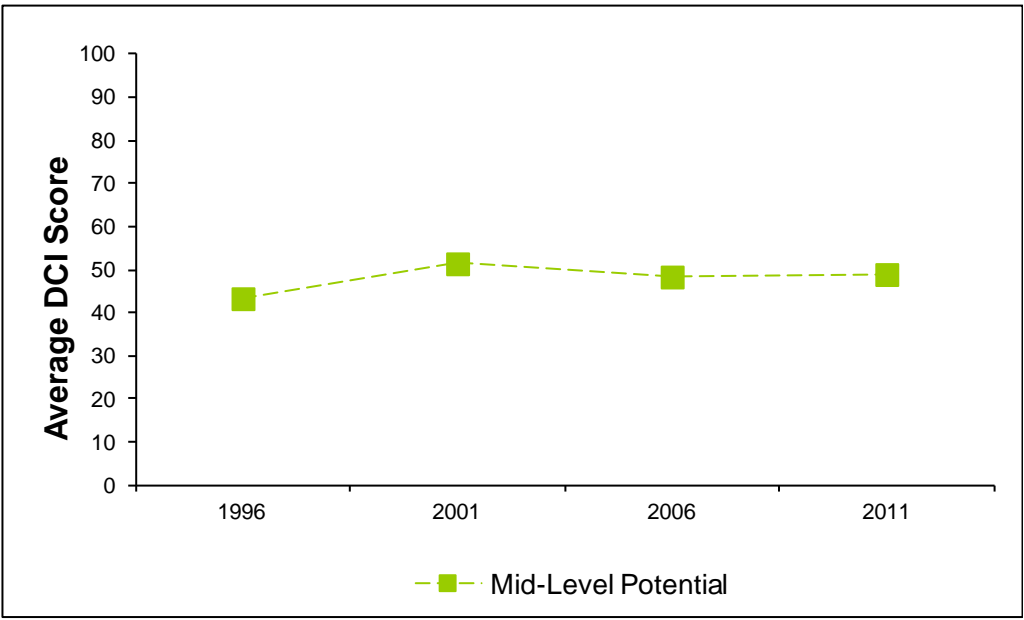


Figure 5. Mean mid-level (n=6) potential scale deer DCI scores by year for WMU 3, Ogden. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

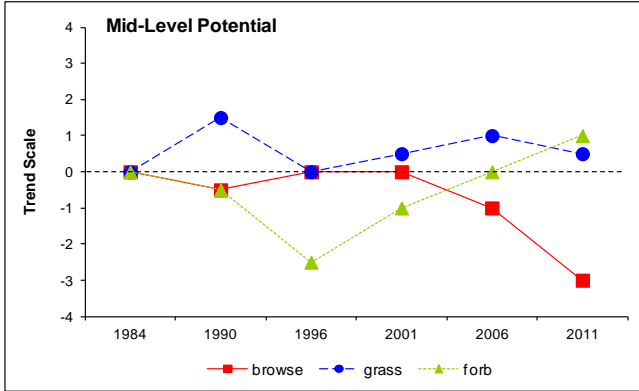


Figure 6. Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 3, Ogden.

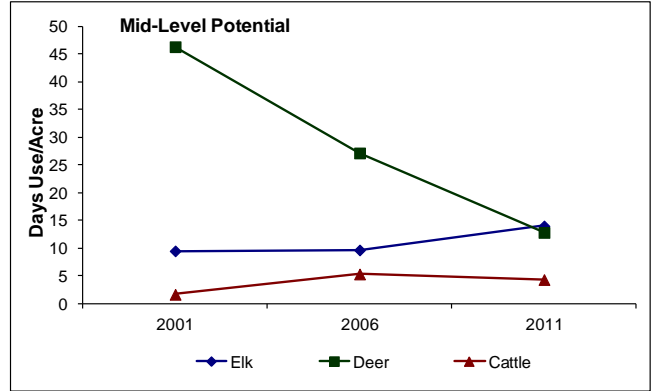
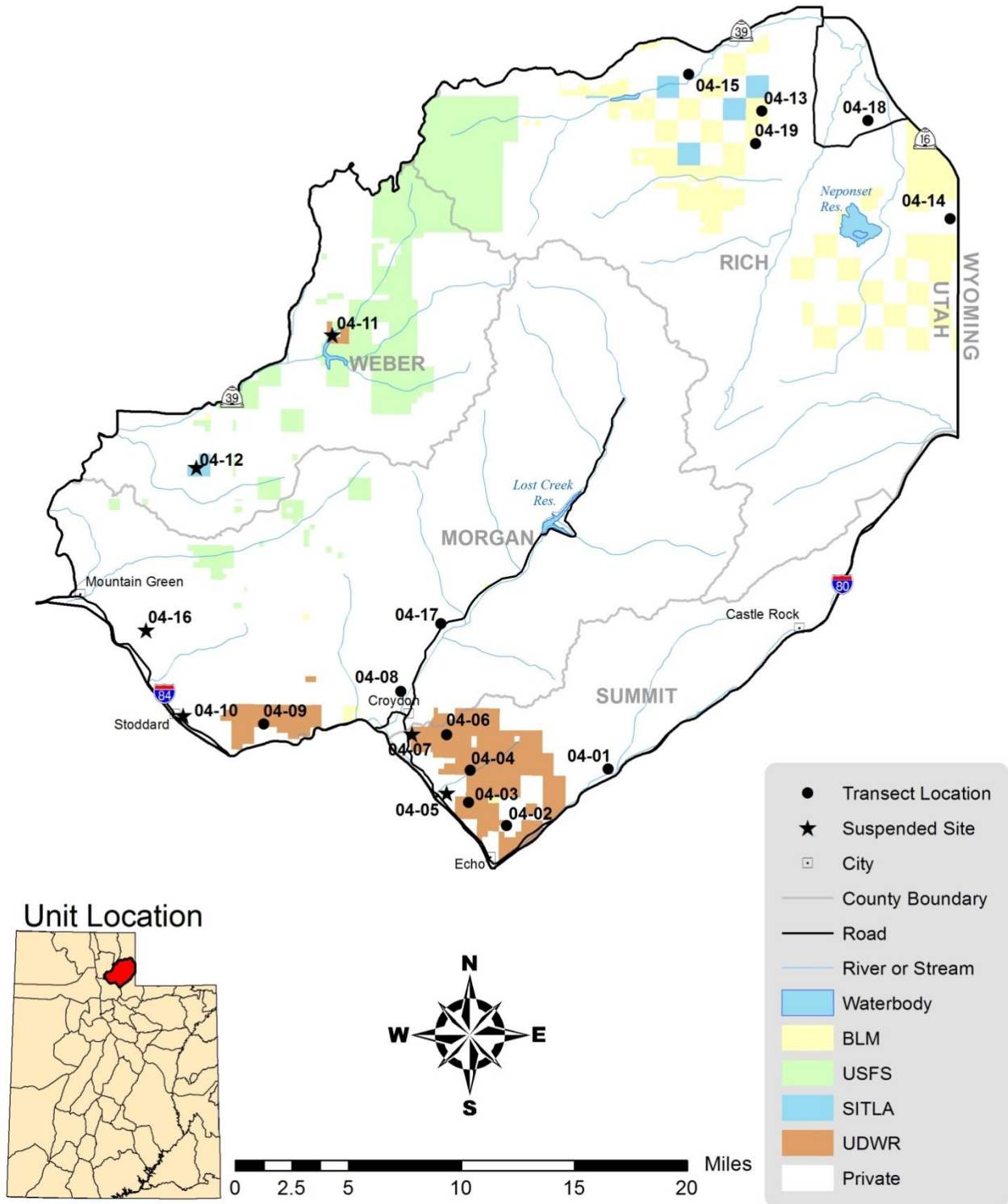


Figure 7. Mid-level potential sites mean animals days use/acre (n=6) by year for WMU 3, Ogden.

Management Unit 4



MANAGEMENT UNIT - 4 - MORGAN-SOUTH 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.

Management Unit Description

In 1993, management unit boundaries were changed and the Morgan-South Rich Management 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.

Most deer 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 areas are becoming 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, snowmobilers, winter fishermen, and other recreationists used the facilities during 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 crucial 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 Chalk Creek Units which also have adequate summer range, but limited winter range.

Range Trend Studies

Thirteen interagency range trend studies were sampled in Unit 4 during the summer of 2011. A total of nineteen studies have been established within Unit 4 since 1984. Twelve studies were established in 1984, and of these studies two studies [Heiner's Creek (4-1) and Causey Dam (4-11)] sample mountain brush communities; seven studies [Echo Canyon (4-2), Tank Canyon (4-3), Owen's Canyon Bench (4-5), Harris Canyon (4-6), Croyden Access Road (4-7), Shell Hollow (4-8), and Big Hollow (4-10)] sample mountain big sagebrush communities; one study [Owen's Canyon (4-4)] samples a burned site; one study [Scott Rees Ranch (4-9)] samples a Gambel oak community; and one study [Chapman Canal (4-14)] samples a Wyoming big sagebrush community. Two studies were established in 1990, and of these studies, one study [Wheatgrass Hollow (4-13)] samples a Wyoming big sagebrush community and one study [Bennett Creek (4-12)] samples a low sagebrush community. Three studies were established in 1996, and of these studies, one study [Woodruff Creek South (4-15)] samples a Wyoming big sagebrush community, and two studies [Above Toon Ranch (4-17) and Dry Hollow (4-16)] sample mountain big sagebrush communities. Two studies were established in 1997, and of these studies, one study [Deseret Main Gate (4-18)] samples a Wyoming Big Sagebrush Community and one study [Deseret Burn (4-19)] samples a burned site.

In 1990, four studies (Owen's Canyon Bench, Croyden Access Road, Big Hollow, and Causey Dam) were suspended. In 1996, one study (Bennett Creek) was suspended. In 2001 one study (Dry Hollow) was suspended. These sites were suspended for various reasons and if the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

HEINER'S CREEK - TREND STUDY NO. 4-1-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [High Mountain Stony Loam \(Aspen\), R047XA430UT](#)

Land Ownership: Private

Elevation: 6,300 ft (1,920 m)

Aspect: Southeast

Slope: 10%

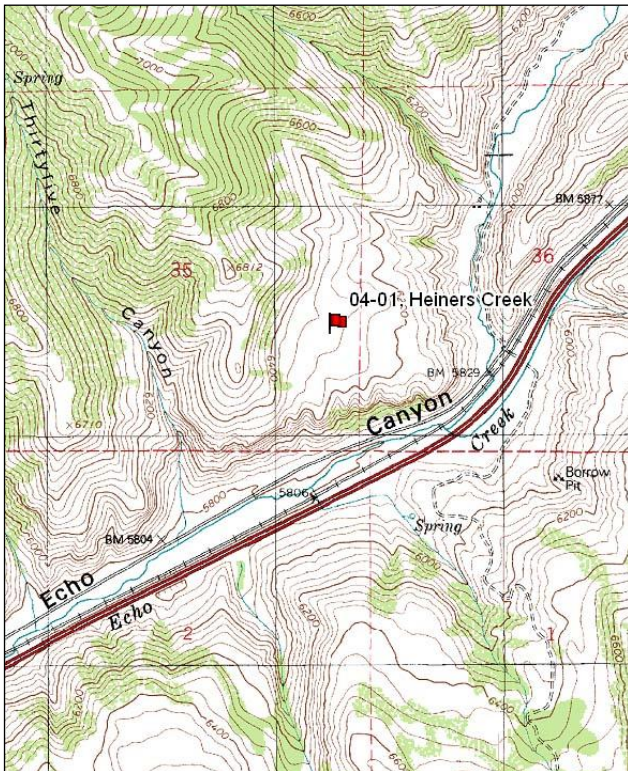
Transect bearing: 164° magnetic

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

Directions:

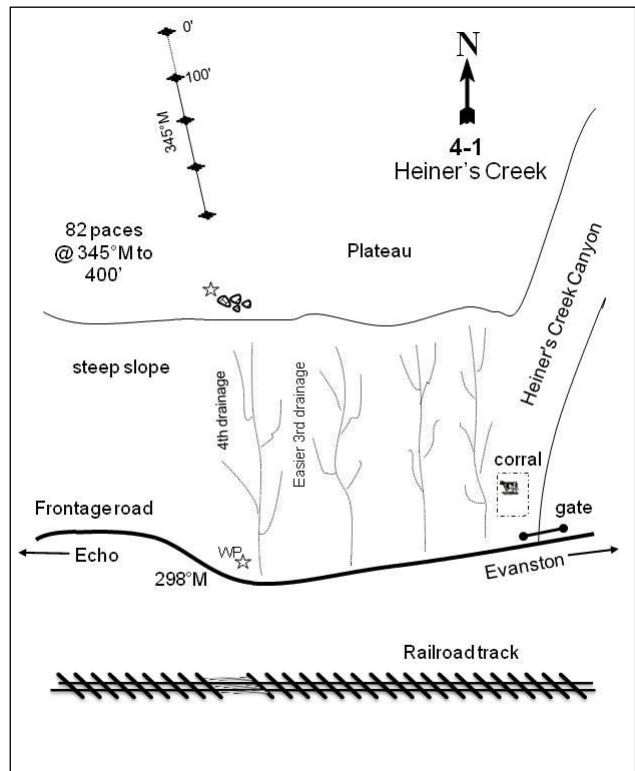
From exit 169 on I-80, travel 6.2 miles northeast on the frontage road to a witness post on the north side of the road next to a large rock. Hike up the third drainage west of Heiner's Creek. This drainage is wider and easier to hike up. Once on the top of the bench walk west to the head of the next 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



Township: 4N Range: 5E Section: 35

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 471181 E 4542648 N

HEINER'S CREEK - TREND STUDY NO. 4-1

Site Information

Site Description: The study is located on private land on the north side of Echo Canyon, just west of Heiner's Creek. It is located above the steep bluffs, or cliffs, prevalent in Echo Canyon. The study samples a mixed mountain brush community, which appears to have been burned prior to the 1984 reading. The area is considered important winter range for deer and, to a lesser extent, elk. Deer pellet groups were sampled in high abundance in 2001 and 2006, but low abundance in 2011 following a severe winter. Sampled elk and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: When the study was established in 1984, the site was dominated by the increaser species stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). Since that time, stickyleaf low rabbitbrush has decreased and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has increased. However, stickyleaf low rabbitbrush remains prevalent on the site. The mountain big sagebrush population is a moderately dense stand that has displayed mostly light to moderate use. Health of the sagebrush population has been good, with low decadence and good vigor. Recruitment of young sagebrush plants has been very good over the course of the study. Other important browse species include scattered populations of antelope bitterbrush (*Purshia tridentata*) and Saskatoon serviceberry (*Amelanchier alnifolia*). Individual Bitterbrush plants have been heavily utilized and have a fairly prostrate growth form. Serviceberry have also displayed moderate to heavy use through the sample years, but plants appear to still be healthy. Woods rose (*Rosa woodsii*) is also abundant (Table - Browse Characteristics), but provides only limited cover (Table - Browse Trends).

Herbaceous Understory: Grasses are diverse and abundant, though most grass plants were found growing in or around shrubs. Common grasses include bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), mutton bluegrass (*P. fendleriana*), and Kentucky bluegrass (*P. pratensis*). Prior to the fire in 1984, forb diversity was low, but has steadily increased since 1990. However, many of the increases have been increases of low growing or weedy species. The most abundant perennial forbs have been pacific aster (*Aster chilensis*) and silvery lupine (*Lupinus argenteus*). Annual forb species are also common on the site (Table - Herbaceous Trends).

Soil: The soil is in the Fewkes series, which occur on mountain slopes. Parent material consists of slope alluvium and colluvium derived from sandstone, quartzite, and shale. The soils are categorized as very deep, well drained soils, with a moderate shrink-swell potential (Soil Survey Staff 2011). The soil has a clay loam texture with a neutral soil reaction (pH 6.6) (Table - Soil Analysis Data). A compacted clay horizon was estimated at 10 inches below the surface. The bare ground cover is moderately high on the site, but large amount of vegetation and litter provide good protective cover (Table - Basic Cover). There are abundant signs of soil movement including soil pedestalling around shrubs, rills, and an active gully near the end of the base line. The soil erosion condition was classified as moderate in 2001 and 2006, but decreased to slight in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** Density of mountain big sagebrush decreased slightly from 332 plants/acre to 299 plants/acre. Most of the decrease was due to a decrease in the recruitment of young plants from 40% of the population to 0%. Density of mature sagebrush plants increased slightly. Density of the increaser species stickyleaf low rabbitbrush decreased 19% from 6,898 plants/acre to 5,564 plants/acre.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased from 11% to 2%. Recruitment of young sagebrush plants increased to 19% of the population.

- **1996 to 2001 - up (+2):** Mountain big sagebrush density increased nearly four-fold from 1,060 plants/acre to 4,120 plants/acre, and cover increased from 5% to 9%. Recruitment of young plants was very high at 67% of the population. Density of serviceberry increased over four-fold from 80 plants/acre to 320 plants/acre, though cover remained less than 1%. Density of stickyleaf low rabbitbrush remained similar at 14,840 plants/acre, but cover decreased slightly from 22% to 20%.
- **2001 to 2006 - stable (0):** There was a slight increase in the density of mountain big sagebrush to 4,360 plants/acre, and cover increased to 17%. The increase in cover is due to a shift in age class with more mature plants sampled. Recruitment of young sagebrush plants is still very high at 42% of the population. Stickyleaf low rabbitbrush decreased 11% in density to 13,180 plants/acre, and cover decreased to 14%.
- **2006 to 2011 - stable (0):** The density of mountain big sagebrush remained similar at 4,180 plants/acre, though cover increased to 22%. The population continued to mature, but recruitment of young plants remained high at 29%. Density of stickyleaf low rabbitbrush decreased 17% to 10,900 plants/acre, and cover decreased to 12%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 35%.
- **1990 to 1996 - slightly up (+1):** There was a 34% increase in the sum of nested frequency of perennial grasses. Some of the increase was likely due to the increased sample area.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 18%, but cover increased from 12% to 20%. There was a significant decrease in the nested frequency of the annual species cheatgrass (*Bromus tectorum*), and cover decreased from 2% to less than 1%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 15%, but cover decreased slightly to 17%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 13%, and cover decreased to 11%.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency perennial forbs decreased by 34%.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased 43%, and cover increased from 4% to 6%. However, much of the increase was due to low growing species such as Pacific aster, which have limited use for big game. The annual forb sum of nested frequency and cover also increased substantially.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, but cover increased to 7%. The annual forb sum of nested frequency increased substantially.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 35%, and cover increased to 12%. Much of the increase in cover was due to a significant increase in the nested frequency of Pacific aster.

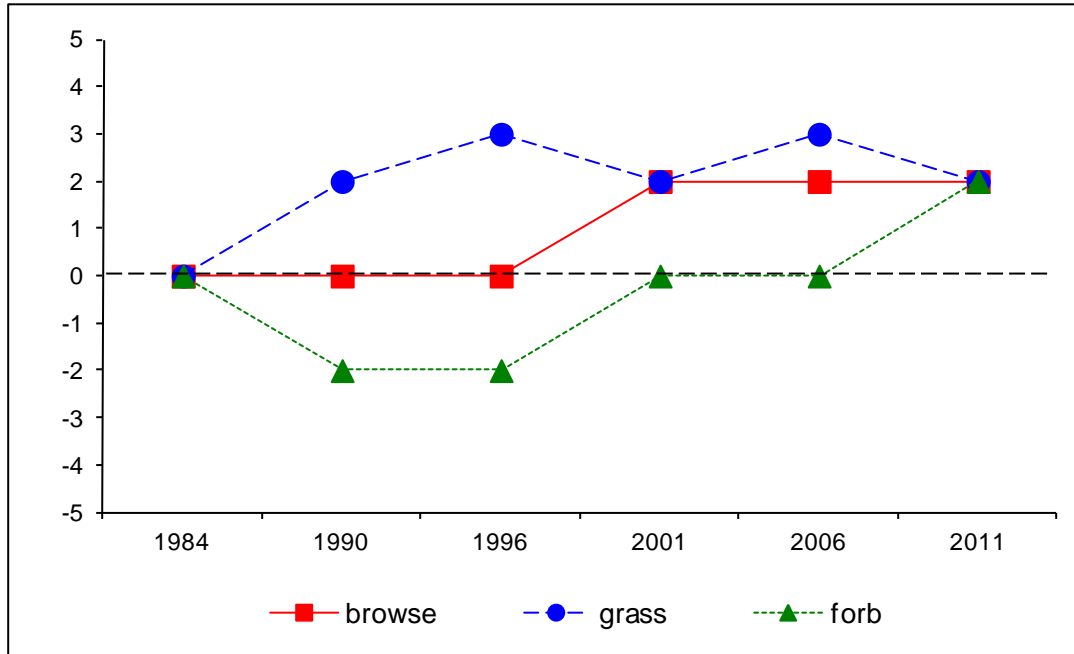
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 4, study no: 1

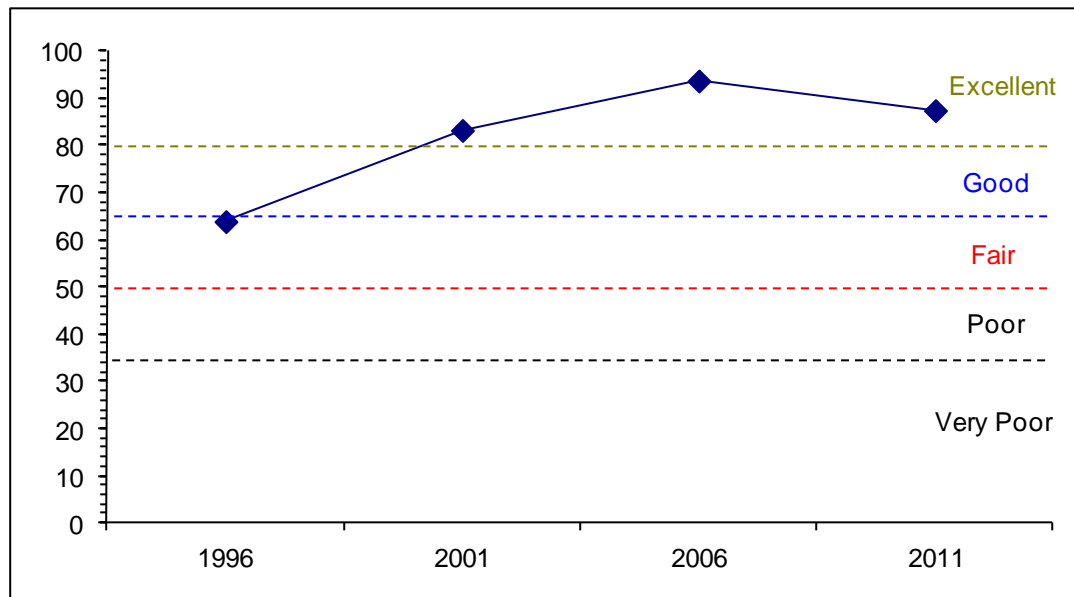
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	9.5	13.1	10.6	24.2	-1.2	7.8	0.0	63.9	Fair-Good
01	14.5	14.3	15.0	30.0	-0.6	10.0	0.0	83.2	Excellent
06	25.9	13.0	15.0	30.0	-0.2	10.0	0.0	93.7	Excellent
11	30.0	12.6	14.3	21.5	-1.0	10.0	0.0	87.4	Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 1



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 1



HERBACEOUS TRENDS--
Management unit 04, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	b41	a2	cd92	bc68	d98	bcd71	.55	.71	1.28	1.12
G	Agropyron spicatum	c169	a69	c130	ab80	abc108	bc122	2.67	3.33	2.97	2.51
G	Bromus tectorum (a)	-	-	b140	a61	a69	a76	1.60	.80	.26	1.33
G	Carex sp.	-	-	3	-	10	3	.03	-	.09	.01
G	Elymus cinereus	3	1	9	6	8	6	.21	.18	.36	.06
G	Koeleria cristata	1	3	3	9	7	12	.03	.10	.07	.09
G	Melica bulbosa	-	-	3	-	-	-	.01	-	-	-
G	Poa fendleriana	a14	c152	b88	a19	a38	a31	1.73	.98	1.10	.32
G	Poa pratensis	a6	a7	b42	bc64	bc62	c69	1.00	4.11	1.98	1.73
G	Poa secunda	a82	bc208	c209	c249	c229	b162	5.17	10.55	8.90	4.40
G	Sitanion hystrix	b14	a3	a1	a1	a-	a4	.00	.00	-	.03
G	Stipa comata	9	12	-	-	-	-	-	-	-	-
G	Stipa lettermani	a-	a-	b30	a6	ab17	ab23	.66	.41	.22	.46
Total for Annual Grasses		0	0	140	61	69	76	1.60	0.80	0.26	1.33
Total for Perennial Grasses		339	457	610	502	577	503	12.09	20.38	17.01	10.77
Total for Grasses		339	457	750	563	646	579	13.69	21.19	17.28	12.10
F	Achillea millefolium	c137	ab40	b71	ab61	a31	ab57	.80	.96	.59	.85
F	Agoseris glauca	a-	a-	a-	a-	a1	b14	-	-	.00	.05
F	Allium acuminatum	bc54	a-	a2	b32	c63	d136	.01	.18	.22	.99
F	Alyssum alyssoides (a)	-	-	-	-	-	9	-	-	-	.02
F	Antennaria rosea	4	2	1	5	-	1	.00	.03	-	.00
F	Arabis sp.	a5	a2	a4	b45	a14	a8	.03	.18	.02	.04
F	Artemisia ludoviciana	3	4	-	-	-	-	-	-	-	-
F	Aster chilensis	ab87	a67	ab100	bc128	ab91	c139	1.87	2.64	3.00	6.65
F	Astragalus convallarius	a12	a7	a4	a11	b31	ab20	.01	.22	.41	.15
F	Astragalus lentiginosus	-	2	-	6	8	16	-	.09	.30	.39
F	Calochortus nuttallii	-	-	-	-	2	5	-	-	.00	.01
F	Cirsium sp.	abc13	c31	bc18	ab3	a1	ab4	.52	.09	.01	.01
F	Collinsia parviflora (a)	-	-	a5	b118	b123	c165	.01	.46	.30	.83
F	Collomia linearis (a)	-	-	-	10	6	24	-	.02	.01	.07
F	Comandra pallida	c68	bc51	a4	a18	a4	ab21	.01	.09	.09	.26
F	Cryptantha sp.	-	-	-	-	-	1	-	-	-	.00
F	Draba sp. (a)	-	-	a-	b11	b32	c72	-	.19	.06	.63
F	Epilobium brachycarpum (a)	-	-	a-	a-	c163	b49	-	-	.47	.16
F	Eriogonum umbellatum	b19	ab14	ab10	a5	a7	ab9	.23	.09	.24	.25
F	Hackelia patens	-	-	7	-	4	-	.06	-	.06	-
F	Helianthella uniflora	b28	b32	a-	a-	a2	a7	-	-	.03	.36
F	Heterotheca villosa	-	-	3	-	-	-	.00	-	-	-
F	Holosteum umbellatum (a)	-	-	a-	a-	a-	b16	-	-	-	.05
F	Lappula occidentalis (a)	-	-	-	4	-	2	-	.03	-	.00
F	Lithospermum ruderales	-	-	1	1	1	-	.03	.15	.03	-
F	Lupinus argenteus	a3	a3	ab11	b39	c49	c51	.10	.78	1.12	1.71
F	Machaeranthera canescens	-	-	5	-	-	-	.01	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b16	d134	c59	-	.03	.39	.22
F	<i>Penstemon</i> sp.	-	-	-	-	-	1	-	-	-	.03
F	<i>Phlox longifolia</i>	a-	b33	bc52	bc65	c75	b30	.14	.32	.30	.09
F	<i>Polygonum douglasii</i> (a)	-	-	b39	a-	a6	a1	.12	-	.02	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	a105	b194	b220	b165	.37	1.91	2.17	.82
F	<i>Senecio integerrimus</i>	-	-	-	-	7	4	-	-	.09	.01
F	<i>Sphaeralcea coccinea</i>	-	-	-	-	1	1	-	.03	.15	.15
F	<i>Taraxacum officinale</i>	-	-	-	1	5	4	-	.00	.03	.03
F	<i>Tragopogon dubius</i> (a)	-	-	-	3	7	-	-	.00	.07	-
F	<i>Viola</i> sp.	-	-	-	-	-	8	-	-	-	.09
Total for Annual Forbs		0	0	149	356	691	562	0.50	2.67	3.52	2.82
Total for Perennial Forbs		433	288	293	420	397	537	3.88	5.87	6.73	12.18
Total for Forbs		433	288	442	776	1088	1099	4.39	8.55	10.26	15.00

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	4	7	4	4	.41	.71	1.03	.91
B	<i>Artemisia tridentata vaseyana</i>	34	62	69	80	4.92	8.73	17.01	22.02
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	1	0	0	.38	.38	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	99	100	94	94	22.09	19.86	14.38	12.13
B	<i>Purshia tridentata</i>	5	4	2	5	.00	.00	.03	.03
B	<i>Rosa woodsii</i>	29	30	31	29	1.77	1.62	2.40	1.86
B	<i>Symphoricarpos oreophilus</i>	8	8	8	7	.67	.53	.18	.56
B	<i>Tetradymia canescens</i>	0	0	1	1	-	-	.03	.03
Total for Browse		180	212	209	220	30.26	31.85	35.08	37.55

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 1

Species	Percent Cover	
	'06	'11
<i>Amelanchier alnifolia</i>	.43	.80
<i>Artemisia tridentata vaseyana</i>	17.10	24.29
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	17.95	12.14
<i>Purshia tridentata</i>	.18	.68
<i>Rosa woodsii</i>	2.13	1.64
<i>Symphoricarpos oreophilus</i>	1.01	.86

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 1

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	3.5	4.2	2.4
Artemisia tridentata vaseyana	3.3	2.1	1.9
Purshia tridentata	1.8	2.5	0.8

BASIC COVER--

Management unit 04, Study no: 1

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	6.75	10.25	48.59	55.00	51.95	52.77
Rock	0	0	.14	.64	.10	.07
Pavement	3.00	1.25	.72	.59	1.17	.38
Litter	58.75	51.75	45.24	38.59	35.07	36.57
Cryptogams	.75	.75	.34	.31	1.85	1.28
Bare Ground	30.75	36.00	22.39	26.87	25.97	27.88

SOIL ANALYSIS DATA --

Management unit 04, Study no: 1, Study Name: Heiner's Creek

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.1	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	2	56	18	-	-	-
Horse	3	-	-	-	-	-	-
Elk	-	2	23	6	1 (3)	16 (40)	11 (26)
Deer	15	17	32	23	41 (101)	46 (112)	18 (45)
Cattle	1	2	4	3	5 (13)	6 (14)	7 (18)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 1

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Amelanchier alnifolia										
84	0	0	0	-	-	0	0	0	-/-	
90	33	0	100	-	-	0	0	0	14/20	
96	80	25	75	-	-	0	25	0	18/30	
01	320	44	56	-	-	31	6	0	20/27	
06	100	40	60	-	-	40	60	0	28/39	
11	180	0	100	-	-	44	56	0	32/41	
Artemisia tridentata vaseyana										
84	332	40	60	0	-	0	0	0	19/17	
90	299	0	89	11	-	22	33	0	24/23	
96	1060	19	79	2	180	23	0	2	26/35	
01	4120	67	31	3	1000	4	0	5	29/39	
06	4360	42	50	8	760	15	2	4	25/38	
11	4180	29	62	9	100	35	0	8	24/38	
Chrysothamnus nauseosus albicaulis										
84	33	0	100	0	-	0	0	0	20/31	
90	33	0	0	100	-	0	0	0	-/-	
96	20	0	0	100	-	0	0	0	25/35	
01	20	0	100	0	-	0	0	0	18/24	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
Chrysothamnus viscidiflorus viscidiflorus										
84	6898	15	77	8	66	0	0	0	15/24	
90	5564	20	63	17	-	7	0	0	11/15	
96	14240	14	83	3	160	3	0	.28	14/23	
01	14840	8	88	4	120	1	0	.67	11/19	
06	13180	14	80	6	120	5	0	2	10/18	
11	10900	20	74	6	20	4	0	.91	10/17	
Purshia tridentata										
84	66	0	100	0	-	100	0	0	8/21	
90	33	0	100	0	-	0	100	0	13/39	
96	100	40	60	0	-	20	40	20	14/41	
01	100	20	80	0	-	20	60	0	13/38	
06	40	0	100	0	-	0	100	0	15/52	
11	100	0	80	20	-	40	60	0	13/56	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Rosa woodsii</i>										
84	7499	98	2	0	766	0	0	0	14/11	
90	8565	94	3	3	-	0	0	0	12/8	
96	3780	31	69	0	500	0	0	0	14/16	
01	5960	94	6	0	-	55	0	0	15/9	
06	6980	73	26	0	420	.57	0	.57	9/8	
11	3700	37	63	0	80	0	0	0	9/8	
<i>Symphoricarpos oreophilus</i>										
84	399	8	92	-	-	50	8	0	14/29	
90	199	0	100	-	-	17	33	0	17/27	
96	200	10	90	-	-	30	0	0	17/36	
01	240	0	100	-	-	42	0	0	14/29	
06	220	9	91	-	-	0	0	0	16/31	
11	220	9	91	-	-	9	0	0	22/51	
<i>Tetradymia canescens</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	20	0	0	100	-	0	0	0	-/-	
11	20	0	100	0	-	0	0	0	11/22	

ECHO CANYON - TREND STUDY NO. 4-2-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,800 ft (2,073 m)

Aspect: Southwest

Slope: 30%

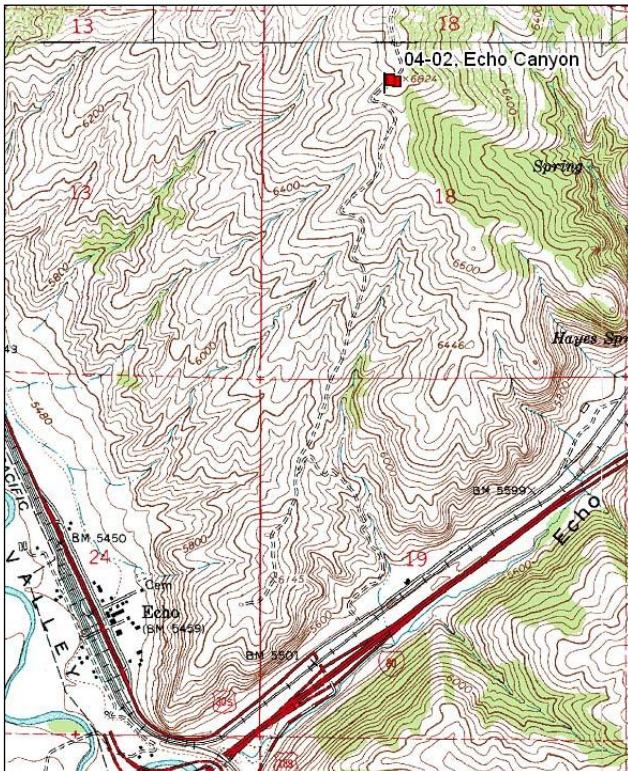
Transect bearing: 92° magnetic

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

Directions:

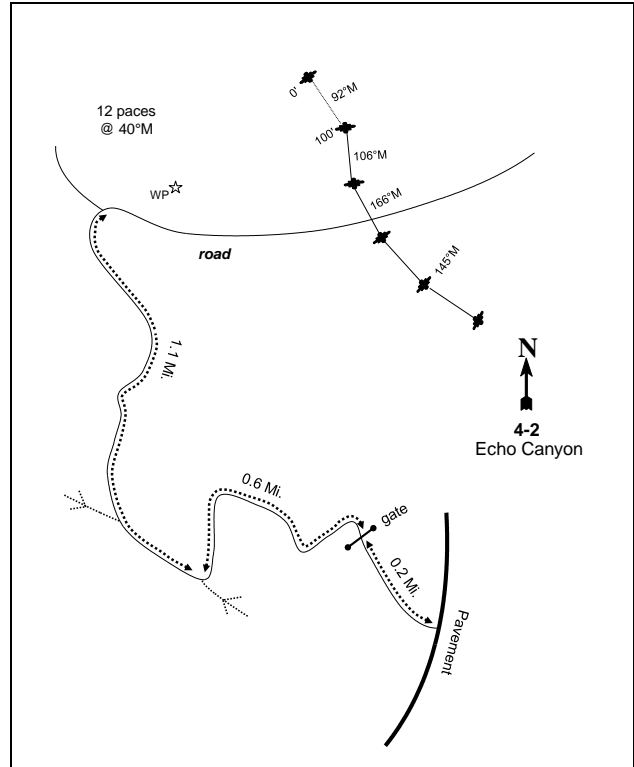
From I-80 exit 169, just east of the I-80/I-84 junction, travel northeast towards Emery 0.1 miles, and turn left onto a dirt road. Proceed up the mountain 0.2 miles to a gate. Proceed 0.6 miles to a fork, and turn right. Proceed north 1.1 miles to a fork in the road and stop. From this point, walk 12 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:



GPS: NAD 83, UTM 12S 463944 E 4538613 N

ECHO CANYON - TREND STUDY NO. 4-2

Site Information

Site Description: This is located on the ridge approximately one mile to the northeast of Echo Junction. The area is managed by the Division of Wildlife Resources (DWR) as part of the Henefer-Echo Wildlife Management Area (WMA). At the outset of the study, the study area was dominated by a moderately dense population of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but sagebrush has decreased in abundance and the weedy grass species bulbous bluegrass (*Poa bulbosa*) has become the dominant species on the site. Deer pellet groups were sampled in high abundance in 2001 and 2006, but in low abundance in 2011 following a hard winter. Elk pellet groups have been sampled in low to moderate abundance since 2001. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: Mountain big sagebrush provides the majority of the browse cover (Table - Browse Trends). The sagebrush population has been declining since 1996. The population was moderately dense at the outset of the study, but has steadily decreased since 1996. Decadence and poor vigor of sagebrush have also steadily increased since 1996, and both parameters were very high in 2011. Recruitment of young sagebrush plants has been poor in most sample years. Utilization of sagebrush has been moderate to heavy over the course of the study. Other browse species are rare on the site (Table - Browse Characteristics). The decrease in sagebrush on this site is a major concern. Decreases in density and cover are likely primarily due to competition with the weedy exotic species bulbous bluegrass and cheatgrass (*Bromus tectorum*). Continued heavy utilization of browse by animals will likely exasperate the stress from competition and increase the rate of decline of browse on this site.

Herbaceous Understory: The grass component has increased, and provides the majority of the vegetation cover on the site. However, most of the increase is due to the weedy species bulbous bluegrass, which has steadily increased since 1996 and has become the dominant species. The competition from the increase in bulbous bluegrass is likely responsible for much of the decrease in the sagebrush population. The only other common perennial grass species are bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*). Bluebunch wheatgrass is the major forage producer. Photographs taken from 1984 show little cheatgrass; however, annuals were not included in the sample in 1984 and 1990. Cheatgrass cover was high in 1996, but has decreased to more moderate levels. Forbs are abundant and relatively diverse. Common perennial forb species include Louisiana sagebrush (*Artemisia ludoviciana*), three species of milkvetch (*Astragalus* spp.), and silvery lupine (*Lupinus argenteus*). Annual forb species are also prevalent on the site (Table - Herbaceous Trends).

Soil: The soil is in the Horrocks-Cutoff complex, likely as part of the Horrocks component. These soils occur on mountain slopes, with parent material consisting of colluvium derived from conglomerate, sandstone, and andesite. The soils are characterized as moderately deep, well drained, and moderately permeable (Soil Survey 2011). The soil texture is a sandy clay loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of vegetation and litter cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2001, but has been stable since 2006.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** Density of mountain big sagebrush decreased 51% from 5,998 plants/acre to 2,932 plants/acre. Decadence increased from 29% to 64%.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 19%, and recruitment of young plants increased from 0% to 16% of the population.

- **1996 to 2001 - slightly down (-1):** Mountain big sagebrush density decreased 16% from 3,300 plants/acre to 2,780 plants/acre, but cover increased slightly from 14% to 15%. Decadence increased to 31%, and recruitment of young plants decreased to 0%.
- **2001 to 2006 - down (-2):** Density of mountain big sagebrush decreased 32% to 1,880 plants/acre, and cover decreased to 10%. Decadence increased to 48%, and poor vigor increased from 9% to 30%.
- **2006 to 2011 - down (-2):** Mountain big sagebrush decreased 37% to 1,180 plants/acre, and cover decreased to 4%. Decadence increased to 68%, and poor vigor increased to 63%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased 43%, with a significant increase in the nested frequency of bluebunch wheatgrass.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 31%. However, bulbous bluegrass was sampled for the first time. Annual grasses were included in the sample for the first time, and the nested frequency and cover of cheatgrass were very high.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 36%, and cover increased from 10% to 16%. There was a significant decrease in the nested frequency of cheatgrass, and cover decreased from 14% to 4%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased to 20% due to an increase in bluebunch wheatgrass. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 3% to 5%.
- **2006 to 2011 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 13%, and cover decreased to 13%. Bulbous bluegrass increased significantly in nested frequency, and cover increased to 24%. Bulbous bluegrass dominated the site.

Forb:

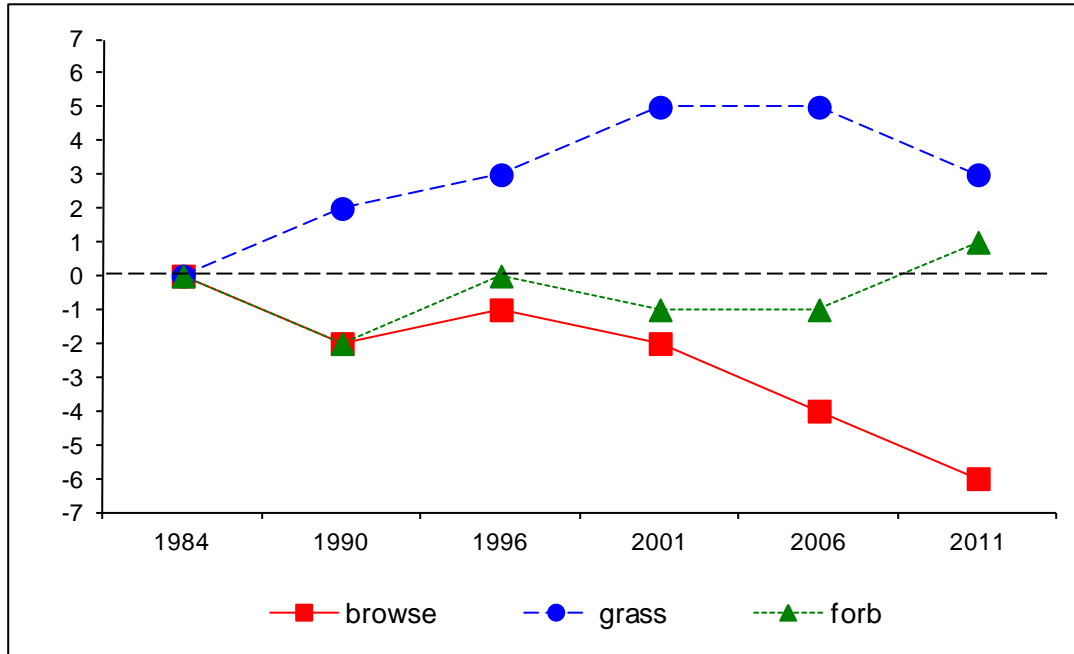
- **1984 to 1990 - down (-2):** The perennial forb sum of nested frequency decreased by 69%.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased more than two-fold. There was also a substantial increase in the sum of nested frequency of annual forbs.
- **1996 to 2001 - slightly down (-1):** There was a 19% decrease in the sum of nested frequency of perennial forbs, but cover increased slightly from 6% to 7%.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 40%, and cover increased to 10%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 4, study no: 2

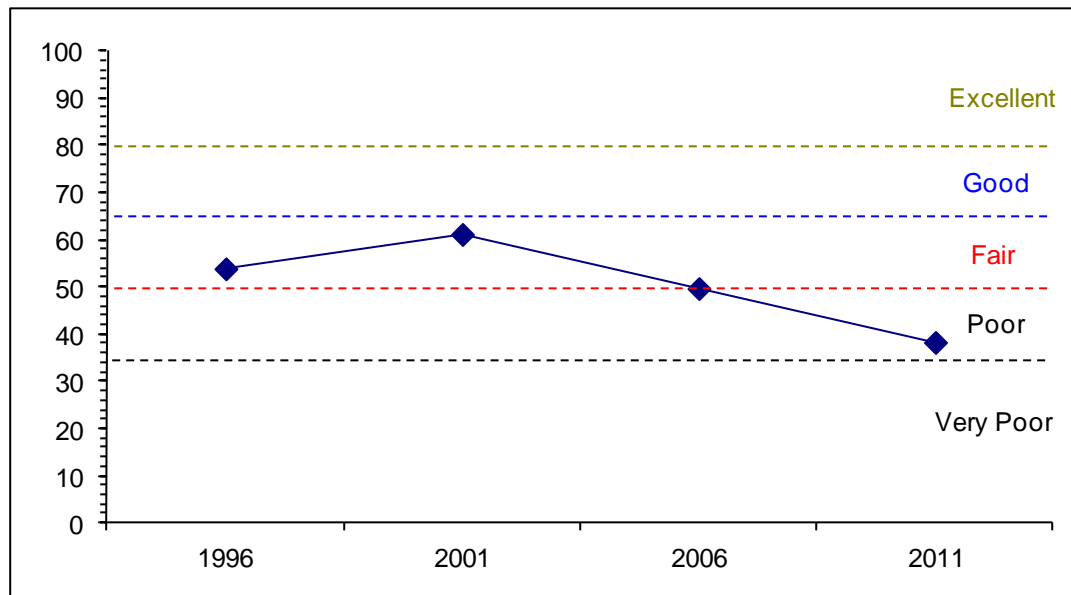
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	17.9	9.3	8.0	19.0	-10.3	10.0	0.0	53.9	Fair
01	18.8	5.7	0.0	30.0	-3.3	10.0	0.0	61.2	Fair
06	12.0	0.6	0.5	30.0	-3.4	10.0	0.0	49.7	Poor-Fair
11	5.3	0.0	0.0	26.5	-3.5	10.0	0.0	38.3	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 2



HERBACEOUS TRENDS--
Management unit 04, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a125	bc179	b182	bc184	c226	bc232	7.53	7.38	15.21	10.14
G	Bromus japonicus (a)	-	-	a16	b33	a6	a4	.08	.36	.04	.00
G	Bromus tectorum (a)	-	-	c330	b169	b179	a128	13.71	4.04	4.49	4.67
G	Poa bulbosa	-	-	a58	a85	b160	c310	1.31	2.56	4.97	23.65
G	Poa fendleriana	-	-	6	3	16	1	.01	.03	.15	.03
G	Poa pratensis	7	17	10	17	4	6	.12	.66	.38	.03
G	Poa secunda	a20	a22	b83	c169	b121	b83	1.81	7.96	4.49	3.04
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	132	13.79	4.40	4.54	4.67
Total for Perennial Grasses		152	218	344	473	530	632	10.82	18.72	25.36	36.90
Total for Grasses		152	218	690	675	715	764	24.62	23.13	29.91	41.58
F	Achillea millefolium	-	2	4	4	3	3	.01	.01	.03	.03
F	Agoseris glauca	6	9	6	13	14	18	.01	.10	.14	.30
F	Allium acuminatum	b145	a6	a-	a21	a2	a23	-	.11	.00	.11
F	Alyssum alyssoides (a)	-	-	c199	bc167	a79	b122	5.09	1.06	.25	.62
F	Ambrosia psilostachya	-	-	-	-	-	-	-	.00	-	-
F	Antennaria rosea	-	-	-	3	1	-	-	.03	.00	-
F	Artemisia ludoviciana	bc45	c65	a19	ab26	ab25	ab33	1.32	1.85	.70	.79
F	Astragalus beckwithii	-	-	9	9	12	18	.07	.24	1.16	.87
F	Astragalus cibarius	b163	a-	a15	a22	a17	a2	.09	.34	.54	.03
F	Astragalus utahensis	a6	a5	c75	b39	a16	a12	1.76	1.37	.43	.53
F	Calochortus nuttallii	a1	a-	a1	ab6	a1	b22	.00	.02	.00	.07
F	Camelina microcarpa (a)	-	-	-	8	5	-	-	.07	.01	-
F	Castilleja linariaefolia	-	-	2	4	-	1	.00	.04	-	.03
F	Cirsium undulatum	6	17	13	5	2	3	.29	.18	.03	.18
F	Collinsia parviflora (a)	-	-	a22	b97	a50	a38	.07	.72	.10	.24
F	Collomia linearis (a)	-	-	b14	c39	a-	b12	.04	.18	-	.20
F	Crepis acuminata	-	-	1	2	-	3	.00	.00	-	.03
F	Cymopterus sp.	a-	a-	a-	b13	c69	c83	-	.06	.92	1.56
F	Descurainia pinnata (a)	-	-	-	3	-	1	-	.01	-	.00
F	Descurainia sp. (a)	-	-	-	-	-	7	-	-	-	.01
F	Draba sp. (a)	-	-	106	93	74	109	.31	.24	.34	.53
F	Epilobium brachycarpum (a)	-	-	-	10	4	-	-	.02	.01	-
F	Erigeron pumilus	-	-	-	3	-	-	-	.00	-	-
F	Eriogonum umbellatum	-	-	-	2	-	-	-	.00	-	-
F	Erodium cicutarium (a)	-	-	b97	a57	a37	c131	2.56	2.00	.35	5.48
F	Galium sp.	a-	a-	b14	a2	a-	a-	.08	.00	-	-
F	Grindelia squarrosa	a-	a-	b22	ab10	a1	a-	.10	.34	.03	-
F	Helianthus annuus (a)	-	-	-	-	5	-	-	-	.01	-
F	Heterotheca villosa	-	1	3	2	-	-	.00	.15	-	-
F	Holosteum umbellatum (a)	-	-	b239	a106	a80	a109	1.67	.66	.25	.97

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Lactuca serriola</i> (a)	-	-	3	-	-	1	.01	-	-	.00
F	<i>Lithophragma</i> sp.	-	-	-	-	-	3	-	-	-	.04
F	<i>Lomatium</i> sp.	a ⁻	a ³	b ²⁸	ab ¹⁹	a ³	ab ²¹	.09	.14	.02	.31
F	<i>Lupinus argenteus</i>	a ¹	ab ³	bc ²⁵	c ³¹	c ²⁹	c ⁴²	.97	1.37	.76	1.85
F	<i>Machaeranthera</i> spp	a ⁻	a ⁻	b ⁴²	a ⁻	a ⁻	a ²	.10	-	-	.00
F	<i>Microsteris gracilis</i> (a)	-	-	-	22	26	8	-	.05	.05	.02
F	<i>Oenothera</i> sp.	-	-	-	-	9	-	-	-	.07	-
F	<i>Penstemon</i> sp.	b ¹⁹	a ⁻	a ⁻	a ⁻	a ⁻	a ⁻	-	-	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	24	53	50	25	.10	.53	.36	.22
F	<i>Schoenrambe linifolia</i>	-	-	-	-	-	7	-	-	-	.21
F	<i>Senecio integerrimus</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	-	-	9	-	-	-	.23
F	<i>Sphaeralcea grossulariifolia</i>	-	-	4	-	-	1	.18	-	-	.03
F	<i>Taraxacum officinale</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Tragopogon dubius</i> (a)	a ⁻	bc ³⁵	c ⁶¹	bc ³¹	ab ¹³	a ²	.37	.49	.18	.03
F	<i>Verbascum thapsus</i>	-	-	-	4	-	-	-	.01	-	-
F	<i>Veronica biloba</i> (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Vicia americana</i>	a ⁻	a ¹⁰	c ⁶³	ab ³⁶	bc ⁶³	c ⁸¹	.57	.36	1.71	2.91
F	<i>Zigadenus paniculatus</i>	-	1	-	-	3	-	-	-	.00	-
Total for Annual Forbs		0	35	765	687	423	574	10.25	6.06	1.93	8.58
Total for Perennial Forbs		392	122	346	280	270	378	5.69	6.78	6.58	9.93
Total for Forbs		392	157	1111	967	693	952	15.94	12.85	8.51	18.52

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	'11	'96	'01	'06	'11
B	<i>Artemisia tridentata vaseyana</i>	75	77	60	42	14.32	15.01	9.60	4.08
B	<i>Chrysothamnus nauseosus albicaulis</i>	4	1	1	0	-	-	-	.15
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	4	2	5	2	.45	.53	.74	.00
B	<i>Gutierrezia sarothrae</i>	20	34	5	1	.29	.90	-	.00
B	<i>Opuntia</i> sp.	6	6	4	1	-	-	.15	-
B	<i>Symphoricarpos oreophilus</i>	4	5	4	6	.18	.04	.06	.68
Total for Browse		113	125	79	52	15.25	16.48	10.55	4.92

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 2

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	11.75	5.88
Chrysothamnus viscidiflorus viscidiflorus	.08	.20
Gutierrezia sarothrae	.05	-
Opuntia sp.	.23	-
Symphoricarpos oreophilus	1.18	1.46

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.7	1.8	1.0

BASIC COVER--

Management unit 04, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.50	10.50	49.46	50.97	47.50	60.85
Rock	23.00	13.50	9.88	11.98	8.98	9.15
Pavement	13.25	9.25	6.84	11.67	11.53	2.95
Litter	49.75	63.00	59.37	43.15	42.29	45.18
Cryptogams	0	0	.03	.10	.08	.07
Bare Ground	11.50	3.75	2.89	9.38	6.46	3.04

SOIL ANALYSIS DATA --

Management unit 04, Study no: 2, Study Name: Echo Canyon

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.5	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	-	-	1	-	-	-	-
Rabbit	-	-	5	2	-	-	-
Elk	17	1	22	14	6 (15)	28 (69)	5 (13)
Deer	17	29	35	38	50 (124)	84 (208)	7 (18)
Cattle	2	1	1	1	5 (13)	-	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 2

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	32/29	
01	0	0	0	-	-	0	0	0	34/37	
06	0	0	0	-	-	0	0	0	50/52	
11	0	0	0	-	-	0	0	0	50/50	
<i>Artemisia tridentata vaseyana</i>										
84	5998	1	70	29	266	23	76	0	26/35	
90	2932	0	36	64	1933	66	23	7	26/35	
96	3300	16	64	19	20	44	4	1	18/37	
01	2780	0	69	31	80	53	12	9	23/44	
06	1880	1	51	48	280	40	37	30	24/39	
11	1180	2	31	68	20	56	14	63	22/38	
<i>Chrysothamnus nauseosus albicaulis</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	80	0	100	-	-	0	0	0	18/30	
01	20	0	100	-	-	0	0	0	29/41	
06	20	0	100	-	-	0	0	0	31/47	
11	0	0	0	-	-	0	0	0	26/44	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	66	0	100	-	-	0	0	0	7/9	
90	66	0	100	-	-	0	0	100	9/20	
96	80	0	100	-	-	0	0	0	12/22	
01	40	0	100	-	-	0	0	0	10/19	
06	100	0	100	-	-	0	0	0	13/24	
11	40	0	100	-	-	0	0	0	12/20	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	1340	39	61	0	980	0	0	0	8/11	
01	1540	3	91	6	-	0	0	3	7/9	
06	140	14	86	0	-	0	0	0	7/10	
11	20	0	100	0	20	0	0	0	5/4	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Opuntia sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	240	8	92	-	-	0	0	0	6/12	
01	260	15	85	-	-	8	0	23	4/10	
06	80	0	100	-	-	0	0	0	5/17	
11	20	0	100	-	-	0	0	0	6/18	
Symphoricarpos oreophilus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	80	75	25	-	-	0	0	0	25/25	
01	120	0	100	-	-	0	0	0	16/22	
06	80	0	100	-	-	0	0	0	24/43	
11	160	0	100	-	-	0	0	0	25/36	

TANK CANYON - TREND STUDY NO. 4-3-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,100 ft (1,895 m)

Aspect: West

Slope: 23%

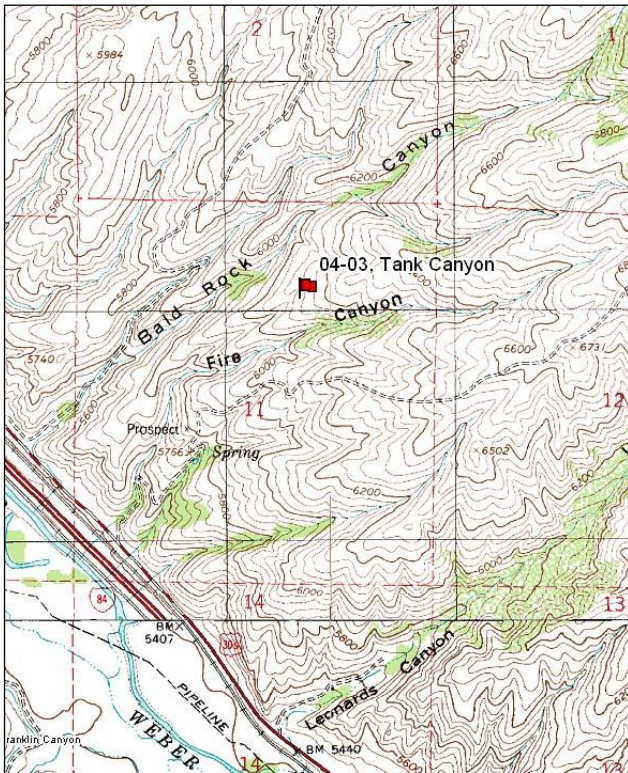
Transect bearing: 146° magnetic

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

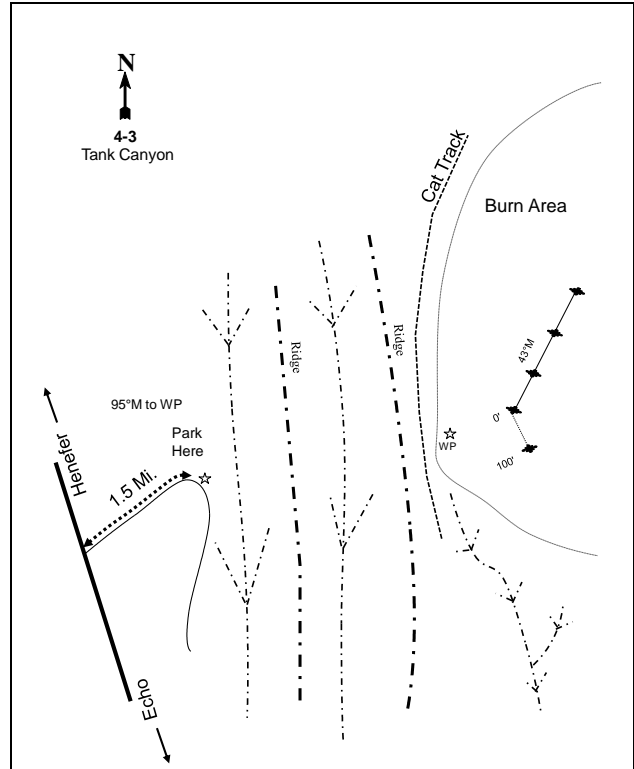
Directions:

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 on 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



Diagrammatic Sketch:



Township: 3N Range: 4E Section: 11

GPS: NAD 83, UTM 12S 461262 E 4540256 N

TANK CANYON - TREND STUDY NO. 4-3

Site Information

Site Description: This study samples crucial deer winter range on the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA) between Tank Canyon and Bald Rock Canyon. The area was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) prior to a 1982 fire, and appears to have been seeded following the fire. Another small fire burned 40 acres of the area, including the study, 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 only data collected since 1996 will be included in this report. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA. On the original studies, pellet groups were abundant and several winter-killed carcasses were seen in the immediate vicinity. Elk pellet groups have been sampled in moderate to high abundance since 2001. Deer pellet groups have been moderated in abundance since 2001. Sampled cattle sign has been high since 2006 (Table - Pellet Group Data).

Browse: Prior to the burn, the browse composition consisted primarily of mountain big sagebrush, with a lesser component comprised of stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), mountain snowberry (*Symphoricarpos oreophilus*), and Saskatoon serviceberry (*Amelanchier alnifolia*). Since the fire, browse species have been much less common on the site. The most abundant shrub species since the fire has been stickyleaf low rabbitbrush (Table - Browse Characteristics).

Herbaceous Understory: Grasses and forbs were rare prior to the burn, but grasses have dominated the site since 1996. The grass component has been dominated by the seeded species crested wheatgrass (*Agropyron cristatum*) and the weedy species bulbous bluegrass (*Poa bulbosa*). Competition from these species appears to be preventing sagebrush seedling establishment. The seeded species smooth brome (*Bromus inermis*) increased significantly in 2011, and became prevalent on the study. Forbs are abundant, but the seeded forb species alfalfa (*Medicago sativa*) provides nearly all of the forb cover. The native species American vetch (*Vicia americana*) is also common, but provides limited cover (Table - Herbaceous Trends).

Soil: The soil is in the Horrocks-Cutoff complex, likely as part of the Horrocks component. These soils occur on mountain slopes, with parent material consisting of colluvium derived from conglomerate, sandstone, and andesite. The soils are characterized as moderately deep, well drained, and moderately permeable (Soil Survey 2011). This area is excessively drained and probably holds little available water in mid-summer. Soil texture is a clay loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is low, with a very high amount of vegetation and litter cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** Browse remains limited on the site. Stickyleaf low rabbitbrush density decreased 46% from 3,500 plants/acre to 1,900 plants/acre, and cover decreased from 3% to 1%.
- **2001 to 2006 - stable (0):** Browse remains limited on the site.
- **2006 to 2011 - stable (0):** Browse remains limited on the site.

Grass:

- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased from 17% to 33%. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 19% to 25%.

- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, though cover decreased to 22%. Nested frequency of bulbous bluegrass remained similar, but cover increased to 29%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 13%, and cover decreased to 19%. There was a slight change in composition with a significant decrease in the nested frequency of crested wheatgrass, and a significant increase in the nested frequency of smooth brome. Bulbous bluegrass remained the dominant species on the site.

Forb:

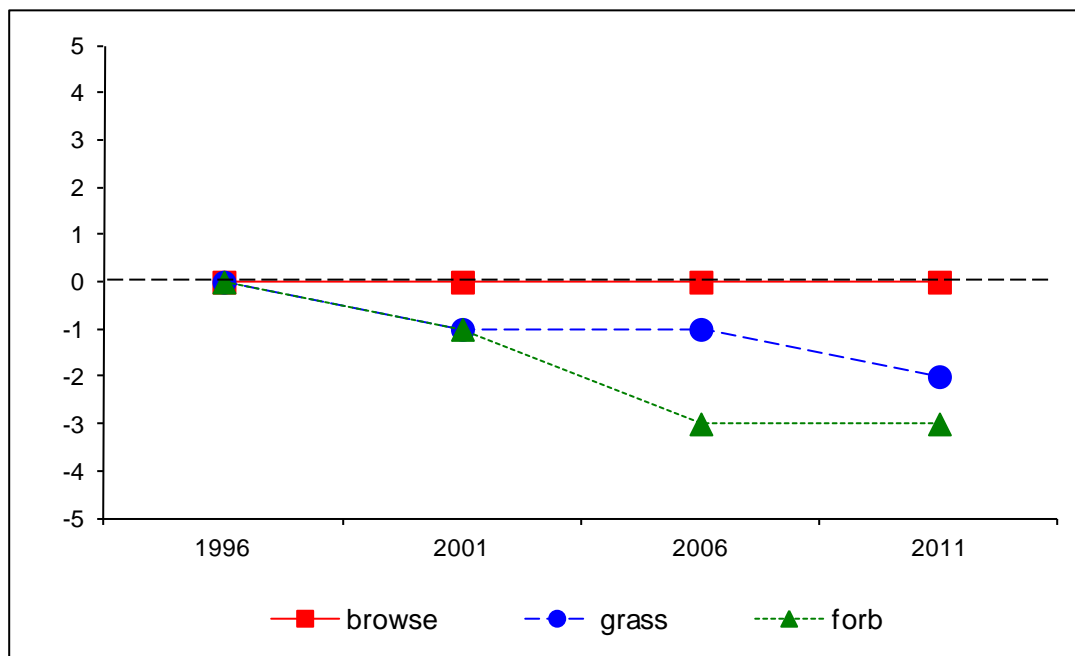
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 15%, though cover increased from 13% to 19%.
- **2001 to 2006 - down (-2):** The perennial forb sum of nested frequency decreased by 37%, and cover decreased to 11%. There was a significant decrease in the nested frequency of alfalfa.
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, but cover decreased to 6%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 4, study no: 3

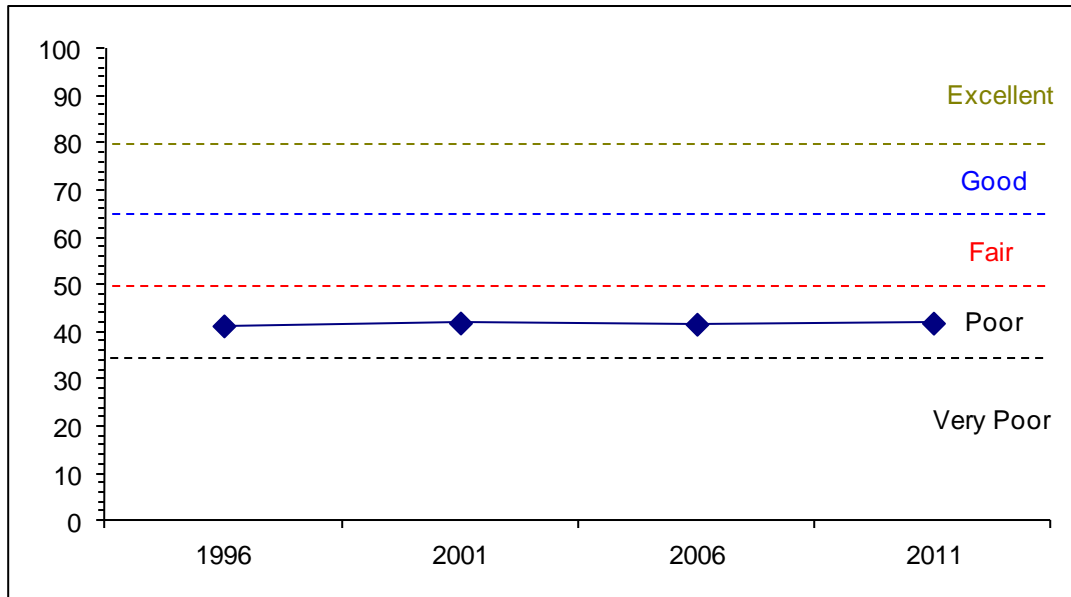
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	1.5	0.0	0.0	30.0	-0.2	10.0	0.0	41.3	Poor
01	1.9	0.0	0.0	30.0	0.0	10.0	0.0	41.9	Poor
06	1.7	0.0	0.0	30.0	0.0	10.0	0.0	41.7	Poor
11	1.9	0.0	0.0	30.0	0.0	10.0	0.0	41.9	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 4 Study no: 3



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 3



HERBACEOUS TRENDS--
 Management unit 04, Study no: 3

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	b ²⁷⁵	c ³²²	bc ³²¹	a ¹⁶³	14.40	28.78	14.76	7.40
G	Agropyron dasystachyum	b ¹²	a ⁻	a ⁻	a ⁻	.10	-	-	-
G	Agropyron intermedium	b ⁵⁶	b ⁷⁰	b ⁴⁴	a ¹⁶	.77	2.92	1.03	.37
G	Agropyron spicatum	b ¹⁵	ab ⁴	a ⁻	b ¹⁷	1.08	.18	-	1.11
G	Bromus inermis	b ⁵²	a ²⁰	ab ³⁴	c ¹⁶¹	.70	.38	.61	6.88
G	Bromus japonicus (a)	3	-	-	-	.00	-	-	-
G	Bromus tectorum (a)	b ¹⁵	a ¹	a ⁻	a ⁻	.21	.00	-	-
G	Festuca ovina	3	3	-	-	.18	.00	-	-
G	Oryzopsis hymenoides	-	-	-	-	-	-	-	-
G	Poa bulbosa	a ²⁸⁷	b ³⁵⁸	ab ³²⁶	ab ³³⁵	18.70	24.53	29.17	29.90
G	Poa fendleriana	-	-	-	-	-	-	-	-
G	Poa pratensis	-	-	-	13	-	-	-	1.39
G	Poa secunda	a ⁻	b ¹⁸	c ⁵²	b ²⁵	-	.81	5.03	2.30
G	Sitanion hystrix	1	1	-	-	.00	.00	-	-
Total for Annual Grasses		18	1	0	0	0.21	0.00	0	0
Total for Perennial Grasses		701	796	777	730	35.96	57.62	50.63	49.37
Total for Grasses		719	797	777	730	36.18	57.62	50.63	49.37
F	Achillea millefolium	-	-	-	-	-	-	-	.00
F	Agoseris glauca	-	-	-	3	-	-	-	.03
F	Allium sp.	-	-	-	1	-	-	-	.00
F	Alyssum alyssoides (a)	b ⁶⁹	b ⁵²	a ²⁴	b ⁶¹	.26	.18	.05	.30
F	Astragalus cibarius	-	-	-	-	-	-	.00	-
F	Astragalus sp.	-	-	2	4	-	-	.00	.16

T y p e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Calochortus nuttallii</i>	-	3	-	-	-	.01	-	-
F	<i>Cirsium undulatum</i>	2	4	4	-	.00	.30	.01	-
F	<i>Collinsia parviflora</i> (a)	-	2	11	3	-	.00	.03	.01
F	<i>Collomia linearis</i> (a)	-	2	-	1	-	.00	-	.00
F	<i>Comandra pallida</i>	1	-	-	-	.00	-	-	-
F	<i>Cymopterus</i> sp.	-	5	3	5	-	.04	.01	.07
F	<i>Descurainia pinnata</i> (a)	a-	a ¹	a-	b ¹⁴	-	.00	-	.04
F	<i>Epilobium brachycarpum</i> (a)	-	-	8	4	-	-	.01	.01
F	<i>Eriogonum ovalifolium</i>	3	-	-	-	.00	-	-	-
F	<i>Erodium cicutarium</i> (a)	-	7	1	2	-	.04	.00	.00
F	<i>Lactuca serriola</i> (a)	a-	a-	a-	b ¹⁴	-	-	-	.05
F	<i>Lesquerella</i> sp.	-	3	-	-	-	.00	-	-
F	<i>Medicago sativa</i>	b ¹⁶⁹	b ¹⁸³	a ¹²⁹	a ¹²⁰	11.81	16.42	10.31	5.29
F	<i>Microsteris gracilis</i> (a)	-	-	3	-	-	-	.00	-
F	<i>Pedicularis centranthera</i>	-	-	1	-	-	-	.15	-
F	<i>Polygonum douglasii</i> (a)	5	-	3	-	.01	-	.01	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	3	-	-	-	.00
F	<i>Sanguisorba minor</i>	9	5	-	6	.06	.18	-	.06
F	<i>Sisymbrium altissimum</i> (a)	-	1	-	-	-	.00	-	-
F	<i>Sphaeralcea coccinea</i>	2	-	-	-	.03	-	-	-
F	<i>Tragopogon dubius</i> (a)	b ²³	a ⁷	a ¹	a-	.11	.09	.00	-
F	<i>Vicia americana</i>	c ¹⁷³	b ¹⁰²	a ⁵³	a ⁵⁰	1.22	1.50	.42	.71
Total for Annual Forbs		97	72	51	102	0.38	0.33	0.12	0.43
Total for Perennial Forbs		359	305	192	189	13.14	18.46	10.92	6.33
Total for Forbs		456	377	243	291	13.53	18.80	11.04	6.77

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

BROWSE TRENDS--

Management unit 04, Study no: 3

T y p e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	3	1	1	1	-	-	-	-
B	<i>Artemisia tridentata vaseyana</i>	10	3	3	5	.68	1.13	.38	.91
B	<i>Chrysothamnus nauseosus albicaulis</i>	6	6	5	7	.48	.39	.94	.59
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	66	38	51	47	3.00	1.44	2.59	1.75
B	<i>Gutierrezia sarothrae</i>	6	6	4	1	.01	-	-	.00
B	<i>Tetradymia canescens</i>	-	-	-	-	-	-	-	.01
Total for Browse		91	54	64	61	4.18	2.97	3.92	3.28

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 3

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	.18	.11
Chrysothamnus nauseosus albicaulis	.88	.16
Chrysothamnus viscidiflorus viscidiflorus	1.26	1.48
Gutierrezia sarothrae	.11	-

BASIC COVER--

Management unit 04, Study no: 3

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	53.31	68.63	66.61	64.87
Rock	3.11	2.72	3.68	2.06
Pavement	1.29	3.76	4.38	4.01
Litter	63.50	34.77	29.13	36.70
Cryptogams	.40	.58	.30	.33
Bare Ground	1.60	3.50	4.73	8.16

SOIL ANALYSIS DATA --

Management unit 04, Study no: 3, Study Name: Tank Canyon

Effective rooting depth (in)	pH	Clay-Loam			% OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
16.3	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	26	-	-	1	-	-	-
Rabbit	-	6	26	8	-	-	-
Elk	9	15	63	15	46 (112)	56 (137)	37 (91)
Deer	11	12	12	12	21 (51)	15 (38)	11 (26)
Cattle	-	4	24	7	-	35 (86)	51 (125)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 3

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
96	60	0	100	0	-	67	33	0	22/26
01	220	100	0	0	-	0	0	0	14/20
06	20	0	100	0	-	0	0	0	13/24
11	20	100	0	0	-	0	0	0	19/28

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata vaseyana</i>									
96	200	40	60	0	-	10	0	0	21/27
01	60	0	100	0	-	0	33	0	22/22
06	60	33	33	33	160	0	0	33	26/39
11	140	57	29	14	-	14	43	14	14/27
<i>Chrysothamnus nauseosus albicaulis</i>									
96	140	14	71	14	-	0	0	0	24/36
01	140	14	43	43	-	0	0	0	24/27
06	140	29	57	14	-	57	0	0	25/39
11	180	44	33	22	40	33	11	22	21/27
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	3500	16	82	2	140	26	0	2	13/19
01	1900	6	88	5	-	0	0	1	8/11
06	2060	11	86	3	20	10	0	.97	8/12
11	1440	42	58	0	-	15	6	0	10/15
<i>Gutierrezia sarothrae</i>									
96	220	64	36	0	40	0	0	0	7/10
01	280	7	93	0	-	0	0	0	9/9
06	120	0	83	17	-	0	0	17	10/11
11	20	100	0	0	-	0	0	0	5/4
<i>Opuntia sp.</i>									
96	0	0	0	-	-	0	0	0	6/21
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	3/7
11	0	0	0	-	20	0	0	0	4/7
<i>Symphoricarpos oreophilus</i>									
96	0	0	0	-	-	0	0	0	18/45
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	15/26
11	0	0	0	-	-	0	0	0	26/36
<i>Tetradymia canescens</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	13/20
11	0	0	0	-	40	0	0	0	6/11

OWEN'S CANYON - TREND STUDY NO. 4-4-11

Vegetation Type: Burned and Seeded

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,300 ft (1,920 m)

Aspect: South

Slope: 22-30%

Transect bearing: 160° magnetic

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

Directions:

From the "R" Ranch main gate 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 farther to a DWR gate.

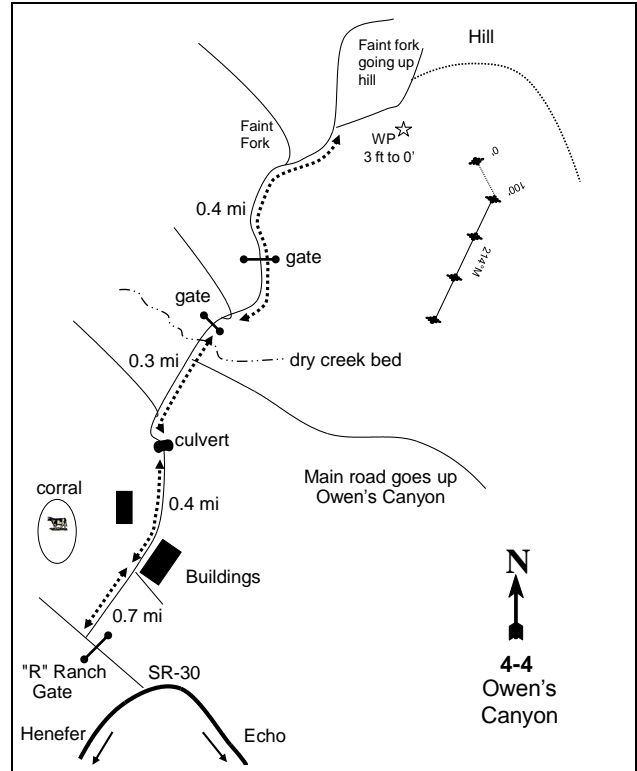
Continue through the gate 0.25 miles, turn left, cross the wash, and stay on the main road (left fork leads to DWR cabin). Proceed 0.4 miles to a fork in the road. Continue right for 0.3 miles. A witness post is three feet from the 0-foot stake. The 0-foot baseline stake is marked by browse tag #7945. The baseline doglegs after the 100-foot baseline stake and runs 214 degrees magnetic.

Map Name: Henefer



Township: 4N Range: 4E Section: 35

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 461368 E 4542573 N

OWEN'S CANYON - TREND STUDY NO. 4-4

Site Information

Site Description: The study is located in the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA) on the north side of Owen's Canyon. The study samples a former mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. The Eagle Canyon fire burned 3,744 acres, including the study site, in 1999, effectively removing the sagebrush and other browse species. The site is now dominated by grasses. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA. It was noted that deer pellet groups were moderately abundant during the 1984 reading. Deer pellet groups have been sampled in low abundance since 2001. Elk pellet groups were sampled in low abundance in 2001, but in high abundance since 2006. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The sagebrush on the site was classified as mountain big sagebrush, but also had characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*). Prior to the burn in 1996, mountain big sagebrush provided 20% cover (Table - Browse Trends) from a moderately dense stand. Utilization was mostly light to moderate, and decadence was moderately high. The fire reduced all of the preferred browse populations substantially. Forage kochia (*Kochia prostrata*) was seeded following the fire, and has become the only browse species with substantial density. Utilization of the kochia has been light to moderate since 2006. The kochia appears to be establishing well despite the dense herbaceous understory. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is present on the site, but density did not change after the fire (Table - Browse Characteristics).

Herbaceous Understory: Grasses have dominated the herbaceous understory, and have become the dominant vegetation since the fire. The most abundant herbaceous plants are the exotic perennial grasses crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*A. intermedium*), and smooth brome (*Bromus inermis*), all of which were seeded prior to the study establishment. Several other native perennial grasses are found, but only western wheatgrass (*Agropyron smithii*) is abundant. The weedy species bulbous bluegrass (*Poa bulbosa*) has been steadily increasing on the site since the fire. The annual grasses cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are common, and have dominated the site at times. The majority of forbs are weedy biennials and annuals. The only common perennial forb is American vetch (*Vicia americana*). Pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*) are very common annual forbs. The noxious weed musk thistle (*Carduus nutans*) was sampled at very low cover in 2001 (Table - Herbaceous Trends).

Soil: The soil is in the Horrocks-Cutoff complex, likely as part of the Horrocks component. These soils occur on mountain slopes, with parent material consisting of colluvium derived from conglomerate, sandstone, and andesite. The soils are characterized as moderately deep, well drained, and moderately permeable (Soil Survey 2011). Drainage is probably excessive and soil moisture may be limited in the upper horizons during midsummer. The soil texture is a clay loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). Bare ground cover increased following the fire, but is still relatively low. There is abundant vegetation and litter cover provided by herbaceous species (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was a slight increase in the density of mountain big sagebrush from 3,964 plants/acre to 4,098 plants/acre. Decadence increased from 17% to 43%, and poor vigor increased from 3% to 17%. Recruitment of young sagebrush plants remained high at 21%.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decadence decreased to 22%, and poor vigor decreased to 6%. Recruitment of young sagebrush plants decreased to 9% of the population.
- **1996 to 2001 - down (-2):** The fire effectively removed all preferred browse from the site. The density of sagebrush decreased to 60 plants/acre. The population consisted entirely of young plants.
- **2001 to 2006 - slightly up (+1):** The mountain big sagebrush density remains very low, but increased to 180 plants/acre. The seeded species forage kochia increased 73% from 1,460 plants/acre to 2,520 plants/acre, most of which were mature, established plants. Cover of kochia increased, but remained low at 1%.
- **2006 to 2011 - stable (0):** The density of forage kochia increased slightly to 2,740 plants/acre, but cover remained around 1%. There was little change in the sagebrush population.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 73% due to a significant increase in the nested frequency of crested wheatgrass.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 27%. Annual grasses were included in the sample for the first time and were present at high frequency and cover.
- **1996 to 2001 - up (+2):** Following the fire, the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 16%, and cover increased from 12% to 24%. Both cheatgrass and Japanese chess decreased significantly in nested frequency, and annual grass cover decreased from 20% to 3%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased by 14%, and cover increased to 28%. Cheatgrass increased significantly in nested frequency, and cover of annual grasses increased to 10%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grass, excluding bulbous bluegrass, increased 36%, though cover remained similar at 27%. Japanese chess increased significantly in nested frequency, but annual grass cover decreased to 7%.

Forb:

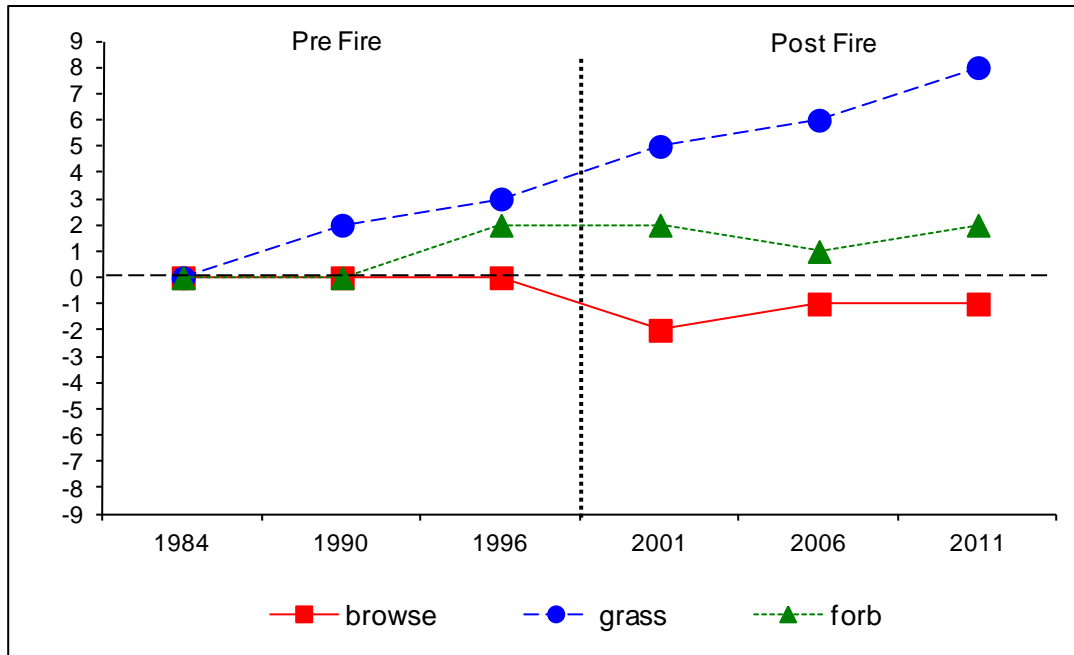
- **1984 to 1990 - stable (0):** Perennial forbs remained rare on the site.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased nearly seven-fold, though cover was only 1%.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, though cover increased to 2%. The annual forb sum of nested frequency and cover increased substantially. Most of the increase in annual forbs was due to significant increases in the nested frequency of Pale alyssum and storksbill.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 26%, but forbs were rare on the site and only provided 2% cover. The annual forb sum of nested frequency increased substantially, but cover decreased to 7%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased to 2001 levels, but cover remained low at 1%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 4, study no: 4

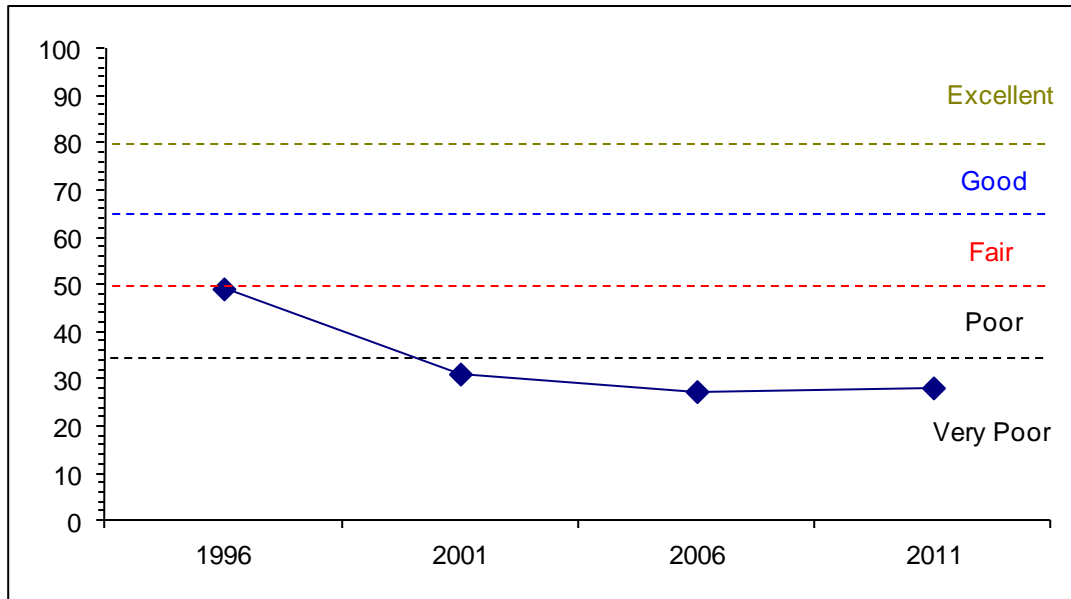
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	25.9	8.2	4.6	23.3	-14.8	2.0	0.0	49.1	Poor-Fair
01	0.5	0.0	0.0	30.0	-1.9	4.4	-2.0	31.1	Very Poor
06	2.0	0.0	0.0	30.0	-7.5	2.9	0.0	27.4	Very Poor
11	1.2	0.0	0.0	30.0	-5.3	2.2	0.0	28.2	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4, Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 4, Study no: 4



HERBACEOUS TRENDS--
Management unit 04, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a70	c132	bc133	ab87	bc127	c143	6.62	5.27	8.26	8.47
G	Agropyron intermedium	a1	a8	a15	b55	b77	b76	.69	3.37	5.58	4.81
G	Agropyron smithii	a-	a-	b29	b45	b42	c111	.39	4.52	3.94	6.85
G	Agropyron spicatum	3	-	2	-	4	2	.01	-	.76	.15
G	Bromus inermis	a50	ab83	bc99	bc105	bc113	c141	3.80	9.85	8.68	5.86
G	Bromus japonicus (a)	-	-	c203	a73	a89	b140	4.48	.50	.79	1.92
G	Bromus tectorum (a)	-	-	c321	a84	b178	b173	15.25	1.99	9.26	5.10
G	Dactylis glomerata	a-	a-	a-	b21	a1	a-	-	.35	.15	-
G	Oryzopsis hymenoides	-	2	4	10	4	-	.03	.36	.15	-
G	Poa bulbosa	a-	a-	a2	ab26	b39	c101	.01	1.43	1.12	3.55
G	Poa fendleriana	-	-	-	4	-	-	-	.15	-	-
G	Poa pratensis	-	2	5	8	1	-	.09	.18	.03	-
G	Poa secunda	a-	a1	a2	a-	a13	b45	.03	-	.30	.53
G	Sitanion hystrix	b9	a2	a-	a-	a-	a1	-	-	.00	.00
Total for Annual Grasses		0	0	524	157	267	313	19.74	2.50	10.05	7.02
Total for Perennial Grasses		133	230	291	361	421	620	11.68	25.51	29.01	30.25
Total for Grasses		133	230	815	518	688	933	31.43	28.01	39.06	37.27
F	Agoseris glauca	-	-	-	3	-	-	-	.00	-	-
F	Allium sp.	a-	a-	a-	c32	b9	c35	-	.20	.02	.10
F	Alyssum alyssoides (a)	-	-	a157	c324	b279	c332	.81	25.80	2.18	6.28
F	Ambrosia psilostachya	-	-	-	7	-	-	-	.04	-	-
F	Arabis sp.	2	13	2	-	-	-	.01	-	-	-
F	Arenaria sp.	-	-	-	-	4	-	-	-	.03	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Aster sp.	-	-	4	7	6	1	.03	.18	.18	.03
F	Astragalus sp.	-	-	2	1	-	-	.03	.03	-	-
F	Astragalus utahensis	-	-	-	-	-	1	-	-	-	.03
F	Calochortus nuttallii	-	-	-	3	-	-	-	.00	-	-
F	Camelina microcarpa (a)	-	-	a4	b23	a-	a-	.38	.06	-	-
F	Carduus nutans (a)	-	-	-	-	-	-	-	.03	-	-
F	Cirsium undulatum	-	2	8	5	-	-	.06	.01	-	-
F	Collinsia parviflora (a)	-	-	a3	bc45	c60	ab22	.00	.68	.15	.05
F	Collomia linearis (a)	-	-	a-	b14	cd19	c23	-	.02	.08	.06
F	Cymopterus sp.	-	-	1	-	7	6	.00	-	.07	.01
F	Descurainia pinnata (a)	-	-	-	10	3	3	-	.04	.00	.00
F	Draba sp. (a)	-	-	a-	b18	b41	c127	-	.04	.08	.58
F	Epilobium brachycarpum (a)	-	-	a-	bc39	c57	b22	-	.75	.31	.04
F	Erigeron strigosus	-	-	5	-	-	-	.03	-	-	-
F	Eriogonum umbellatum	-	-	-	-	-	3	-	-	-	.00
F	Erodium cicutarium (a)	-	-	a-	b70	b69	c109	-	3.65	1.08	1.26
F	Gayophytum ramosissimum(a)	-	-	-	-	2	-	-	-	.00	-
F	Grindelia squarrosa	8	-	-	3	1	-	-	.03	.03	-
F	Hedysarum boreale	a-	a-	b40	a-	a-	a-	.42	-	-	-
F	Helianthus annuus (a)	-	-	a-	a-	b16	c37	-	-	.07	.16
F	Holosteum umbellatum (a)	-	-	a31	a69	b128	b97	.36	.43	.47	.28
F	Lactuca serriola (a)	-	-	a-	bc17	b14	c34	-	.06	.04	.11
F	Lappula occidentalis (a)	-	-	-	-	2	-	-	-	.00	-
F	Machaeranthera spp	-	-	6	-	-	-	.01	-	-	-
F	Medicago sativa	-	-	-	-	-	3	-	-	.15	.03
F	Melilotus officinalis	-	-	-	5	-	-	-	.18	.03	-
F	Microsteris gracilis (a)	-	-	a-	b12	c44	c72	-	.08	.09	.25
F	Oenothera caespitosa	3	-	-	-	-	-	-	-	-	-
F	Penstemon sp.	-	-	-	1	-	-	-	.03	-	-
F	Phlox longifolia	a-	a-	a-	b14	a-	a-	-	.36	-	-
F	Polygonum douglasii (a)	-	-	3	3	6	3	.00	.01	.01	.00
F	Ranunculus testiculatus (a)	-	-	a3	a8	c90	b40	.00	.04	.50	.12
F	Sanguisorba minor	a-	a-	a-	b7	a-	a-	-	.66	-	-
F	Sisymbrium altissimum (a)	-	-	a-	b25	a1	a-	-	.21	.00	-
F	Sphaeralcea coccinea	-	-	-	4	1	-	-	.21	.00	-
F	Tragopogon dubius (a)	a6	a6	bc20	a12	d81	c41	.16	.10	1.50	.54
F	Vicia americana	a-	a4	b61	a29	a62	a78	.36	.26	.94	.87
Total for Annual Forbs		6	6	221	689	912	962	1.73	32.04	6.60	9.77
Total for Perennial Forbs		13	19	129	121	90	127	0.98	2.22	1.47	1.09
Total for Forbs		19	25	350	810	1002	1089	2.72	34.26	8.08	10.86

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	3	0	1	1	-	-	.15	-
B	Artemisia tridentata vaseyana	82	3	7	8	19.85	-	.15	.30
B	Chrysothamnus nauseosus albicaulis	7	0	0	0	.83	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	16	16	14	10	.97	.36	.59	.38
B	Gutierrezia sarothrae	1	1	0	0	.07	-	-	-
B	Kochia prostrata	0	37	43	44	-	.35	1.04	.58
B	Symphoricarpos oreophilus	1	0	0	0	-	-	-	-
Total for Browse		110	57	65	63	21.72	0.70	1.94	1.27

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 4

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.18	-
Artemisia tridentata vaseyana	.31	.48
Chrysothamnus viscidiflorus viscidiflorus	1.03	.58
Kochia prostrata	2.29	1.79

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 4

Species	Average leader growth (in)	
	'06	'11
Artemisia tridentata vaseyana	2.7	2.0

BASIC COVER--

Management unit 04, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	.50	8.50	50.47	63.19	44.72	58.20
Rock	12.75	7.00	2.49	4.01	4.59	3.23
Pavement	11.50	11.75	2.90	5.78	5.42	8.05
Litter	68.75	61.50	68.31	32.54	42.84	29.47
Cryptogams	0	0	.95	.00	.00	.03
Bare Ground	6.50	11.25	1.56	15.32	18.73	15.01

SOIL ANALYSIS DATA --

Management unit 04, Study no: 4, Study Name: Owen's Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.8	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	'11
Sheep	-	-	-	1
Rabbit	1	-	1	2
Elk	4	3	49	27
Deer	12	3	2	3
Cattle	1	-	4	3

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	-	-
9 (23)	66 (164)	64 (159)
4 (10)	5 (12)	5 (12)
-	9 (23)	4 (11)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 4

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Amelanchier alnifolia										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	60	33	67	-	-	0	0	0	25/20	
01	0	0	0	-	-	0	0	0	12/9	
06	20	0	100	-	-	100	0	0	17/26	
11	20	0	100	-	-	100	0	100	20/21	
Artemisia tridentata vaseyana										
84	3964	25	58	17	133	61	11	3	23/32	
90	4098	21	36	43	1066	56	20	17	14/17	
96	3420	9	69	22	120	13	2	6	26/45	
01	60	100	0	0	140	0	0	0	-/-	
06	180	0	100	0	-	11	78	0	14/13	
11	200	0	100	0	-	90	10	0	17/23	
Chrysothamnus nauseosus albicaulis										
84	33	0	100	0	-	0	0	0	9/6	
90	99	33	0	67	33	0	0	0	-/-	
96	160	13	50	38	-	0	0	0	24/34	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	21/23	
11	0	0	0	0	-	0	0	0	25/47	
Chrysothamnus viscidiflorus viscidiflorus										
84	33	0	0	100	-	0	0	0	-/-	
90	33	0	100	0	-	100	0	100	6/8	
96	420	10	81	10	-	0	0	0	14/22	
01	460	0	100	0	-	0	0	0	11/16	
06	400	10	85	5	-	10	0	5	14/24	
11	360	0	78	22	-	0	0	11	12/16	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
84	1132	0	97	3	-	0	0	0	12/6	
90	33	0	100	0	33	0	0	0	5/6	
96	200	20	80	0	180	0	0	0	10/12	
01	20	0	100	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
<i>Kochia prostrata</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	1460	71	29	-	20	0	0	0	4/6	
06	2520	33	67	-	6380	40	21	0	10/13	
11	2740	10	90	-	-	34	.72	0	8/10	
<i>Symphoricarpos oreophilus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	17/16	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	18/27	
11	0	0	0	-	-	0	0	0	19/37	

HARRIS CANYON - TREND STUDY NO. 4-6-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,254 ft (1,902 m)

Aspect: South

Slope: 35%

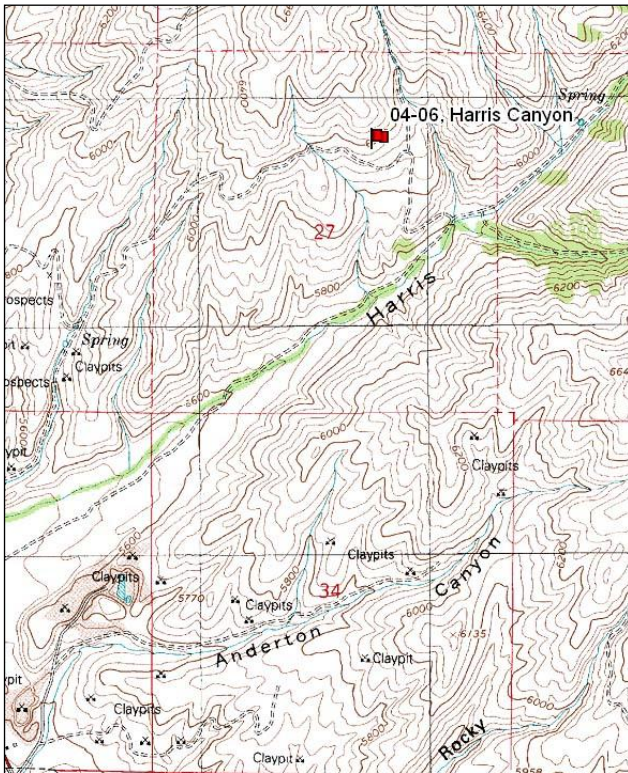
Transect bearing: 164° magnetic

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

Directions:

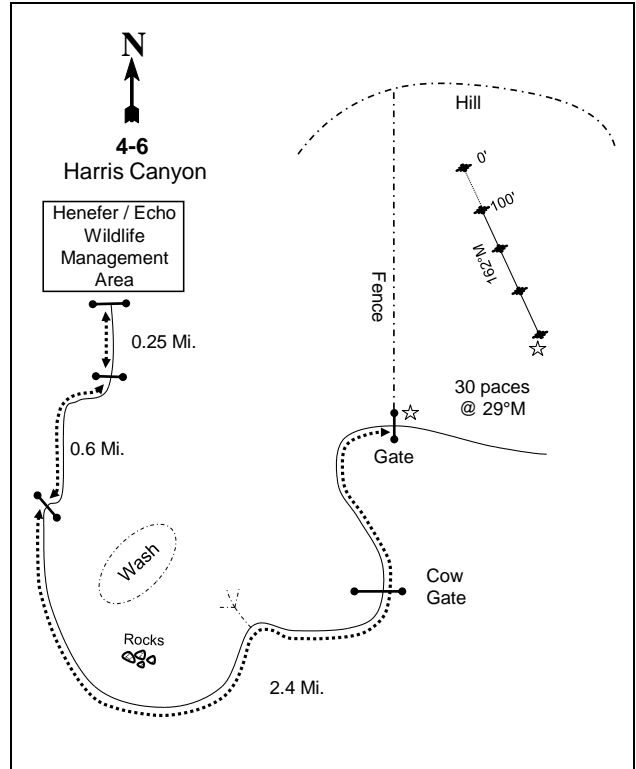
From exit 115 to Henefer, proceed northwest for 3.5 miles (towards Croyden) to the Croyden access road. At the DWR/R-Ranch property, turn right and travel 0.25 miles. Turn right at the DWR fence line and proceed 0.6 miles to another gate. Stay to the right, traveling around a wash for 2.4 to a fence 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



Township: 4N Range: 4E Section: 27

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 459689 E 4545091 N

HARRIS CANYON - TREND STUDY NO. 4-6

Site Information

Site Description: The study is located in the hills to the north of Harris Canyon within the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA). The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA. Deer and elk pellet groups have been sampled in high abundance since 2001. There have been very little cattle sign sampled since 2001 (Table - Pellet Group Data).

Browse: The total browse density is well below optimum for this location. The key species are mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*). Sagebrush density has remained relatively low throughout the course of the study. Health of the sagebrush population has fluctuated with years of low decadence and good vigor, and years of high decadence and poor vigor. In 2006, 40 plants/acre were identified with the sagebrush defoliator moth (*Aroga websteri*), but many individuals in the population appeared infested. Utilization of sagebrush was very heavy at the outset of the study, but use has been mostly light to moderate since 1996. Recruitment of young sagebrush plants has been mostly good over the course of the study. The bitterbrush population is comprised of a small population of very heavily used plants. Decadence and poor vigor were high in 2011. Recruitment of young bitterbrush plants has been mostly poor throughout the study years. Utah serviceberry (*Amelanchier utahensis*) is present in low densities, and a small population of white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) provides additional forage, but has steadily decreased in density since 1996. The increaser species stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*) are both common (Table - Browse Characteristics), but provide limited cover (Table - Browse Trends).

Herbaceous Understory: The herbaceous understory is dominated by the native perennial grass bluebunch wheatgrass (*Agropyron spicatum*), and the annual grasses cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*). Other grass species are fairly rare. A fair number of forbs are also present, but few are abundant. The predominant perennial forbs are Louisiana sagebrush (*Artemisia ludoviciana*) and American vetch (*Vicia americana*). Weedy annual forbs are quite abundant with pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*) being some of the most prevalent annual forb species (Table - Herbaceous Trends).

Soil: The soil is in the Horrocks-Cutoff complex, likely as part of the Horrocks component. These soils occur on mountain slopes, with parent material consisting of colluvium derived from conglomerate, sandstone, and andesite. The soils are characterized as moderately deep, well drained, and moderately permeable (Soil Survey 2011). The soil texture is a clay loam with a neutral soil reaction (pH of 7.2). Organic matter content is relatively high at 4% (Table - Soil Analysis Data). The color of the surface soil is reddish, which indicates some iron oxide. The soil surface is moderately rocky, and most surface rocks are rounded and cobblestone-like. Bare ground cover is moderately low, with a high amount of vegetation, litter, and rock cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2001 and 2006, but was stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** Mountain big sagebrush increased slightly from 631 plants/acre to 698 plants/acre. Decadence decreased from 63% to 52%, but remains very high. Poor vigor increased from 0% to 24%. Recruitment of young sagebrush plants remained similar at 24% of the population. Bitterbrush density increased 25% from 132 plants/acre to 165 plants/acre. However, decadence increased from 50% to 60%, and poor vigor increased from 0% to 60%. Recruitment of young bitterbrush plants increased from 0% to 20% of the population. White rubber rabbitbrush increased in

density four-fold from 232 plants/acre to 931 plants/acre. Most of the increase was due to an increase in the recruitment of young plants.

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush and bitterbrush decreased to 10% and 5%, respectively. Poor vigor of sagebrush decreased to 5%, and poor vigor of bitterbrush decreased to 0%.
- **1996 to 2001 - stable (0):** The density of mountain big sagebrush decreased 19% from 840 plants/acre to 680 plants/acre, but cover increased from 3% to 8%. Most of the decrease in density was due to a decrease in the recruitment of young sagebrush plants from 24% to 6% of the population. Decadence increased slightly to 21%, and poor vigor increased to 9%. Density of bitterbrush decreased 21% from 380 plants/acre to 300 plants/acre, and cover remained less than 1%. Decadence and poor vigor remained low. White rubber rabbitbrush density decreased 32% from 1,180 plants/acre to 800 plants/acre, but cover increased from 2% to 5%.
- **2001 to 2006 - down (-2):** Mountain big sagebrush density decreased 35% to 440 plants/acre, and cover decreased to 5%. Decadence remained similar at 18%, and poor vigor at 5%. Nearly 10% of the sagebrush population was identified as infested by the sagebrush defoliator moth. Bitterbrush density remained similar at 280 plants/acre, but cover increased to 1%. Decadence of bitterbrush increased to 21%. White rubber rabbitbrush density decreased 20% to 640 plants/acre, and cover decreased to 2%.
- **2006 to 2011 - slightly down (-1):** The density of mountain big sagebrush increased by 41% to 620 plants/acre, but cover decreased slightly to 4%. Decadence of sagebrush increased to 35%, and poor vigor increased to 23%. Bitterbrush density decreased by 36% to 180 plants/acre, and cover decreased to near 0%. Decadence of bitterbrush increased to 44%, and poor vigor increased to 22%. White rubber rabbitbrush density decreased by 44% to 360 plants/acre, and cover decreased to less than 1%.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 16%.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses decreased by 27%, with a significant decrease in the nested frequency of bluebunch wheatgrass. Annual species were included in the sample for the first time and were moderately abundant on the site.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased 24%, and cover increased from 12% to 14%. The sum of nested frequency of annual grasses and cover remained similar.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased slightly to 15%. The sum of nested frequency of annual grasses remained similar, but cover increased from 9% to 19%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grasses increased 20%, though cover decreased slightly to 13%. There was a significant increase in the nested frequency of intermediate wheatgrass (*Agropyron intermedium*), which had cover of 1%.

Forb:

- **1984 to 1990 - down (-2):** The perennial forb sum of nested frequency decreased 40%.
- **1990 to 1996 - up (+2):** There was a 79% increase in the sum of nested frequency of perennial forbs. The annual forb sum of nested frequency also increased substantially.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, though cover increased slightly from 2% to 4%. The annual forb sum of nested frequency increased markedly, and cover increased from 3% to 10%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased 13%, and cover increased to 5%. The annual forb sum of nested frequency decreased, and cover decreased to 4%.

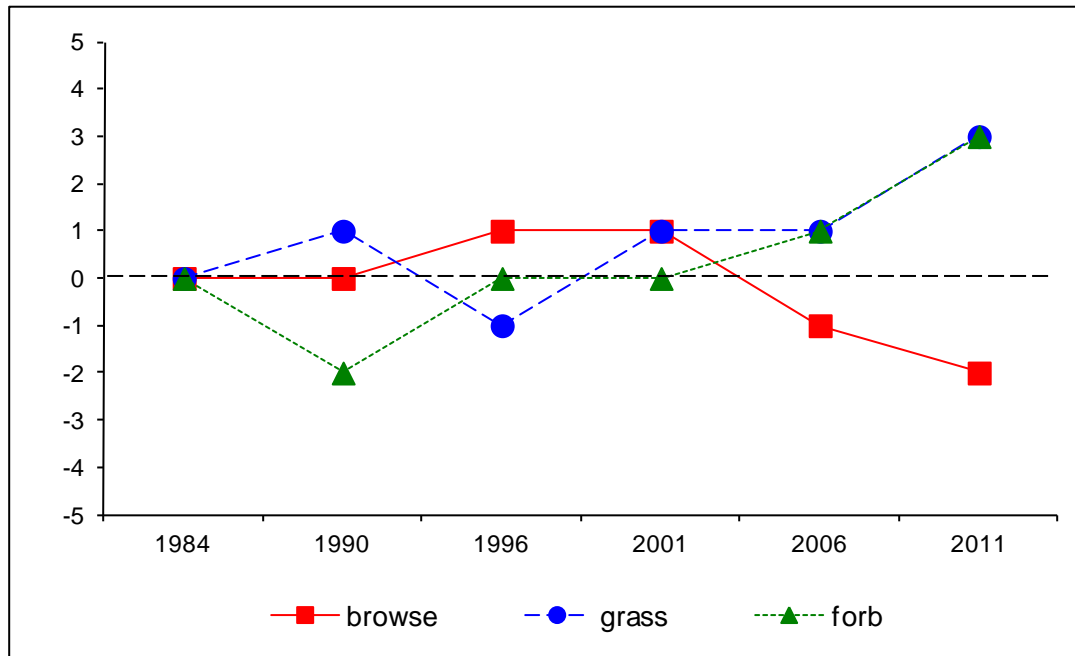
- **2006 to 2011 - up (+2):** The perennial forb sum of nested frequency increased two-fold, and cover increased to 8%. Annual forb sum of nested frequency increased substantially, and cover increased to 13%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 4, study no: 6

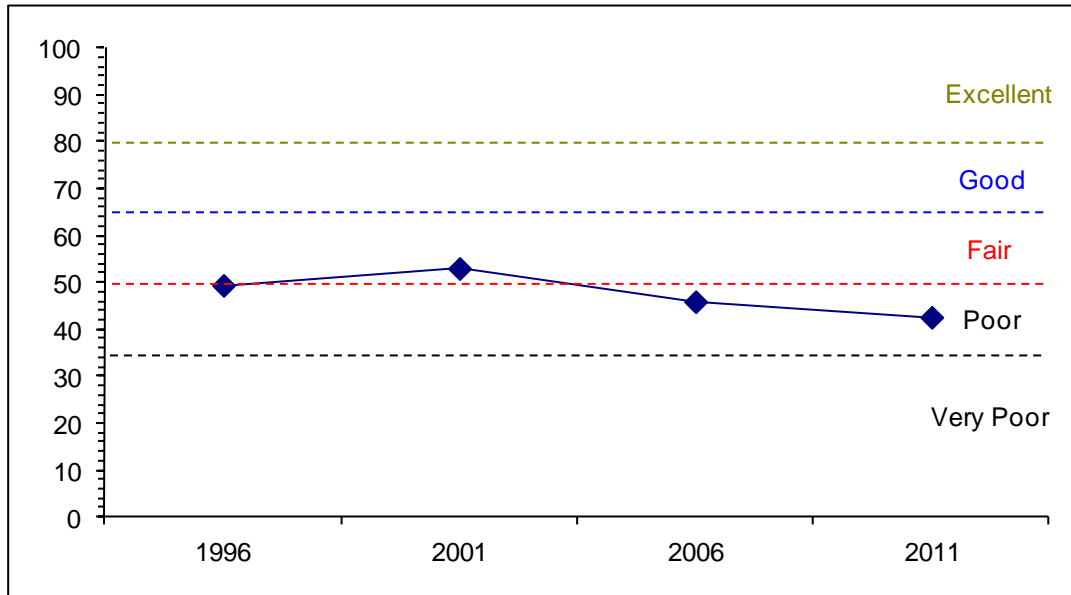
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	8.5	11.9	9.5	24.6	-7.2	4.2	-2.0	49.4	Poor-Fair
01	16.9	7.1	3.3	27.2	-6.6	7.0	-2.0	53.0	Fair
06	11.0	8.2	3.2	29.4	-13.9	10.0	-2.0	45.9	Poor
11	6.8	4.9	4.4	25.2	-8.6	10.0	0.0	42.6	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 4 Study no: 6



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 6



HERBACEOUS TRENDS--
 Management unit 04, Study no: 6

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	-	-	-	-	3	-	-	-	.03	-
G	Agropyron intermedium	a3	a2	ab5	ab7	b20	c44	.03	.33	.97	1.35
G	Agropyron spicatum	ab218	b231	a182	a189	ab219	b234	11.84	11.55	12.99	10.35
G	Bromus brizaeformis (a)	-	-	4	3	3	1	.01	.03	.00	.00
G	Bromus japonicus (a)	-	-	b205	b227	a151	a117	2.62	3.64	1.90	.55
G	Bromus tectorum (a)	-	-	b267	a239	b310	b299	6.97	5.10	16.68	10.97
G	Elymus cinereus	-	-	-	4	-	4	-	.38	.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	17	5	-	2	-	6	-	.03	-	.03
G	Poa secunda	a-	b26	a6	b28	a7	ab20	.06	.77	.04	.48
Total for Annual Grasses		0	0	476	469	464	417	9.60	8.77	18.59	11.53
Total for Perennial Grasses		242	280	204	252	256	308	12.31	13.61	14.72	12.59
Total for Grasses		242	280	680	721	720	725	21.92	22.39	33.32	24.12
F	Achillea millefolium	7	-	6	2	2	5	.01	.15	.15	.01
F	Agoseris glauca	a-	a1	a-	a5	a1	b21	-	.01	.00	.33
F	Allium sp.	a-	a-	a4	a11	a4	b29	-	.03	.01	.18
F	Alyssum alyssoides (a)	-	-	a245	bc304	ab291	c306	1.12	6.27	2.84	9.80
F	Arabis drummondii	-	-	-	-	-	3	-	-	.03	.00
F	Arenaria sp.	-	-	-	-	3	-	-	-	.03	-
F	Artemisia ludoviciana	a24	a23	a30	c68	ab45	bc71	.53	2.45	1.49	2.40
F	Aster chilensis	b15	a2	a1	a1	a-	a3	.00	.00	-	.03

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Astragalus beckwithii</i>	-	-	-	-	6	10	-	-	.36	.33
F	<i>Astragalus</i> sp.	b31	a-	a7	a-	a-	a-	.21	-	-	-
F	<i>Astragalus utahensis</i>	2	1	3	2	-	-	.03	.03	.00	-
F	<i>Camelina microcarpa</i> (a)	-	-	a2	b17	a5	ab8	.00	.04	.01	.01
F	<i>Castilleja linariaefolia</i>	-	-	4	-	3	-	.18	-	.15	-
F	<i>Cirsium undulatum</i>	c23	bc27	abc16	ab5	abc7	a2	.21	.24	.37	.01
F	<i>Collinsia parviflora</i> (a)	-	-	10	7	10	2	.02	.07	.05	.00
F	<i>Collomia linearis</i> (a)	-	-	-	2	-	2	-	.01	-	.00
F	<i>Crepis acuminata</i>	-	-	-	-	4	9	-	-	.09	.12
F	<i>Cryptantha</i> sp.	b10	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Cymopterus</i> sp.	a-	a8	a3	a2	a2	b47	.03	.03	.03	.33
F	<i>Cynoglossum officinale</i>	-	-	2	2	2	-	.00	.03	.15	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	9	1	14	-	.04	.00	.08
F	<i>Draba</i> sp. (a)	-	-	-	-	14	7	-	-	.03	.01
F	<i>Erodium cicutarium</i> (a)	-	-	a24	b77	a38	c125	.10	1.62	.22	1.14
F	<i>Gilia</i> sp. (a)	-	-	-	-	-	8	-	-	-	.01
F	<i>Hackelia patens</i>	-	-	7	-	-	-	.04	-	-	-
F	<i>Hedysarum boreale</i>	-	7	2	6	1	4	.15	.04	.03	.03
F	<i>Helianthus annuus</i> (a)	-	1	-	-	-	-	-	-	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	a32	b130	c181	c195	.09	.60	.66	1.69
F	<i>Lactuca serriola</i> (a)	-	-	6	16	-	16	.01	.08	-	.07
F	<i>Lappula occidentalis</i> (a)	-	-	-	-	-	3	-	-	-	.00
F	<i>Lithospermum ruderales</i>	6	6	-	-	-	-	-	-	.03	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b35	ab21	a9	-	.20	.09	.01
F	<i>Oenothera caespitosa</i>	6	-	1	-	2	-	.03	-	.03	-
F	<i>Penstemon</i> sp.	5	-	-	-	-	-	-	-	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	3	2	5	-	.00	.01	.03
F	<i>Sisymbrium altissimum</i> (a)	-	-	a-	a-	a-	b15	-	-	-	.42
F	<i>Streptanthus cordatus</i>	-	2	-	-	-	-	-	-	-	-
F	<i>Taraxacum officinale</i>	-	-	-	2	3	5	-	.03	.03	.04
F	<i>Tragopogon dubius</i> (a)	c134	ab37	c96	b66	a11	a8	1.27	.48	.09	.08
F	<i>Veronica biloba</i> (a)	-	-	-	-	-	3	-	-	-	.03
F	<i>Vicia americana</i>	-	-	ab52	a29	b67	c108	.65	.42	2.18	3.92
Total for Annual Forbs		134	38	415	666	574	726	2.63	9.45	4.03	13.44
Total for Perennial Forbs		129	77	138	135	152	317	2.10	3.49	5.19	7.77
Total for Forbs		263	115	553	801	726	1043	4.74	12.94	9.22	21.21

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	'11	'96	'01	'06	'11
B	<i>Amelanchier utahensis</i>	4	1	1	1	.41	.15	.63	.38
B	<i>Artemisia tridentata vaseyana</i>	30	30	16	24	3.45	7.90	4.65	4.26
B	<i>Chrysothamnus nauseosus albicaulis</i>	37	31	25	15	1.99	5.21	2.04	.63
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	32	28	24	21	1.61	.95	1.42	.87
B	<i>Gutierrezia sarothrae</i>	41	35	3	4	1.43	.75	.15	.15
B	<i>Leptodactylon pungens</i>	-	-	-	-	-	.15	-	-
B	<i>Mahonia repens</i>	4	5	6	6	.06	.27	.63	.48
B	<i>Purshia tridentata</i>	10	8	10	5	.69	.22	1.14	.06
Total for Browse		14	13	16	11	9.66	15.61	10.67	6.85

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 6

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata vaseyana</i>	7.68	5.50
<i>Chrysothamnus nauseosus albicaulis</i>	3.54	.93
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1.76	2.04
<i>Gutierrezia sarothrae</i>	-	.15
<i>Mahonia repens</i>	.11	.96
<i>Purshia tridentata</i>	.93	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 6

Species	Average leader growth (in)		
	'06	'11	
<i>Artemisia tridentata vaseyana</i>	2.6	2.0	1.8
<i>Purshia tridentata</i>	-	2.7	0.6

BASIC COVER--

Management unit 04, Study no: 6

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	10.00	40.52	52.22	47.18	50.22
Rock	19.00	16.50	13.25	18.04	20.68	19.32
Pavement	5.25	5.00	.59	.80	.70	.86
Litter	55.00	38.50	48.43	33.40	33.34	22.61
Cryptogams	0	0	.33	.14	.51	.85
Bare Ground	18.50	30.00	4.82	14.94	14.47	14.57

SOIL ANALYSIS DATA --

Management unit 04, Study no: 6, Study Name: Harris Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.4	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	9	1	-	-	-
Elk	4	20	31	9	22 (55)	29 (71)	32 (78)
Deer	25	22	25	14	79 (195)	46 (112)	48 (119)
Cattle	-	1	-	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 6

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier utahensis									
84	33	0	0	100	-	0	100	100	-/-
90	33	0	0	100	-	0	100	100	-/-
96	80	0	50	50	-	50	25	0	27/28
01	20	0	0	100	-	0	0	0	48/29
06	20	0	100	0	-	100	0	0	40/37
11	20	0	100	0	-	0	100	0	32/32
Artemisia tridentata vaseyana									
84	631	26	10	63	-	11	63	0	6/6
90	698	24	24	52	133	10	81	24	26/31
96	840	24	67	10	-	17	2	5	25/44
01	680	6	74	21	-	26	3	9	28/46
06	440	9	73	18	20	32	5	5	30/44
11	620	10	55	35	-	45	19	23	25/43
Chrysothamnus nauseosus albicaulis									
84	232	14	57	28	-	0	100	0	36/27
90	931	82	7	11	-	4	0	0	40/52
96	1180	19	76	5	20	20	0	0	22/35
01	800	8	60	33	-	30	18	13	25/34
06	640	6	53	41	-	13	0	16	25/33
11	360	6	50	44	20	44	0	44	20/25

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Chrysothamnus viscidiflorus viscidiflorus										
84	33	0	0	100	-	100	0	100	-/-	
90	765	22	30	48	-	13	65	35	6/8	
96	1380	17	83	0	20	4	3	0	11/17	
01	1020	6	92	2	-	2	0	0	9/14	
06	900	2	98	0	20	0	0	0	15/18	
11	760	11	82	8	960	8	0	5	9/16	
Gutierrezia sarothrae										
84	0	0	0	0	-	0	0	0	-/-	
90	1132	12	85	3	-	0	0	0	7/12	
96	2600	53	44	3	4100	0	0	3	10/13	
01	2140	7	90	4	-	0	0	3	8/9	
06	80	0	100	0	-	0	0	0	10/12	
11	120	17	83	0	-	0	0	0	7/11	
Mahonia repens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	660	100	0	-	-	0	0	0	-/-	
01	3300	7	93	-	-	0	0	0	3/4	
06	2540	0	100	-	-	0	0	0	2/4	
11	1700	0	100	-	-	0	0	0	2/4	
Purshia tridentata										
84	132	0	50	50	-	0	100	0	15/15	
90	165	20	20	60	-	20	80	60	11/28	
96	380	5	89	5	-	42	47	0	16/29	
01	300	0	100	0	-	0	100	0	15/30	
06	280	0	79	21	40	14	86	0	19/35	
11	180	11	44	44	-	11	89	22	21/33	
Symphoricarpos oreophilus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	15/22	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	17/24	
11	0	0	0	-	-	0	0	0	23/40	
Tetradymia canescens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	8/13	
11	0	0	0	-	-	0	0	0	12/37	

SHELL HOLLOW - TREND STUDY NO. 4-8-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: Private

Elevation: 5575 ft (1,699 m)

Aspect: Southwest

Slope: 18-32%

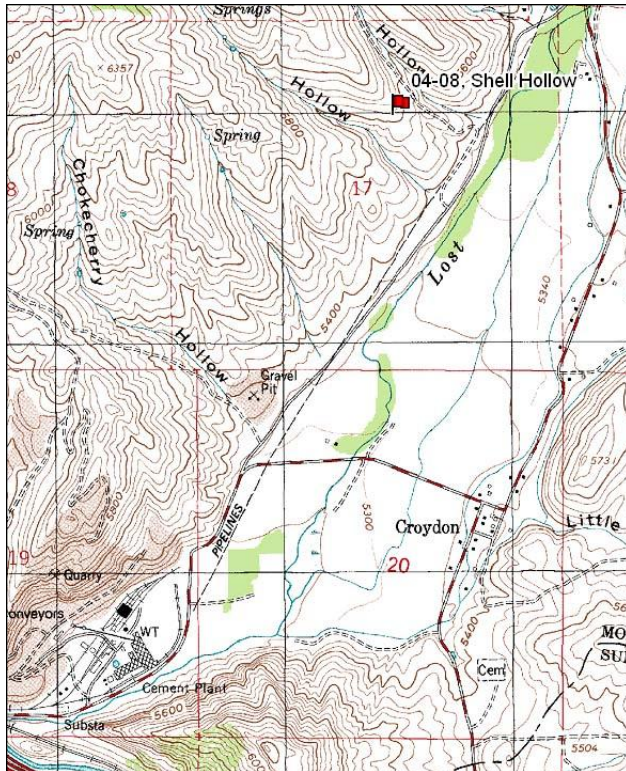
Transect bearing: 159° magnetic

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

Directions:

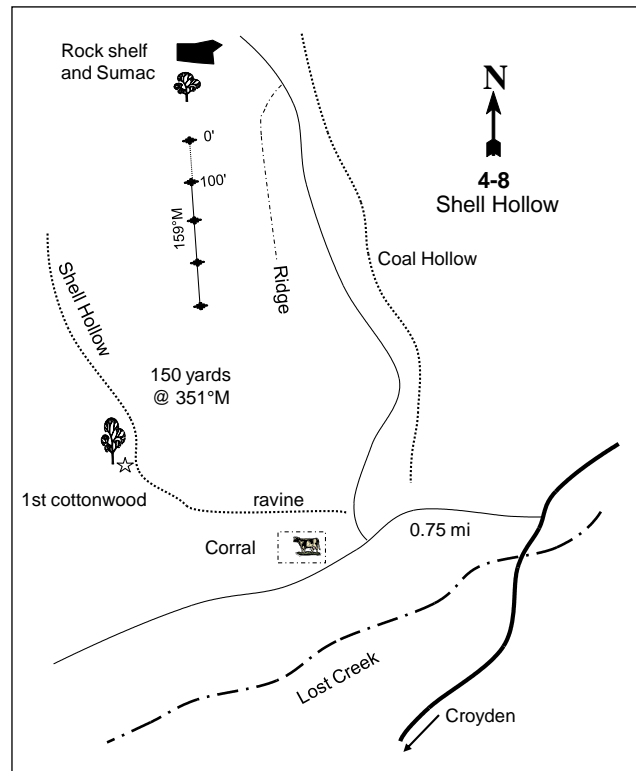
From 6900 East and 1900 South in Croyden, proceed east 1.55 miles to a road paralleling Lost Creek. Turn left here and travel 0.75 miles to Coal Hollow Road. Just east of the road is a corral. Northwest of the corral is the ravine, Shell Hollow. Walk up Shell Hollow to the first cottonwood tree over 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



Township: 4N Range: 4E Section: 17

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 456425 E 4548191 N

SHELL HOLLOW - TREND STUDY NO. 4-8

Site Information

Site Description: This study is located on a small privately owned ridge between Shell Hollow and Coal Hollow, on the west side of Lost Creek. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) hybrid community on a hillside 150 yards above Shell Hollow. A road near the site was improved just prior to the 2011 sample, and a bulldozer had crossed one of the sample belts. Deer pellet groups were sampled in moderate abundance in 2001 and 2006, but in low abundance in 2011 following a severe winter. Three deer carcasses were identified below the study area and a skeleton was identified in the study area in 2006. Elk pellet groups have been sampled in low abundance since 2001. Cattle were present along the creek during the 1996 reading and had already utilized the available understory forage. Sampled sheep and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The key browse species is classified as mountain big sagebrush. It appears to be a hybrid with basin big sagebrush, since many are tall and have the upright growth form of basin big sagebrush. Sagebrush has provided the majority of the shrub cover since 1996 (Table - Browse Trends). The sagebrush population has been moderately dense, with mostly light to moderate use over the course of the study. Density of sagebrush has steadily decreased since 1996. Decadence has been moderately high to high since the outset of the study. Part of the poor vigor of the sagebrush in 2006 might have been a product of the presence of the sagebrush defoliator moth (*Aroga websteri*), which was identified on the study, but not on any individuals sampled in density measurements. Small populations of Saskatoon serviceberry (*Amelanchier alnifolia*) and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) have also been sampled. The increaser species stickyleaf low rabbitbrush is the most abundant shrub in density (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are rare. The annual grasses cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are the most prevalent grasses. Perennial forbs are fairly diverse, but are not abundant. Weedy, annual forb species dominate the forb component (Table - Herbaceous Trends).

Soil: The soil is in the Kilfoil-Rock outcrop complex, which occurs on mountainsides. Parent material consists of colluvium over residuum derived from sandstone and shale. The soil is classified as moderately deep and well drained (Soil Survey Staff 2011). Soil texture is a sandy clay loam with a slightly alkaline soil reaction (pH 7.8) (Table - Soil Analysis Data). It is very gravelly, with some large, exposed boulders. Bare ground cover has increased since 1996, and was moderately high in 2011. Vegetation and litter cover has been high over the course of the study (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2006, but was slight in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of sagebrush decreased 21% from 4,797 plants/acre to 3,798 plants/acre. Decadence increased from 33% to 54%, and poor vigor increased from 3% to 19%. Recruitment of young sagebrush decreased from 11% to 7%.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 24%, but poor vigor increased to 28%. Recruitment of young sagebrush plants remained similar at 8% of the population.
- **1996 to 2001 - down (-2):** The density of sagebrush decreased 30% from 4,780 plants/acre to 3,340 plants/acre, but cover increased from 22% to 27%. Decadence decreased to 20%, and poor vigor decreased to 8%. Recruitment of young plants decreased to 3%.

- **2001 to 2006 - slightly down (-1):** The sagebrush density decreased 16% to 2,820 plants/acre, and cover decreased to 21%. Decadence increased to 39%, and poor vigor increased to 15%. Recruitment of young plants decreased to just 2% of the population.
- **2006 to 2011 - slightly down (-1):** Density of sagebrush decreased 17% to 2,340 plants/acre, and cover remained similar. Decadence decreased slightly to 32%, and poor vigor remained the same. There were no young plants sampled.

Grass:

- **1984 to 1990 - stable (0):** Perennial grass species are rare on the site.
- **1990 to 1996 - stable (0):** There was an increase in the sum of nested frequency of perennial grasses, but this is likely due to the increased sample area. Perennial grass species remain relatively rare on the site. Annual species were included in the sample for the first time, and were abundant on the site, namely Japanese chess.
- **1996 to 2001 - slightly up (+1):** There was little change in the sum of nested frequency of perennial grasses, but Japanese chess decreased significantly in nested frequency. Cover of annual grasses decreased from 26% to 2%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grass increased 10%, and cover increased from 3% to 5%. However, there was a significant increase in the nested frequencies of Japanese chess and cheatgrass, and cover of annual grasses increased to 26%.
- **2006 to 2011 - stable (0):** There was a slight decrease in the sum of nested frequency of perennial grasses, and cover decreased to 3%. The sum of nested frequency of annual grasses decreased 22%, and annual grass cover decreased to 10%.

Forb:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased substantially.
- **1990 to 1996 - stable (0):** There was a slight increase in the sum of nested frequency of perennial forbs, but again this is likely due to the increased sample area.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased 50%, and cover increased from 2% to 3%. The forb composition remained poor for big game.
- **2001 to 2006 - stable (0):** The perennial forb sum of nested frequency decreased 17%, but cover increased to 7%. There was a significant increase in the desirable forb species American vetch (*Vicia americana*). Annual forb sum of nested frequency decreased substantially, and cover decreased from 13% to 3%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial forbs increased 29%, but cover decreased to 3%. Annual forb sum of nested frequency increased substantially, and cover increased to 16%.

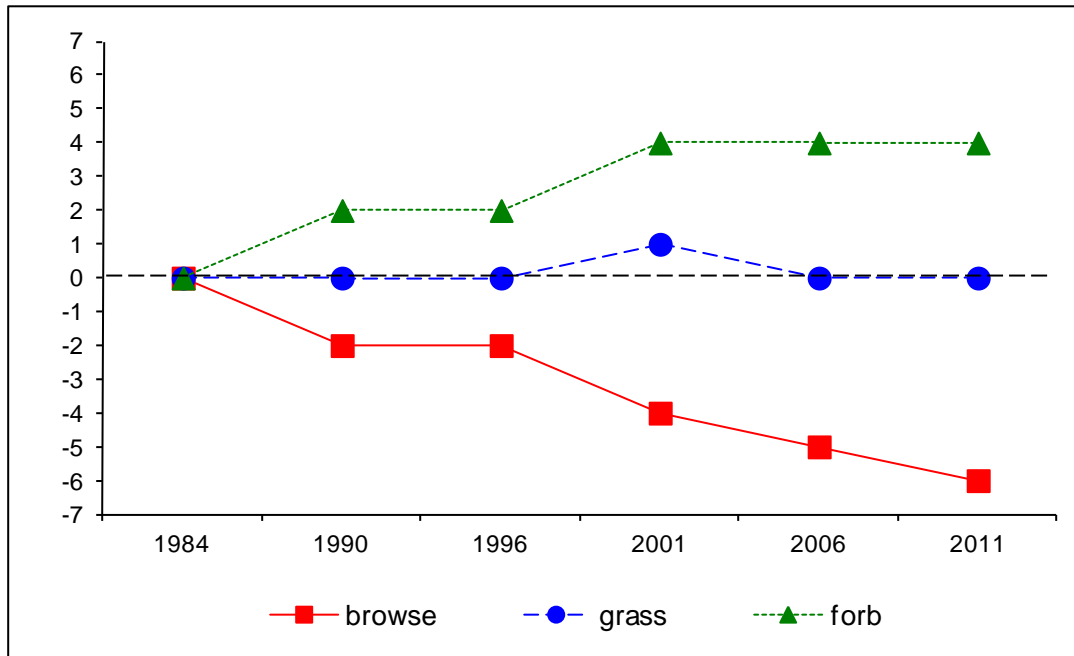
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 4, study no: 8

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	8.0	4.0	3.8	-19.5	3.4	0.0	29.7	Very Poor
01	30.0	9.2	1.7	6.0	-1.6	5.8	0.0	51.2	Poor-Fair
06	27.9	4.2	1.9	9.2	-19.4	10.0	0.0	33.9	Very Poor-Poor
11	26.5	5.6	0.0	5.0	-7.5	5.2	0.0	34.9	Very Poor-Poor

Trend Summary

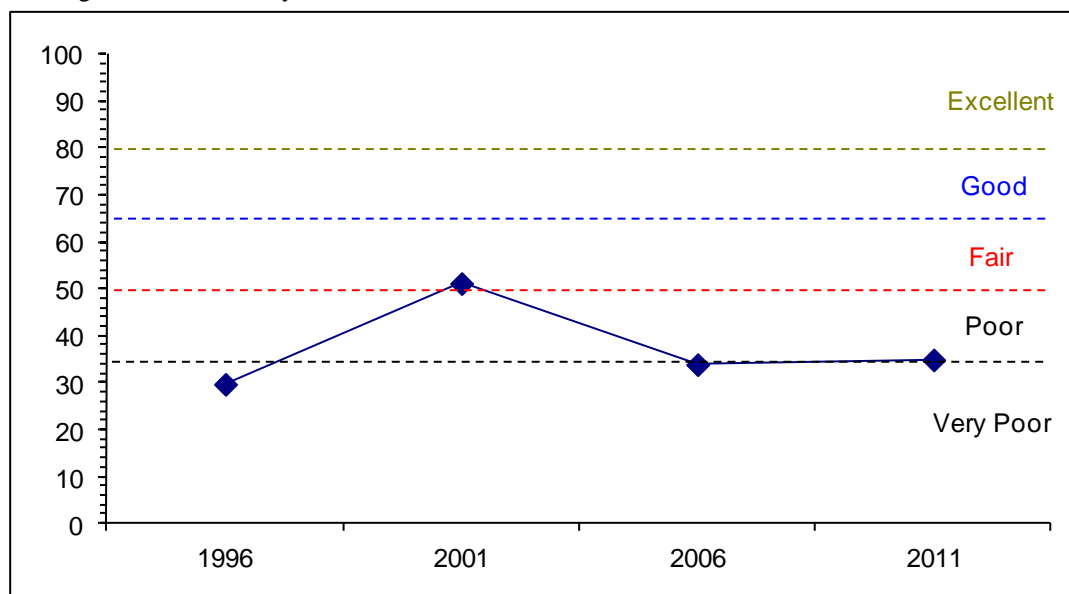
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 4 Study no: 8



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 4, Study no: 8



HERBACEOUS TRENDS--
Management unit 04, Study no: 8

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron dasystachyum</i>	a-	a-	b18	b18	b27	b20	1.52	1.67	1.50	1.95
G	<i>Agropyron spicatum</i>	-	4	10	7	9	15	.18	.18	.51	.28
G	<i>Bromus brizaeformis</i> (a)	-	-	4	12	4	-	.01	.10	.01	-
G	<i>Bromus japonicus</i> (a)	-	-	c382	a198	b239	b242	26.01	1.53	7.88	7.10
G	<i>Bromus tectorum</i> (a)	-	-	a6	a25	c246	b137	.03	.51	17.92	2.87
G	<i>Elymus cinereus</i>	3	1	7	7	10	6	.06	.83	2.21	.24
G	<i>Oryzopsis hymenoides</i>	-	-	1	6	4	3	.03	.18	.33	.03
G	<i>Poa pratensis</i>	-	-	-	-	1	-	-	-	.00	-
G	<i>Poa secunda</i>	-	-	13	12	4	2	.08	.13	.03	.00
Total for Annual Grasses		0	0	392	235	489	379	26.05	2.15	25.81	9.97
Total for Perennial Grasses		3	5	49	50	55	46	1.89	3.00	4.60	2.51
Total for Grasses		3	5	441	285	544	425	27.95	5.15	30.42	12.49
F	<i>Achillea millefolium</i>	-	5	3	3	2	-	.03	.15	.03	.00
F	<i>Allium acuminatum</i>	a1	ab4	b25	d123	ab20	c80	.07	.55	.08	.42
F	<i>Alyssum alyssoides</i> (a)	-	-	b212	a78	b180	c321	.96	.21	.76	7.34
F	<i>Aster chilensis</i>	-	3	-	-	1	-	-	-	.03	-
F	<i>Astragalus beckwithii</i>	3	-	-	10	7	14	-	.15	.17	.10
F	<i>Astragalus convallarius</i>	-	-	6	-	-	-	.06	-	-	-
F	<i>Astragalus utahensis</i>	-	-	2	1	-	-	.01	.00	-	-
F	<i>Calochortus nuttallii</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Camelina microcarpa</i> (a)	-	-	15	13	13	16	.03	.04	.08	.09
F	<i>Cirsium undulatum</i>	8	4	15	6	4	7	.12	.10	.01	.21
F	<i>Collinsia parviflora</i> (a)	-	-	a-	b34	b38	a4	-	.18	.13	.00
F	<i>Collomia grandiflora</i> (a)	-	-	-	-	10	-	-	-	.02	-
F	<i>Collomia linearis</i> (a)	-	-	a8	b30	a2	ab16	.01	.12	.00	.03
F	<i>Comandra pallida</i>	-	-	10	11	3	7	.07	.10	.15	.01
F	<i>Descurainia pinnata</i> (a)	-	-	-	2	2	2	-	.01	.00	.00
F	<i>Draba sp.</i> (a)	-	-	-	-	19	-	-	-	.04	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	a-	a4	b22	a5	-	.01	.05	.04
F	<i>Erodium cicutarium</i> (a)	-	-	a16	a7	a26	b57	.10	.03	.44	.96
F	<i>Galium aparine</i> (a)	-	-	a3	a1	a6	b31	.00	.03	.02	.92
F	<i>Gayophytum ramosissimum</i> (a)	-	-	11	-	-	-	.02	-	-	-
F	<i>Hackelia patens</i>	-	15	14	12	7	10	.16	.25	.13	.22
F	<i>Helianthus annuus</i> (a)	a-	a1	a-	a1	a3	b29	-	.00	.03	.22
F	<i>Holosteum umbellatum</i> (a)	-	-	a-	b18	b26	c73	-	.08	.12	.16
F	<i>Lactuca serriola</i> (a)	-	-	b9	a-	a-	a-	.02	.00	-	-
F	<i>Machaeranthera canescens</i>	-	-	1	-	-	-	.00	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b55	b54	c107	-	.32	.11	.62
F	<i>Phlox longifolia</i>	a-	c117	a4	b38	b43	b40	.01	.13	.28	.59
F	<i>Ranunculus testiculatus</i> (a)	-	-	a53	c220	b103	c207	.13	4.38	.43	1.70
F	<i>Taraxacum officinale</i>	-	-	-	-	-	2	-	-	-	.00
F	<i>Tragopogon dubius</i> (a)	a1	a3	ab9	a3	ab8	b16	.02	.00	.07	.09
F	<i>Verbascum thapsus</i>	a-	a-	b31	a-	a-	a5	.09	-	-	.01

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Veronica biloba</i> (a)	-	-	_a 7	_d 341	_b 72	_c 252	.04	7.48	.42	3.82
F	<i>Vicia americana</i>	_a -	_b 31	_c 92	_c 98	_d 158	_c 120	1.06	1.46	6.17	.73
F	<i>Viola</i> sp.	_a -	_a -	_a -	_a -	_a 7	_b 39	-	-	.21	.28
Total for Annual Forbs		1	4	343	807	584	1136	1.35	12.93	2.76	16.04
Total for Perennial Forbs		12	179	203	304	252	324	1.70	2.91	7.26	2.62
Total for Forbs		13	183	546	1111	836	1460	3.06	15.84	10.03	18.67

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	1	1	0	0	-	-	-	.00
B	<i>Artemisia tridentata vaseyana</i>	97	88	78	75	22.27	26.68	20.50	20.50
B	<i>Chrysothamnus nauseosus albicaulis</i>	8	10	11	9	1.83	1.88	1.79	.68
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	76	65	69	63	6.00	2.82	6.31	2.99
B	<i>Gutierrezia sarothrae</i>	3	9	1	1	-	.36	.03	-
Total for Browse		185	173	159	148	30.11	31.75	28.64	24.18

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 8

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata vaseyana</i>	19.21	30.66
<i>Chrysothamnus nauseosus albicaulis</i>	.83	1.53
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	5.38	3.88

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 8

Species	Average leader growth (in)		
	'01	'06	'11
<i>Artemisia tridentata vaseyana</i>	1.8	2.3	4.2

BASIC COVER--

Management unit 04, Study no: 8

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.50	5.75	55.91	52.17	54.70	49.15
Rock	2.50	1.50	1.75	1.55	1.64	1.69
Pavement	10.75	13.50	1.62	5.81	4.17	6.32
Litter	58.00	47.75	51.50	46.72	47.29	32.40
Cryptogams	0	0	.06	.03	.00	.38
Bare Ground	27.25	31.50	8.15	18.02	16.39	23.84

SOIL ANALYSIS DATA --

Management unit 04, Study no: 8, Study Name: Shell Hollow

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.6	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	-	-	1	1	-	8 (20)	19 (48)
Rabbit	-	6	8	2	-	-	-
Elk	-	-	2	2	-	6 (15)	1 (3)
Deer	10	6	8	2	21 (51)	35 (86)	7 (18)
Cattle	-	1	-	-	2 (5)	2 (5)	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 8

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	20	0	100	-	-	0	100	0	23/40
01	20	100	0	-	-	0	0	0	25/43
06	0	0	0	-	-	0	0	0	25/29
11	0	0	0	-	20	0	0	0	37/51
Artemisia tridentata vaseyana									
84	4797	8	58	33	-	74	24	3	30/34
90	3798	7	39	54	533	60	2	19	29/37
96	4780	8	68	24	20	43	8	28	29/48
01	3340	3	77	20	-	20	2	8	35/47
06	2820	2	59	39	40	28	4	15	33/45
11	2340	0	68	32	-	29	2	15	34/54

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Chrysothamnus nauseosus albicaulis</i>										
84	132	50	50	0	-	50	0	0	21/27	
90	266	0	0	100	-	50	0	50	-/-	
96	220	9	73	18	-	0	0	9	29/38	
01	200	10	40	50	-	10	0	10	32/44	
06	240	25	58	17	-	25	0	17	23/28	
11	200	0	100	0	-	0	0	0	29/43	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	1798	4	89	7	-	56	0	0	14/17	
90	3531	6	57	38	-	21	2	30	10/12	
96	5360	12	85	3	-	2	0	5	13/16	
01	4560	4	93	3	-	4	0	2	9/13	
06	4080	3	96	1	-	2	0	3	13/18	
11	4120	3	97	0	-	10	0	0	9/10	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	140	0	100	0	60	0	0	0	11/9	
01	280	0	79	21	-	0	0	7	8/10	
06	20	0	100	0	-	0	0	0	8/7	
11	20	0	100	0	-	0	0	0	11/13	
<i>Mahonia repens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	3/5	
<i>Opuntia sp.</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	3/6	
01	0	0	0	-	-	0	0	0	4/14	
06	0	0	0	-	-	0	0	0	8/20	
11	0	0	0	-	-	0	0	0	6/23	
<i>Rhus trilobata</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	72/128	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	62/115	
11	0	0	0	-	-	0	0	0	64/93	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Symphoricarpos oreophilus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	23/41	
11	0	0	0	-	-	0	0	0	27/53	

SCOTT REES RANCH - TREND STUDY NO. 4-9-11

Vegetation Type: Gambel Oak

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Shallow Loam \(Mountain Big Sagebrush\), R047XA446UT](#)

Land Ownership: DWR

Elevation: 5,800 ft (1,768 m)

Aspect: South

Slope: 40%

Transect bearing: 165° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (ft)

Directions:

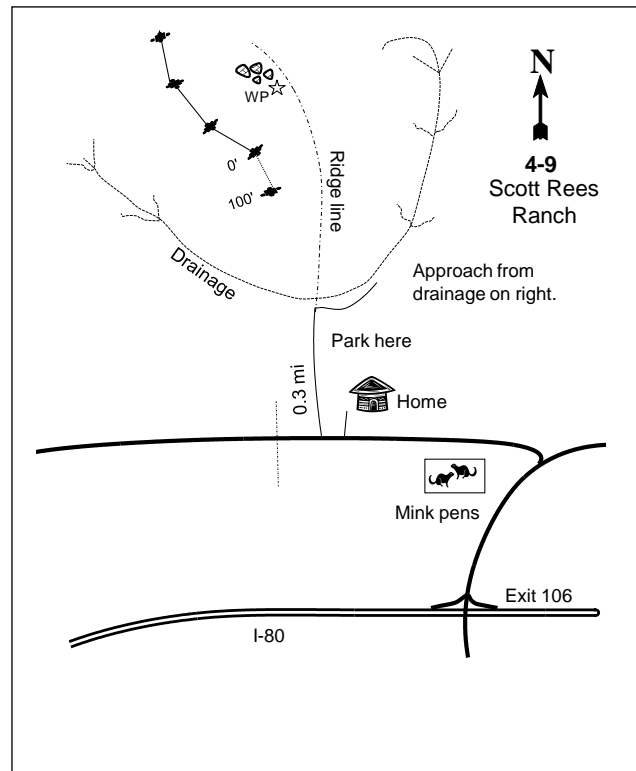
On I-84 between Morgan and Henefer, take exit 106 and go north to the Scott Rees Ranch. Turn left (west) on the road north of the mink pens. Drive on this road approximately 0.3 miles past the main house and turn right (north). Drive up a rough road 0.3 miles to the end of the road at a fork in the canyon and where a 4-wheeler trail takes off. From here walk up the road past the draw and continue around the hill to the next draw. Start walking up the east slope of the draw 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



Township: 4N Range: 3E Section: 20

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 446649 E 4545863 N

SCOTT REES RANCH - TREND STUDY NO. 4-9

Site Information

Site Description: The study is located in the Division of Wildlife Resources (DWR) Round Valley Wildlife Management Area (WMA) in Upper Weber Canyon, east of Morgan and north of Round Valley. Access to the site is through private land. The study area is dominated by low growing Gambel oak (*Quercus gambelii*), interspersed with occasional mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*). Deer presence was moderate to heavy in 1984, with numerous winter-killed deer that were observed during the 1984 reading. The area 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. Deer pellet groups have been sampled in high abundance since 2001. Four deer were seen on the study area in 2001, and a fawn carcass was identified in 2006. Elk pellet groups have fluctuated in abundance with low abundance in 2001, high abundance in 2006, and moderate abundance in 2011 (Table - Pellet Group Data).

Browse: The browse composition consists almost entirely of low growing Gambel oak. The average height of mature oak is only about 2 feet, which is likely caused by the shallow soil. The population has low decadence, good vigor, and a high abundance of young. 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. Other shrub species occur rarely. These include broom snakeweed (*Gutierrezia sarothrae*), white rubber rabbitbrush, Saskatoon serviceberry (*Amelanchier alnifolia*), antelope bitterbrush (*Purshia tridentata*), and mountain big sagebrush. The latter three have sustained heavy use, and decadence is quite common.

Herbaceous Understory: Three annual bromes, cheatgrass (*Bromus tectorum*), Japanese chess (*B. japonicus*), and rattlesnake brome (*B. brizaeformis*), and the annual rattail fescue (*Festuca myuros*) dominate the herbaceous component. Bluebunch wheatgrass (*Agropyron spicatum*) is the only prevalent perennial species. The weedy species bulbous bluegrass (*Poa bulbosa*) is present, but at low frequency and cover. The forb component is a mixture of annual and perennial species. Louisiana sage (*Artemisia ludoviciana*), thistle (*Cirsium undulatum*), low fleabane (*Erigeron pumilus*), western yarrow (*Achillea millefolium*), and pale agoseris (*Agoseris glauca*) are the most common perennial forbs (Table - Herbaceous Trends). Perennial grasses and forbs are most common in the oak brush patches and the open interspaces are dominated by annual grasses and forbs.

Soil: The soil is in the Agassiz-Rock outcrop complex, which occurs on mountain slopes. Parent material consists of colluvium over residuum derived from limestone. The soils are characterized as very shallow and shallow, somewhat excessively drained, and moderate or moderately rapidly permeable (Soil Survey Staff 2011). Soil texture is a clay loam with a neutral soil reaction (pH 6.9) (Table - Soil Analysis Data). The soil is very rocky on the surface and throughout the profile. There is minimal bare ground cover, especially in the areas dominated by oak. These oak dominated areas have very high amounts of vegetation and litter cover (Table - Basic Cover). Current erosion is confined primarily to spaces between oak patches and terracing occurs on the steeper slopes. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** Gambel oak density decreased 42% from 27,532 stems/acre to 15,998 stems/acre. Decadence increased from 13%, to 24%, and poor vigor increased from 0% to 6%. Recruitment of young plants increased from 44% to 59% of the population.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of Gambel oak decreased to 7%, and poor vigor decreased to 0%. Recruitment of young plants decreased to 19% of the population.
- **1996 to 2001 - slightly up (+1):** The nearly three-fold increase in Gambel oak density from 9,240 stem/acre to 26,120 stems/acre 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 as large as three-fold. Cover of oak increased from 28% to 31%.
- **2001 to 2006 - stable (0):** Density of Gambel oak remained similar at 25,460 stems/acre, though cover decreased to 27%.
- **2006 to 2011 - stable (0):** Gambel oak density decreased slightly to 21,980 stems/acre, but cover remained similar at 28%. The population remained healthy with low decadence, good vigor, and good recruitment.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 11%. Though not included in the sample, cheatgrass was abundant.
- **1990 to 1996 - slightly down (-2):** The sum of nested frequency of perennial grasses decreased by 20%, with a significant decrease in the nested frequency of bluebunch wheatgrass. Some of the decrease may be due to the increased sample area.
- **1996 to 2001 - up (+2):** There was a 40% increase in the sum of nested frequency of perennial grasses, and cover increased from 8% to 11%. All three of the annual brome species decreased significantly in nested frequency, but rattail fescue increased significantly. Cover of annual grasses decreased from 24% to 13%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 11%, and cover decreased to 7%. The sum of nested frequency of annual grasses remained similar, but cover decreased to 8%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 13%, and cover decreased to 6%. The annual grass sum of nested frequency increased, and cover increased to 19%.

Forb:

- **1984 to 1990 - down (-2):** The perennial forb sum of nested frequency decreased 60%.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs returned to 1984 levels.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, and cover remained similar at 6%.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased 21%, though cover remained similar at 6%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 14%, but cover increased to 8%.

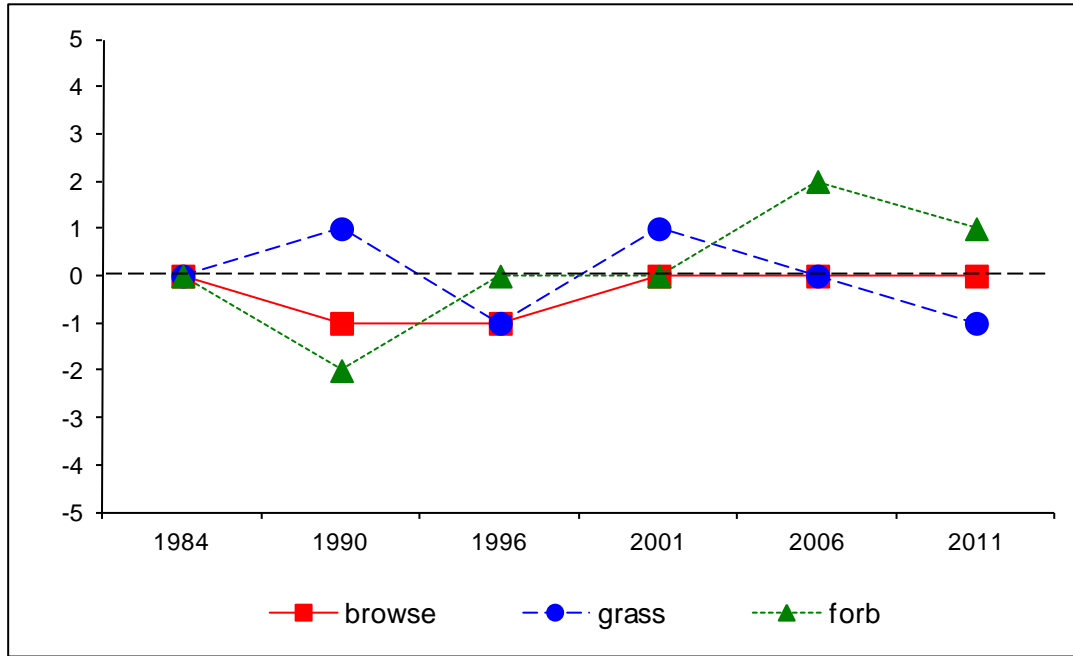
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 4, study no: 9

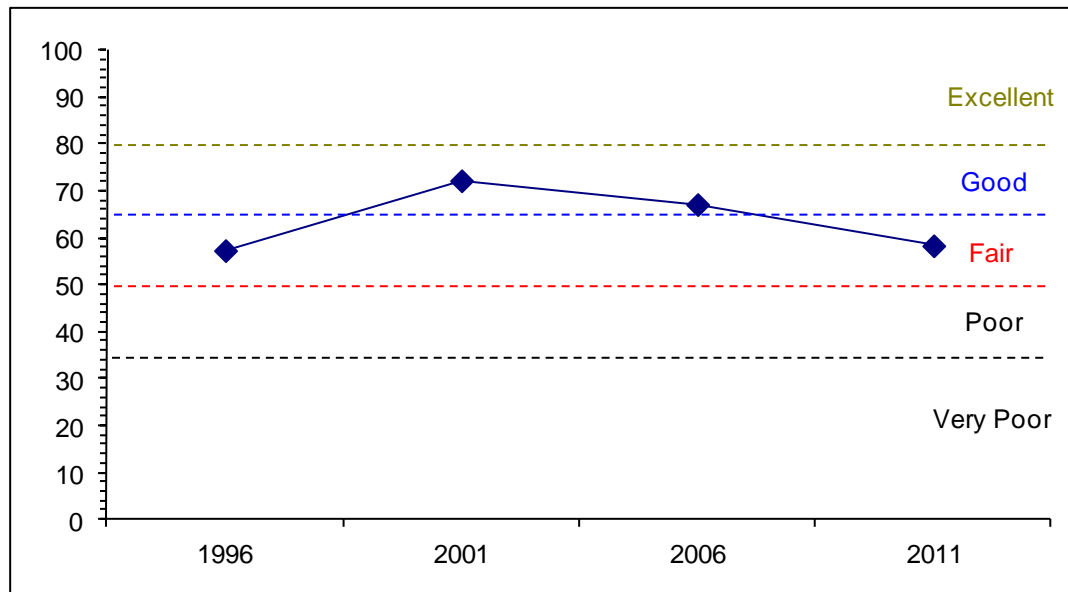
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	28.7	12.6	9.3	15.0	-18.3	10.0	0.0	57.3	Fair
01	30.0	14.4	6.5	21.2	-9.9	10.0	0.0	72.2	Good
06	27.0	14.3	7.4	14.1	-5.8	10.0	0.0	67.1	Good
11	28.6	13.2	11.8	12.2	-14.6	7.2	0.0	58.3	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 9



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 9



HERBACEOUS TRENDS--
Management unit 04, Study no: 9

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	ab201	b227	a168	b221	ab213	a163	7.03	9.83	6.78	4.46
G	Bromus brizaeformis (a)	-	-	c102	b49	a14	a20	.83	.13	.03	.21
G	Bromus japonicus (a)	-	-	bc120	a77	ab91	c163	2.13	.38	.31	1.46
G	Bromus tectorum (a)	-	-	b347	a207	a244	a239	21.03	9.11	5.27	10.19
G	Carex sp.	-	-	-	4	-	-	-	.15	-	-
G	Dactylis glomerata	-	-	-	-	-	-	-	-	-	.01
G	Festuca myuros (a)	-	-	a15	b94	b82	c142	.37	3.53	2.08	7.54
G	Koeleria cristata	-	-	-	6	2	-	-	.06	.03	.00
G	Poa bulbosa	-	-	-	9	18	10	-	.04	.06	.07
G	Poa pratensis	bc24	a-	b19	b17	bc34	c38	.38	.15	.25	1.49
G	Poa secunda	a7	b31	ab19	b32	a1	a16	.09	.40	.00	.13
Total for Annual Grasses		0	0	584	427	431	564	24.36	13.15	7.71	19.41
Total for Perennial Grasses		232	258	206	289	268	227	7.50	10.64	7.13	6.16
Total for Grasses		232	258	790	716	699	791	31.87	23.80	14.84	25.58
F	Achillea millefolium	a6	a2	ab20	ab25	b40	a20	.26	.72	1.37	.31
F	Agoseris glauca	a-	a3	a9	a20	b48	b61	.02	.15	.46	1.07
F	Allium sp.	-	-	-	14	13	13	-	.08	.04	.05
F	Alyssum alyssoides (a)	-	-	a-	b16	c85	c73	-	.22	.70	.70
F	Amsinckia menziesii	-	-	-	3	-	-	-	.00	-	-
F	Artemisia ludoviciana	c109	a38	ab64	bc92	abc81	bc77	2.07	2.48	2.01	2.39
F	Astragalus utahensis	2	-	6	4	3	9	.06	.18	.15	.48
F	Balsamorhiza sagittata	8	5	4	6	2	5	.25	.51	.72	1.87
F	Calochortus nuttallii	4	-	1	7	11	6	.00	.03	.10	.01
F	Camelina microcarpa (a)	-	-	-	3	-	-	-	.00	-	-
F	Cirsium undulatum	ab19	b27	b34	ab17	a7	ab17	1.17	.93	.05	.97
F	Collinsia parviflora (a)	-	-	a-	c66	b33	a-	-	.40	.12	-
F	Collomia linearis (a)	-	-	a14	b52	a14	a11	.03	.13	.08	.03
F	Comandra pallida	b55	a3	a9	a10	a12	a10	.07	.08	.08	.33
F	Cryptantha sp.	-	3	-	-	6	-	-	-	.01	-
F	Cymopterus sp.	-	-	-	3	4	3	-	.03	.15	.01
F	Delphinium nuttallianum	-	-	4	-	-	-	.06	-	-	-
F	Descurainia pinnata (a)	-	-	a-	b38	a2	a12	-	.11	.00	.05
F	Draba sp. (a)	-	-	-	10	13	25	-	.07	.03	.12
F	Epilobium brachycarpum (a)	-	-	a-	b47	c163	a4	-	.21	1.41	.02
F	Erigeron pumilus	a13	a6	b70	a3	a12	a10	1.95	.06	.25	.03
F	Erodium cicutarium (a)	-	-	a7	b51	a19	a25	.06	1.42	.05	.12
F	Galium aparine (a)	-	-	a11	b49	b54	a12	.05	.79	1.00	.06
F	Gayophytum ramosissimum(a)	-	-	b48	b34	a-	a7	.22	.16	-	.06
F	Geranium sp.	-	-	-	2	-	-	-	.00	-	-
F	Hackelia patens	3	-	-	-	-	-	-	-	-	-
F	Helianthella uniflora	1	-	-	-	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	b28	c51	bc50	a-	.08	.20	.20	-
F	Lactuca serriola (a)	-	3	8	17	19	13	.04	.06	.06	.26

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Lappula occidentalis (a)	-	-	2	-	-	-	.01	-	-	-
F	Lathyrus brachycalyx	-	-	-	3	3	2	-	.03	.03	.00
F	Lithophragma sp.	-	-	-	-	-	3	-	-	-	.03
F	Lychnis drummondii	-	-	-	-	9	-	-	-	.02	-
F	Machaeranthera spp	-	-	1	-	-	-	.00	-	-	-
F	Microsteris gracilis (a)	-	-	-	3	9	2	-	.03	.02	.01
F	Penstemon sp.	-	-	3	2	1	-	.03	.03	.00	-
F	Scutellaria antirrhinoides	-	-	-	11	18	-	-	.09	.44	-
F	Taraxacum officinale	-	-	-	-	-	-	-	-	.00	-
F	Tragopogon dubius (a)	_a 18	_b 74	_c 116	_c 152	_c 150	_c 139	1.51	4.15	4.38	2.14
F	Unknown fern	-	-	-	4	5	-	-	.01	.03	-
F	Zigadenus paniculatus	-	2	-	3	3	3	-	.06	.03	.10
Total for Annual Forbs		18	77	234	589	611	323	2.02	7.99	8.09	3.59
Total for Perennial Forbs		220	89	225	229	278	239	5.97	5.52	5.99	7.68
Total for Forbs		238	166	459	818	889	562	8.00	13.51	14.09	11.27

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	1	1	1	1	-	-	-	-
B	Artemisia tridentata vaseyana	11	7	7	7	.53	-	.15	.18
B	Chrysothamnus nauseosus albicaulis	0	1	1	1	-	-	-	.03
B	Gutierrezia sarothrae	17	18	11	14	.67	.78	.18	.34
B	Purshia tridentata	1	1	1	1	.15	.15	.15	.30
B	Quercus gambelii	91	92	92	92	27.84	31.14	26.60	27.87
Total for Browse		121	120	113	116	29.19	32.07	27.09	28.73

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 9

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	.45	.45
Gutierrezia sarothrae	.15	.58
Purshia tridentata	.05	-
Quercus gambelii	45.06	45.04

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 9

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	3.3	1.4	2.4
Purshia tridentata	-	2.9	-

BASIC COVER--

Management unit 04, Study no: 9

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	2.75	56.99	63.45	48.63	58.68
Rock	31.25	30.75	15.05	15.46	18.86	23.09
Pavement	1.50	.75	.10	.01	.06	.16
Litter	52.50	59.75	64.02	58.97	51.39	56.53
Cryptogams	2.25	0	.26	.14	.84	1.19
Bare Ground	10.25	6.00	.32	1.12	.63	.45

SOIL ANALYSIS DATA --

Management unit 04, Study no: 9, Study Name: Scott Rees Ranch

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.4	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	4	-	-	-	-	-	-
Rabbit	-	-	5	-	-	-	-
Elk	4	1	12	13	4 (10)	58 (144)	29 (71)
Deer	11	15	10	7	32 (79)	56 (139)	34 (84)
Cattle	-	-	2	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 9

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	0	0	0	0	-	0	0	0	-/-
90	66	0	100	0	-	100	0	0	28/33
96	20	0	100	0	-	0	100	0	52/18
01	20	0	0	100	-	0	100	0	-/-
06	20	0	100	0	-	0	0	0	31/30
11	20	0	0	100	-	100	0	100	28/31

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	220	0	64	36	-	64	18	0	22/27	
01	180	0	44	56	-	0	11	11	22/25	
06	160	0	63	38	-	38	63	0	25/31	
11	140	0	71	29	-	43	14	43	24/33	
<i>Cercocarpus ledifolius</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	19/49	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	26/35	
<i>Chrysothamnus nauseosus albicaulis</i>										
84	66	0	100	-	-	0	0	0	31/31	
90	66	0	100	-	-	100	0	0	35/41	
96	0	0	0	-	-	0	0	0	-/-	
01	20	100	0	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	16/9	
11	20	0	100	-	-	0	0	0	18/28	
<i>Gutierrezia sarothrae</i>										
84	132	0	50	50	-	50	0	0	12/7	
90	0	0	0	0	-	0	0	0	-/-	
96	960	0	100	0	20	0	0	0	15/20	
01	600	3	97	0	-	0	0	0	11/14	
06	280	0	79	21	-	0	0	21	12/14	
11	480	17	79	4	-	0	0	4	9/10	
<i>Purshia tridentata</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	20	0	0	100	-	0	100	100	37/54	
01	20	0	100	0	-	0	100	0	47/61	
06	20	0	100	0	-	0	100	0	26/35	
11	20	0	100	0	-	0	100	0	25/51	
<i>Quercus gambelii</i>										
84	27532	44	43	13	-	8	45	0	21/11	
90	15998	59	17	24	-	62	1	6	21/22	
96	9240	19	74	7	620	71	6	0	24/31	
01	26120	13	85	2	20	1	0	.07	23/16	
06	25460	15	82	2	620	0	1	.39	23/18	
11	21980	24	70	6	580	5	0	2	26/19	

WHEATGRASS HOLLOW - TREND STUDY NO. 4-13-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: BLM

Elevation: 6,700 ft (2,042 m)

Aspect: Southeast

Slope: 10%

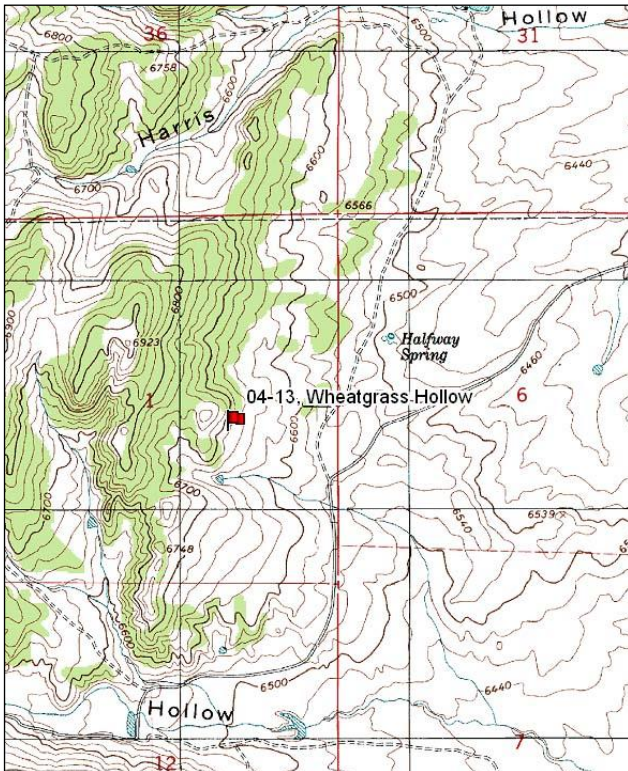
Transect bearing: 135° magnetic

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

Directions:

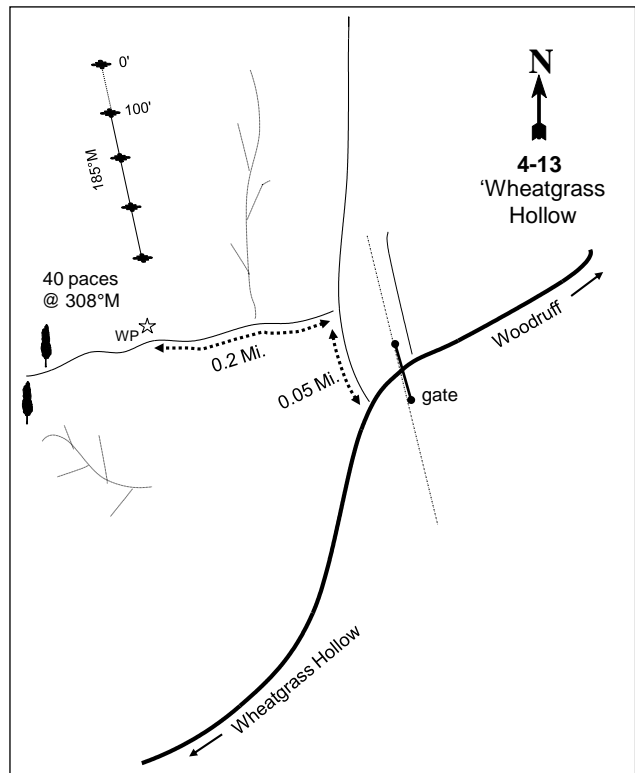
Where Highway SR-16 bends to the east on the south side of Woodruff, continue straight on Deseret Road (South Main). Go 2.5 miles and turn right (west) onto the Wheatgrass Road. Go 3.25 miles, crossing several cattleguards, to the fourth cattleguard. Continue past this cattleguard to a fork. Go north 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



Township: 8N Range: 6E Section: 1

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 482151 E 4589549 N

WHEATGRASS HOLLOW - TREND STUDY NO. 4-13

Site Information

Site Description: The study is located on Bureau of Land Management (BLM) administered land, surrounded by Deseret Land and Livestock properties about six miles south of Woodruff in Wheatgrass Hollow. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community, with scattered Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*), and a sparse understory. The woodland is moderately dense on the ridge above the study area. Deer pellet groups have been sampled in moderate to high abundance since 2001. Sampled elk and cattle sign has been minimal throughout the duration of the study (Table - Pellet Group Data).

Browse: Wyoming big sagebrush is the only abundant shrub. The sagebrush population is comprised of a moderately high density stand of smaller, somewhat prostrate plants. Utilization of sagebrush has been mostly light to moderate, but with some years of heavy use. Decadence has been moderate to high over the course of the study. Vigor has been mostly good, but poor vigor was high in 2011. Recruitment of young plants has been good throughout the sample years. A few shadscale (*Atriplex confertifolia*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), greasewood (*Sarcobatus vermiculatus*), and prickly pear (*Opuntia* sp.) also occupy the site (Table - Browse Characteristics). A moderately dense, but scattered population of Utah juniper occurs across the site (Table - Point-Quarter Tree Data). The majority of sampled trees were less than four feet tall.

Herbaceous Understory: The herbaceous understory is comprised mainly of the native grass Sandberg bluegrass (*Poa secunda*). Other perennial grass species which occur less frequently include western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread (*Stipa comata*). Forbs are not prevalent on the site. The most abundant species are longleaf phlox (*Phlox longifolia*), Hoods phlox (*Phlox hoodii*), and rose pussytoes (*Antennaria rosea*) (Table - Herbaceous Trends).

Soil: The soil is in the Lariat fine sandy loam series, which occur on upland slopes and hillslopes. Parent material consists of residuum weathered from sandstone. The soil is characterized as moderately deep, well drained, with moderately rapid permeability (Soil Survey Staff 2011). Soil texture is a sandy clay loam with a neutral soil reaction (pH 7.2). Bare ground cover is moderate, with moderate amount of vegetation, litter, and pavement cover (Table - Basic Cover). There is good ground cover under shrub crowns, but the interspaces are largely bare. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of Wyoming big sagebrush decreased from 55% to 25%, and poor vigor decreased from 19% to 5%. Recruitment of young sagebrush plants decreased from 25% to 11%, but is still considered to be good.
- **1996 to 2001 - up (+2):** Density of sagebrush increased 44% from 5,940 plants/acre to 8,560 plants/acre, and cover increased from 23% to 26%. Recruitment of young sagebrush plants increased to 23% of the population.
- **2001 to 2006 - stable (0):** Sagebrush density and cover remained similar at 8,100 plants/acre and 26%, respectively. Decadence increased slightly from 23% to 31%, and poor vigor increased from 7% to 12%. Recruitment of young sagebrush plants decreased to 12%.
- **2006 to 2011 - slightly down (-1):** The density of sagebrush decreased 9% to 7,380 plants/acre, which is a 13% decrease since 2001. Cover of sagebrush decreased to 23%. Decadence decreased to 24%,

but poor vigor increased to 28%. Recruitment of young sagebrush plants decreased to 9%, the lowest in the sample years.

Grass:

- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1996 to 2001 - stable (0):** The sum of nested frequency and cover of perennial grasses remained similar.
- **2001 to 2006 - slightly up (+1):** The perennial grass sum of nested frequency increased 12%, and cover increased from 10% to 12%. There was a significant increase in the nested frequency of bottlebrush squirreltail.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, though cover decreased to 8%.

Forb:

- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased 34%, but most of the increase came from an increase in the low value forb Hood's phlox.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 17% due to a decrease in the low value forb longleaf phlox. Forb composition remains poor.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased 17%, which is primarily due to an increase in the nested frequency of rose pussytoes. Cover for perennial forbs increased from 2% to 3%.
- **2006 to 2011 - stable (0):** There was a slight increase in the sum of nested frequency of perennial forbs, but cover decreased to 2%.

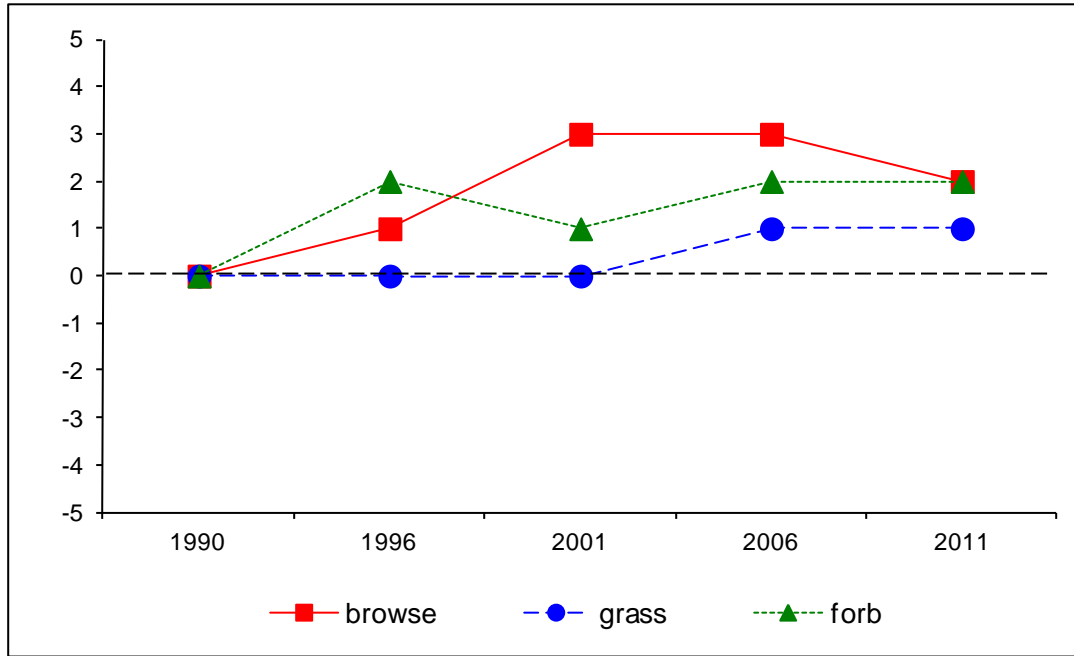
DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

Management unit 4, study no: 13

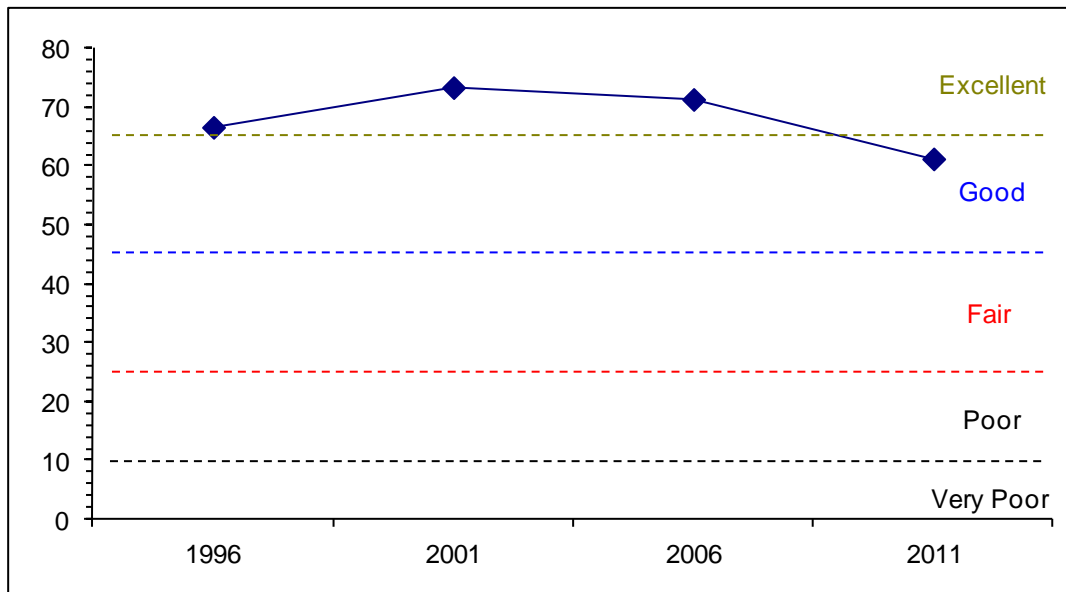
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	29.3	7.5	5.5	20.3	0.0	4.1	0.0	66.6	Good-Excellent
01	30.0	8.1	11.5	20.6	-0.1	3.3	0.0	73.4	Excellent
06	30.0	5.7	6.0	23.8	-0.1	5.9	0.0	71.3	Excellent
11	28.7	7.8	4.5	16.2	-0.1	4.1	0.0	61.2	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 13



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 4, Study no: 13



HERBACEOUS TRENDS--
Management unit 04, Study no: 13

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	-	-	-	3	2	-	-	.03	.03
G	Agropyron smithii	-	a-	b14	bc36	c64	-	.08	.43	.78
G	Agropyron spicatum	c71	a15	b47	ab24	a8	.26	1.02	.55	.04
G	Bromus tectorum (a)	-	27	29	45	41	.05	.10	.18	.09
G	Carex sp.	1	-	-	1	8	-	-	.00	.04
G	Oryzopsis hymenoides	7	8	3	5	4	.22	.01	.06	.01
G	Poa secunda	bc307	c310	bc294	ab281	a246	8.73	8.43	8.80	5.03
G	Sitanion hystrix	ab23	bc38	a7	cd63	d74	.39	.21	1.27	1.25
G	Stipa comata	16	15	36	35	29	.54	.52	.76	.91
Total for Annual Grasses		0	27	29	45	41	0.05	0.10	0.18	0.09
Total for Perennial Grasses		425	386	401	448	435	10.15	10.28	11.92	8.12
Total for Grasses		425	413	430	493	476	10.21	10.39	12.10	8.22
F	Agoseris glauca	-	1	-	-	-	.00	-	-	-
F	Allium sp.	a-	a-	a-	a5	b46	-	-	.02	.22
F	Antennaria rosea	a17	a24	ab32	b52	a26	.38	.20	.66	.17
F	Arabis sp.	4	3	-	-	7	.00	-	-	.02
F	Astragalus convallarius	-	-	2	6	6	-	.03	.06	.05
F	Astragalus spatulatus	a-	ab9	b14	a-	ab12	.09	.07	.00	.03
F	Astragalus utahensis	-	3	3	-	-	.00	.00	-	-
F	Collinsia parviflora (a)	-	-	-	-	3	-	-	-	.00
F	Cordylanthus ramosus (a)	-	a-	c49	b22	d106	-	.59	.28	4.31
F	Cryptantha sp.	-	1	-	8	6	.03	-	.07	.01
F	Erigeron pumilus	13	10	6	13	6	.02	.01	.05	.04
F	Gayophytum ramosissimum(a)	-	-	-	-	5	-	-	-	.01
F	Holosteum umbellatum (a)	-	-	-	-	3	-	-	-	.01
F	Lappula occidentalis (a)	-	-	1	-	3	-	.00	-	.00
F	Orobanche sp.	-	3	-	-	1	.00	-	-	.03
F	Phlox hoodii	a90	b119	ab114	ab96	a83	1.39	1.26	1.84	1.29
F	Phlox longifolia	b43	b50	a14	ab37	b46	.12	.06	.25	.18
F	Ranunculus testiculatus (a)	-	-	-	-	4	-	-	-	.01
F	Veronica biloba (a)	-	-	-	-	2	-	-	-	.00
Total for Annual Forbs		0	0	50	22	126	0	0.59	0.28	4.37
Total for Perennial Forbs		167	223	185	217	239	2.05	1.64	2.97	2.06
Total for Forbs		167	223	235	239	365	2.05	2.24	3.25	6.43

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	99	95	98	97	23.40	25.77	26.35	22.92
B	Atriplex confertifolia	3	2	2	1	-	.03	.03	-
B	Chrysothamnus viscidiflorus viscidiflorus	15	10	10	14	.09	.33	.18	.03
B	Juniperus osteosperma	1	1	2	1	.00	-	.30	.00
B	Opuntia sp.	18	18	21	19	-	-	-	-
B	Sarcobatus vermiculatus	1	0	0	0	.04	.07	.20	.37
Total for Browse		137	126	133	132	23.54	26.20	27.07	23.34

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 13

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	24.10	24.08
Atriplex confertifolia	.16	-
Chrysothamnus viscidiflorus viscidiflorus	.60	.55
Juniperus osteosperma	-	.18
Opuntia sp.	.11	.23

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 13

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	0.8	0.6	1.8

POINT-QUARTER TREE DATA--

Management unit 04, Study no: 13

Species	Trees per Acre			Average diameter (in)		
	'01	'06	'11	'01	'06	'11
Juniperus osteosperma	58	61	59	3.8	2.3	2.4

BASIC COVER--

Management unit 04, Study no: 13

Cover Type	Average Cover %				
	'90	'96	'01	'06	'11
Vegetation	8.00	34.17	39.87	43.31	34.77
Rock	5.50	3.24	2.07	2.56	.60
Pavement	27.00	17.76	18.94	23.85	22.20
Litter	34.50	25.90	27.56	21.83	28.61
Cryptogams	8.50	8.83	8.57	6.66	7.84
Bare Ground	16.50	15.49	26.14	14.37	13.61

SOIL ANALYSIS DATA --

Management unit 04, Study no: 13, Study Name: Wheatgrass Hollow

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.4	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	'11	'01	'06	'11
Rabbit	10	3	26	36	-	-	-
Horse	-	1	1	-	1 (3)	-	-
Elk	4	4	4	7	1 (2)	2 (5)	2 (5)
Deer/Antelope	38	20	18	16	58 (144)	28 (69)	43 (103)
Cattle	1	1	-	-	-	-	2 (4)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 13

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata wyomingensis</i>									
90	6598	25	20	55	266	24	19	19	19/23
96	5940	11	65	25	1120	60	8	5	14/33
01	8560	23	54	23	260	28	6	7	15/28
06	8100	12	57	31	4680	2	1	12	13/28
11	7380	9	67	24	40	23	31	28	13/24
<i>Atriplex confertifolia</i>									
90	0	0	0	-	-	0	0	0	-/-
96	60	0	100	-	-	0	0	0	11/10
01	40	0	100	-	-	0	0	0	15/12
06	40	0	100	-	-	0	50	0	14/15
11	20	0	100	-	-	0	100	0	15/12
<i>Chrysothamnus nauseosus</i>									
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	3/35
06	0	0	0	-	-	0	0	0	25/35
11	0	0	0	-	-	0	0	0	31/29
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
90	66	0	100	0	66	100	0	0	6/8
96	460	13	74	13	-	0	0	9	10/16
01	280	14	79	7	-	14	0	0	10/18
06	240	8	58	33	-	0	0	17	10/17
11	460	9	87	4	-	0	0	4	11/16

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Juniperus osteosperma										
90	0	0	0	-	-	0	0	0	-/-	
96	20	100	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	40	50	50	-	-	0	0	0	-/-	
11	20	100	0	-	-	0	0	0	-/-	
Opuntia sp.										
90	332	40	60	0	66	0	0	0	3/2	
96	540	0	100	0	40	0	0	0	4/13	
01	720	8	75	17	-	8	0	0	3/12	
06	620	10	81	10	60	0	0	0	4/14	
11	640	6	94	0	40	0	0	0	4/12	
Sarcobatus vermiculatus										
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	24/18	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	30/23	
11	0	0	0	-	-	0	0	0	32/30	

CHAPMAN CANAL - TREND STUDY NO. 4-14-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Substantial Deer Year-long, Crucial Elk Winter

NRCS Ecological Site Description: [Semidesert Stony Loam \(Black Sagebrush\), R047XB252UT](#)

Land Ownership: DL&L

Elevation: 6,500 ft (1,981 m)

Aspect: West

Slope: 8%

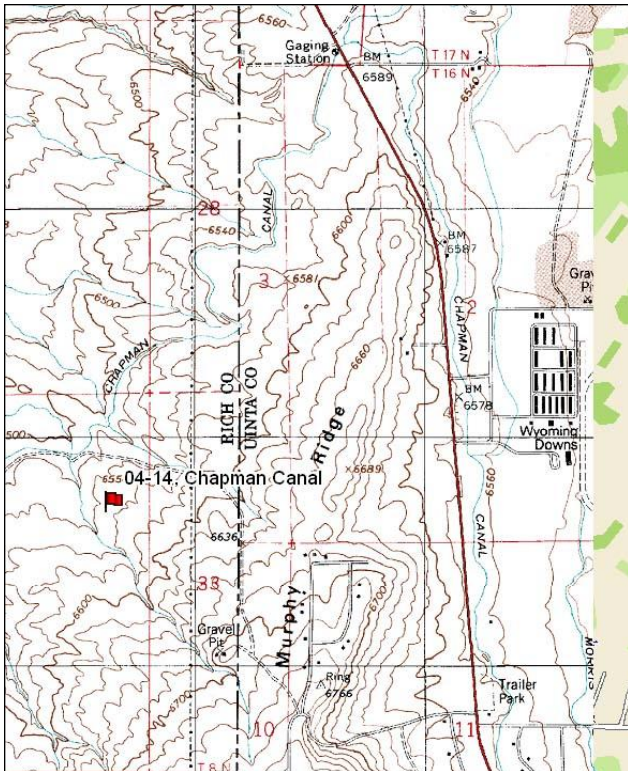
Transect bearing: 165° magnetic

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

Directions:

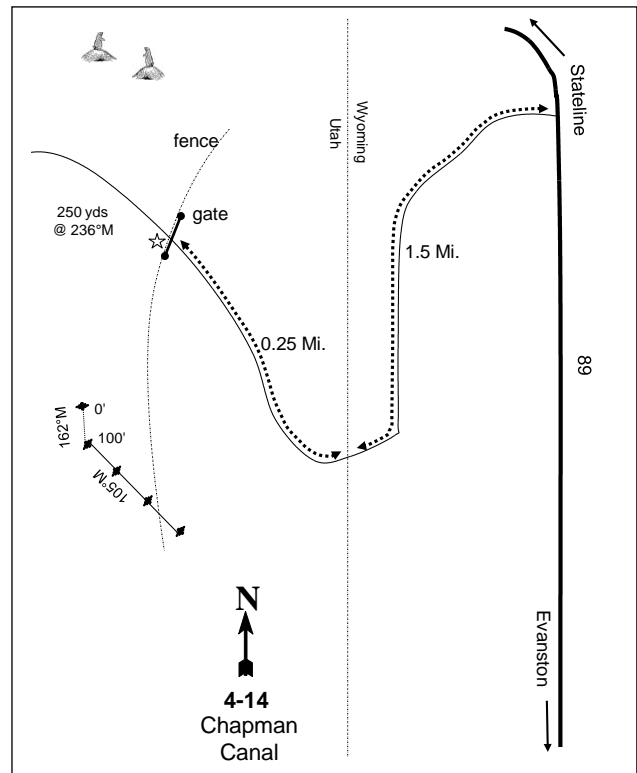
From the state line southbound on Highway 16/89, proceed 0.6 miles towards Evanston and turn right (west). Proceed 1.5 miles, crossing Chapman Canal, to a gate (DL&L). Go through the gate and travel 0.25 miles to a fence/gate. From the gate walk approximately 130 paces at 218 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7939. The baseline doglegs after 100 feet and runs 105 degrees magnetic.

Map Name: Neponset Reservoir NE



Township: 8N Range: 8E Section: 32

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 495549 E 4581878 N

CHAPMAN CANAL - TREND STUDY NO. 4-14

Site Information

Site Description: The study is located three miles east of Neponset Reservoir, near the Utah-Wyoming state line. 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. This area of rolling hills is dominated by an extensive Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and grass community that extends for miles before any cover from trees or terrain is discernible. Deer, elk, pronghorn, sage grouse, horses, and cattle all occupy 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/pronghorn pellet groups have been sampled in moderate to high abundance since 2001. A pronghorn carcass was identified in the area in 2006. Sampled elk and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The key browse species is Wyoming big sagebrush, which contributes the majority of the browse cover. However, sagebrush cover (Table - Browse Trends) and density have steadily decreased since 2001. The sagebrush population is a moderately dense stand of generally low stature plants. Utilization of sagebrush has been light to moderate in the majority of the sample years. Decadence of sagebrush has been high throughout the course of the study, and poor vigor has been very high since 2001. Recruitment of young sagebrush plants has fluctuated through the sample years, with a period of poor recruitment from 1996 to 2006. The sagebrush defoliator moth (*Aroga websteri*) was identified in 29% of the population in 2006 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 (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) is abundant. Mature plants are small, mostly unutilized, and in good vigor. Winterfat (*Ceratoides lanata*) 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 (*Poa secunda*) and western wheatgrass (*Agropyron smithii*). Cheatgrass (*Bromus tectorum*) occurs in low frequency and cover. The most abundant forbs include the low growing species Hoods phlox (*Phlox hoodii*), longleaf phlox (*P. longifolia*), and rose pussytoes (*Antennaria rosea*) (Table - Herbaceous Trends).

Soil: The soil is in the Duckree gravelly loam series, which occurs on stream terraces and alluvial fans. Parent material consists of colluvium and/or slope alluvium derived from quartzite, sandstone, and chert. These soils are characterized as very deep, well drained, and moderately permeable (Soil Survey Staff 2011). Soil texture is a clay loam with a moderately alkaline soil reaction (pH 8.0). Phosphorus may have limited availability for plant growth and development at 5.5 ppm (Tiedemann and Lopez 2004). Organic matter is also relatively low at 1.9% (Table - Soil Analysis Data). Ground cover is poor and comes primarily from the shrub crowns. Most shrub interspaces are barren and soil compaction from trampling is evident. Bare ground cover is moderately high (Table - Basic Cover). Sheet and gully erosion is noticeable throughout the area, but is not excessive. The soil erosion condition was classified as slight in 2001, but has been stable since 2006.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was little change in the density of Wyoming big sagebrush.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased from 43% to 31%, but is still considered to be high. Recruitment of young sagebrush decreased from 31% to 2% of the population.

- **1996 to 2001 - stable (0):** Density of sagebrush increased slightly from 3,700 plants/acre to 4,040 plants/acre, and cover increased from 15% to 18%. Decadence decreased slightly to 26%, but recruitment of young plants remained very low at 1%.
- **2001 to 2006 - slightly down (-1):** The density of sagebrush decreased 13% to 3,500 plants/acre, and cover decreased to 10%. Decadence increased to 89%, and poor vigor increased from 3% to 93%. The defoliator moth was identified in 29% of the population and is likely responsible for much of the poor health on the site.
- **2006 to 2011 - stable (0):** Sagebrush density decreased 7% to 3,260 plants/acre, and cover decreased to 8%. Decadence decreased to 50% and poor vigor decreased to 47%, but both are still considered to be very high. Recruitment of young sagebrush plants increased to 10% of the population.

Grass:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1990 to 1996 - stable (0):** The sum of nested frequency of perennial grasses increased by 12%, but the increase is likely due to the increased sample area.
- **1996 to 2001 - stable (0):** The sum of nested frequency of perennial grasses of perennial grasses remained similar, but cover increased from 6% to 11%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 14%, and cover increased to 19%.
- **2006 to 2011 - slightly up (+1):** There was a 12% increase in the sum of nested frequency of perennial grasses, but cover decreased to 13%.

Forb:

- **1984 to 1990 - slightly up (+1):** The forb community increased slightly in sum of nested frequency.
- **1990 to 1996 - stable (0):** There was a slight increase in the sum of nested frequency of perennial forbs, but much of this increase is likely due to the larger sample area.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 11%, and cover decreased from 4% to 3%.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased 42%, and cover increased to 4%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased 19%, but cover remained similar at 4%.

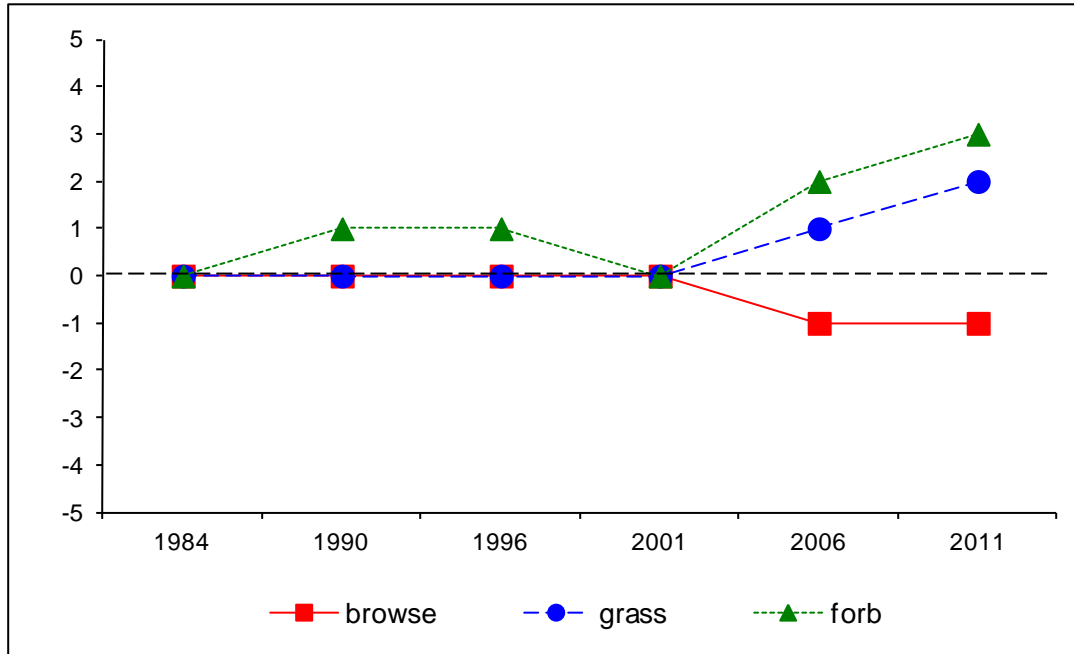
DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

Management unit 4, study no: 14

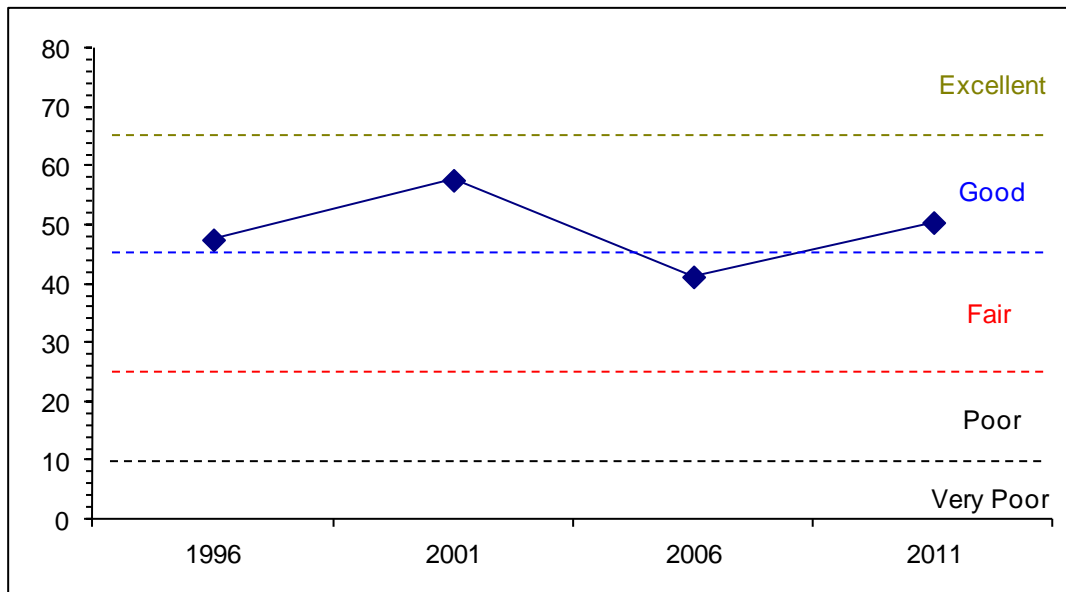
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	18.8	5.8	1.2	12.9	0.0	8.9	0.0	47.5	Good
01	22.9	7.2	0.5	21.7	0.0	5.3	0.0	57.6	Good
06	12.9	-10.9	1.0	30.0	0.0	8.2	0.0	41.2	Fair
11	10.7	0.5	5.1	26.0	0.0	8.1	0.0	50.4	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 14



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 4, Study no: 14



HERBACEOUS TRENDS--
Management unit 04, Study no: 14

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a-	a-	a-	ab2	ab1	b5	.00	.15	.15	.18
G	Agropyron smithii	a206	a220	a202	ab215	bc256	c289	1.81	2.99	9.06	5.59
G	Agropyron spicatum	b30	a13	a-	a1	a6	a-	-	.00	.33	-
G	Bromus tectorum (a)	-	-	a-	b16	a-	b28	-	.04	-	.06
G	Oryzopsis hymenoides	a4	ab11	b27	ab19	b24	ab12	.21	.21	1.24	.69
G	Poa fendleriana	-	-	-	7	-	1	-	.06	-	.03
G	Poa secunda	ab205	a178	b234	b231	b244	ab227	4.33	7.26	7.30	5.48
G	Sitanion hystrix	a15	a1	a13	a-	a8	b57	.07	-	.33	.72
G	Stipa comata	a-	a3	a-	a6	ab9	b25	-	.18	.09	.29
Total for Annual Grasses		0	0	0	16	0	28	0	0.04	0	0.06
Total for Perennial Grasses		460	426	476	481	548	616	6.43	10.87	18.53	13.01
Total for Grasses		460	426	476	497	548	644	6.43	10.92	18.53	13.07
F	Agoseris glauca	-	-	-	-	-	5	-	-	-	.01
F	Allium sp.	-	-	-	-	-	7	-	-	-	.04
F	Alyssum alyssoides (a)	-	-	a19	b164	c212	d328	.04	.44	.87	2.17
F	Antennaria rosea	c38	bc38	ab9	a4	c32	c37	.24	.18	.73	1.18
F	Arabis drummondii	-	-	2	-	1	1	.01	-	.00	.00
F	Arenaria sp.	3	-	-	-	-	-	-	-	-	-
F	Aster sp.	-	-	-	-	-	1	-	-	-	.03
F	Astragalus convallarius	-	5	-	1	2	6	-	.01	.03	.06
F	Astragalus sp.	a7	a7	a3	a8	a6	b21	.00	.12	.01	.33
F	Astragalus utahensis	-	1	-	-	-	6	-	-	-	.09
F	Chorispora tenella (a)	-	-	-	-	-	1	-	-	-	.00
F	Cordylanthus ramosus (a)	-	-	-	2	-	-	-	.03	-	-
F	Cryptantha sp.	11	14	4	-	5	5	.06	-	.06	.06
F	Cymopterus sp.	a-	a-	a3	a5	ab11	b24	.01	.04	.02	.07
F	Descurainia pinnata (a)	-	-	-	7	3	7	-	.02	.01	.01
F	Draba sp. (a)	-	-	-	1	-	1	-	.00	-	.00
F	Erigeron pumilus	-	5	7	11	4	10	.01	.12	.01	.02
F	Haplopappus acaulis	1	4	3	1	1	2	.03	.03	.15	.15
F	Lappula occidentalis (a)	-	-	-	5	-	1	-	.01	-	.00
F	Microsteris gracilis (a)	-	-	-	6	-	-	-	.01	-	-
F	Phlox hoodii	a71	ab108	c145	bc110	bc124	abc108	3.79	1.88	2.45	1.28
F	Phlox longifolia	a16	a6	b56	b64	c104	c110	.28	.24	.62	.69
F	Ranunculus testiculatus (a)	-	-	a8	ab17	b39	c197	.02	.03	.08	1.62
F	Senecio integerrimus	-	-	-	1	-	2	-	.00	-	.00
F	Senecio multilobatus	-	-	-	-	2	-	-	-	.03	-
F	Trifolium sp.	5	7	-	1	-	2	-	.00	-	.00
F	Unknown forb-perennial	-	2	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	27	202	254	535	0.07	0.55	0.96	3.82
Total for Perennial Forbs		152	197	232	206	292	347	4.44	2.65	4.12	4.05
Total for Forbs		152	197	259	408	546	882	4.51	3.20	5.08	7.88

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	88	84	84	81	14.79	18.32	10.03	8.25
B	Atriplex gardneri falcata	7	14	13	12	.53	.09	.37	.49
B	Ceratoides lanata	8	8	8	8	.21	-	.30	.30
B	Chrysothamnus viscidiflorus stenophyllus	82	83	83	86	5.54	4.51	5.53	6.84
B	Opuntia sp.	13	4	9	9	.21	.53	.53	.69
B	Tetradymia canescens	1	2	2	3	-	.15	.15	.15
Total for Browse		199	195	199	199	21.29	23.60	16.92	16.72

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 14

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	10.73	8.51
Atriplex gardneri falcata	.15	.01
Ceratoides lanata	.11	.15
Chrysothamnus viscidiflorus stenophyllus	5.40	10.33
Opuntia sp.	-	-
Tetradymia canescens	.08	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 14

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.1	-	3.7

BASIC COVER--

Management unit 04, Study no: 14

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.00	8.50	28.93	38.24	40.44	35.03
Rock	0	.25	.07	.06	.00	.03
Pavement	0	.75	.63	1.22	.79	.09
Litter	43.25	31.00	27.83	31.87	25.71	28.36
Cryptogams	10.00	18.25	12.77	21.15	12.23	12.52
Bare Ground	44.75	41.25	40.43	31.89	32.98	33.97

SOIL ANALYSIS DATA --

Management unit 04, Study no: 14, Study Name: Chapman Canal

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
10.7	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	'11	'01	'06	'11
Rabbit	9	28	38	41	-	-	-
Grouse	-	-	1	1	-	8.7 Groups/Acre	-
Elk	5	2	7	15	5 (13)	15 (38)	11 (26)
Deer/Pronghorn	24	25	56	34	30 (74)	126 (311)	47 (116)
Cattle	1	-	2	9	5 (13)	3 (7)	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 14

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata wyomingensis</i>									
84	6798	22	31	47	933	29	60	18	13/19
90	6865	31	26	43	-	50	16	4	15/18
96	3700	2	67	31	20	32	2	9	18/34
01	4040	1	73	26	-	43	3	3	19/33
06	3500	2	10	89	140	3	.57	93	16/29
11	3260	10	39	50	-	34	7	47	14/25
<i>Atriplex canescens</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	22/36
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Atriplex gardneri falcata</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	600	0	100	-	-	0	0	0	4/9
01	840	52	48	-	-	2	0	0	3/7
06	840	40	60	-	-	10	0	0	3/7
11	540	0	100	-	-	0	0	0	8/11
<i>Ceratoides lanata</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	300	27	73	-	60	13	0	0	5/7
01	240	8	92	-	-	17	17	0	6/10
06	240	0	100	-	-	33	67	0	5/8
11	220	18	82	-	-	0	0	18	13/15

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Chrysothamnus viscidiflorus stenophyllus									
84	4199	17	75	8	-	6	0	0	10/11
90	4598	19	55	26	-	43	4	3	5/7
96	4260	1	75	23	-	.93	0	4	10/17
01	4240	0	73	26	-	.94	0	4	8/15
06	4180	4	80	15	-	3	1	11	9/14
11	5060	0	99	0	20	0	0	.39	11/18
Leptodactylon pungens									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	7/19
Opuntia sp.									
84	266	0	100	0	-	0	0	0	4/9
90	466	71	29	0	-	0	0	29	5/3
96	480	0	92	8	-	0	0	0	4/15
01	80	0	75	25	-	0	0	0	3/11
06	200	20	70	10	-	0	0	0	4/9
11	300	0	100	0	-	0	0	0	4/13
Tetradymia canescens									
84	133	0	100	0	-	100	0	0	7/14
90	0	0	0	0	-	0	0	0	-/-
96	20	0	0	100	-	0	0	100	8/7
01	40	0	100	0	-	0	0	0	7/10
06	40	0	100	0	-	0	50	50	8/21
11	60	0	100	0	-	0	0	0	11/22

WOODRUFF CREEK SOUTH - TREND STUDY NO. 4-15-11

Vegetation Type: Wyoming Big Sagebrush - PJ

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Semidesert Stony Loam \(Black Sagebrush\), R047XB252UT](#)

Land Ownership: Private

Elevation: 6,800 ft (2,073 m)

Aspect: Southeast

Slope: 21%

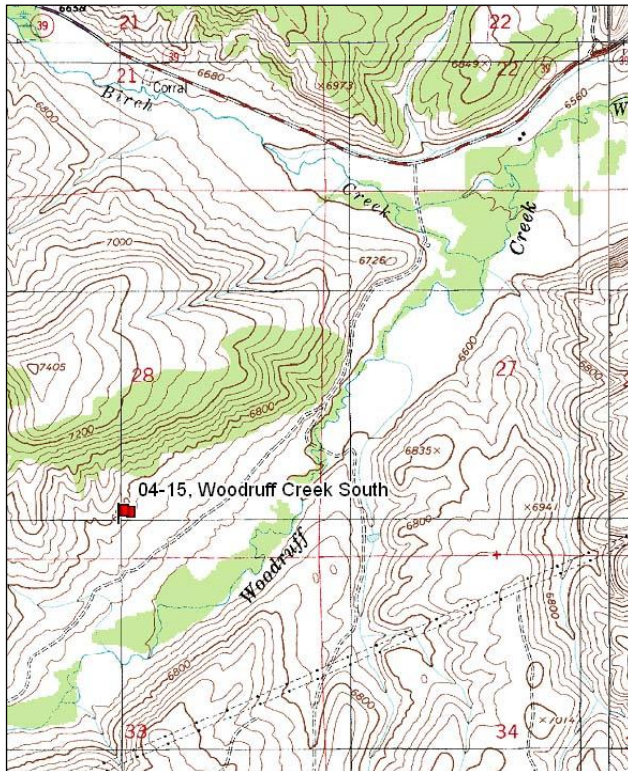
Transect bearing: 26° magnetic

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

Directions:

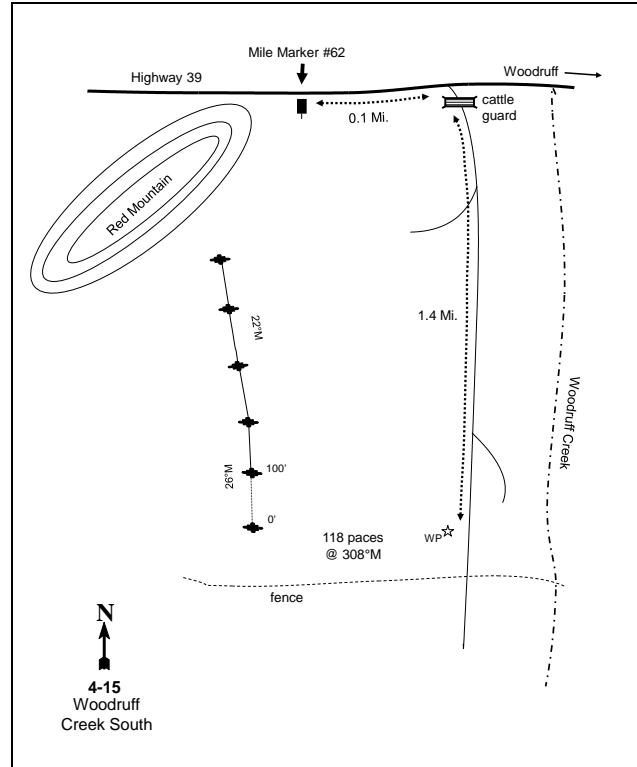
Travel east on highway 39 and turn right (south) 0.1 miles past mile marker #62. Travel west for 1.4 miles to a cattle guard. From the cattlegaurd, walk 118 paces at 205 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline stake is marked with a browse tag #56. There is a fence 200 feet 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



Township: 9N Range: 6E Section: 28

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 476924 E 4592189 N

WOODRUFF CREEK SOUTH - TREND STUDY NO. 4-15

Site Information

Site Description: The study is located on private land downstream from Woodruff Reservoir, about a third of a mile north of Woodruff Creek. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community with a Utah juniper (*Juniperus osteosperma*) overstory. The Ruby Pipeline is just to the south of the study on the other side of the canyon. The area has been heavily used in winter by deer, with five winter-killed deer found in 1996. Several deer carcasses were near the site in 2011. Deer pellet groups have fluctuated in abundance with moderate abundance in 2001, low abundance in 2006, and very high abundance in 2011. Presence of other big game has been minimal. Sampled cattle sign has been high since 2001 (Table - Pellet Group Data).

Browse: Wyoming big sagebrush is the predominant browse species on the site, providing over half of the total browse cover (Table - Browse Trends). The sagebrush population is a moderately dense stand that has displayed mostly light to moderate use. Decadence of sagebrush was high at the outset of the study, but has steadily decreased to more moderate levels. Poor vigor has been moderately high in the population since 2006. Recruitment of young sagebrush plants has been very good over the course of the study. Other shrubs include stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), prickly pear (*Opuntia* sp.), and gray horsebrush (*Tetradymia canescens*). A few snowberry (*Symphoricarpos oreophilus*), bitterbrush (*Purshia tridentata*), and winterfat (*Ceratoides lanata*) plants have been observed, but have not been sampled in the density belt (Table - Browse Characteristics). A moderately dense, but stable, stand of Utah juniper trees are scattered through the area (Table - Point-Quarter Tree Data), with most of the mature trees being highlined.

Herbaceous Understory: The herbaceous understory is dominated by thick patches of cheatgrass (*Bromus tectorum*). In areas where cheatgrass is not as abundant, Sandberg bluegrass (*Poa secunda*), western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and Indian ricegrass (*Oryzopsis hymenoides*) are common. Several other perennial grasses are found in small numbers. Forbs are very sparse, and perennial forbs have produced less than 1% cover since 1996 (Table - Herbaceous Trends).

Soil: The soil is in the Duckree gravelly loam series, which occurs on stream terraces and alluvial fans. Parent material consists of colluvium and/or slope alluvium derived from quartzite, sandstone, and chert. These soils are characterized as very deep, well drained, and moderately permeable (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). At about 6 inches in depth, a layer of larger gravel can be detected. Bare ground is not abundant due to a high amount of vegetation and litter cover provided primarily by cheatgrass (Table - Basic Cover). Some erosion has occurred 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 was classified as slight in 2001 and 2006, but was stable in 2011.

Trend Assessments

Browse:

- **1996 to 2001 - up (+2):** The density of Wyoming big sagebrush increased 66% from 3,300 plants/acre to 5,480 plants/acre, though cover remained similar at 11%. Recruitment of young sagebrush plants increased from 18% to 29% of the population. Decadence decreased from 33% to 23%.
- **2001 to 2006 - stable (0):** The total density of sagebrush decreased 14% to 4,700 plants/acre due to a decrease in the recruitment of young plants to 19% of the population. Cover of sagebrush increased slightly to 12%. Decadence decreased to 19%, but poor vigor increased from 1% to 19%.

- **2006 to 2011 - up (+2):** Density of sagebrush increased 46% to 6,860 plants/acre, and cover increased to 13%. Recruitment of young sagebrush plants increased to 26% of the population. Decadence decreased slightly to 17%, and poor vigor decreased to 10%.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased 19%, and cover increased from 9% to 11%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 16% to 2%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 13%, and cover decreased to 9%. Nested frequency of cheatgrass remained similar, but cover increased to 8%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 12%. Cheatgrass increased significantly in nested frequency, and cover increased to 12%.

Forb:

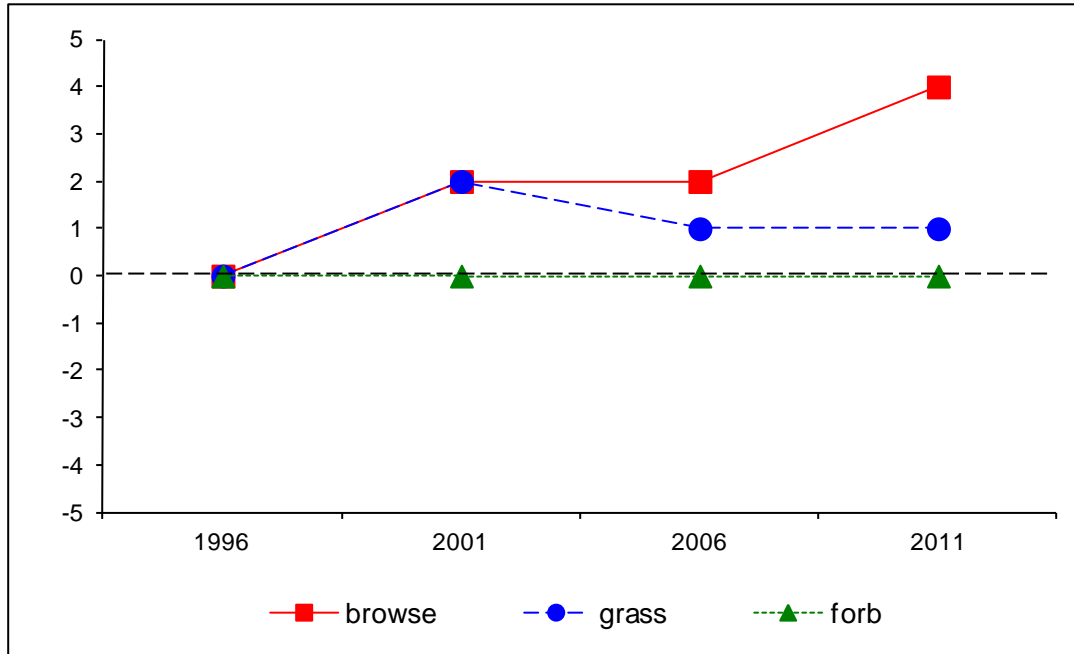
- **1996 to 2001 - stable (0):** Forbs are very rare on the site.
- **2001 to 2006 - stable (0):** Forbs are very rare on the site.
- **2006 to 2011 - stable (0):** Forbs are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 4, study no: 15

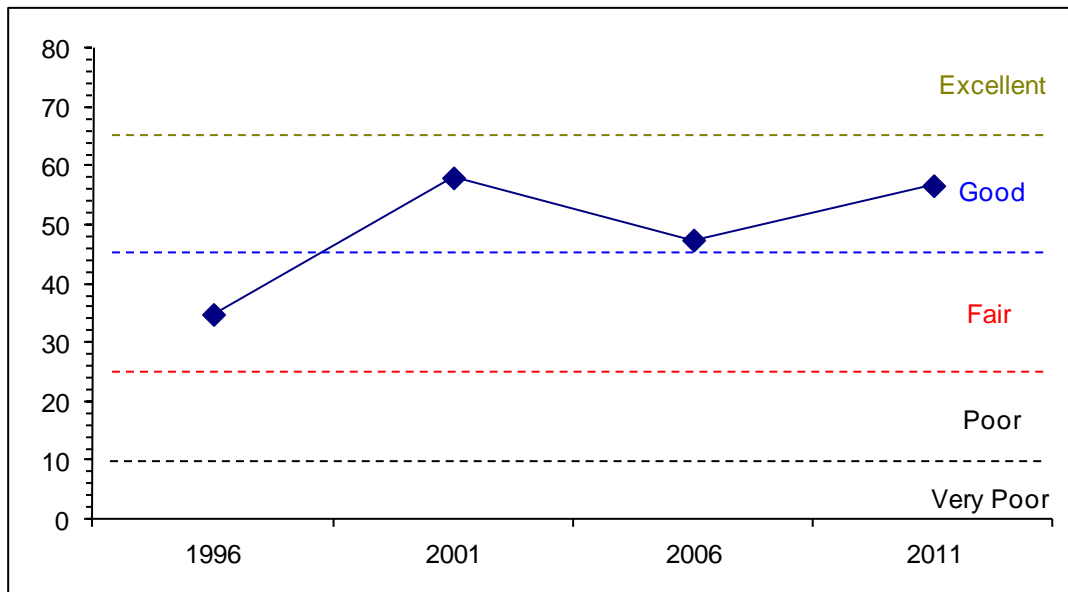
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	13.5	5.1	9.0	18.6	-11.8	0.4	0.0	34.8	Fair
01	13.8	8.1	14.5	22.2	-1.2	0.6	0.0	58.0	Good
06	15.2	9.3	9.5	17.7	-5.8	1.6	0.0	47.5	Good
11	16.7	9.9	13.0	24.4	-8.7	1.4	0.0	56.7	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 4 Study no: 15



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
Management unit 4, Study no: 15



HERBACEOUS TRENDS--

Management unit 04, Study no: 15

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	-	-	-	-	-	-	-	.03
G	Agropyron smithii	a37	c123	bc105	b80	.29	2.29	2.81	3.40
G	Agropyron spicatum	c52	a2	ab13	bc27	1.37	.01	.34	.93
G	Bromus tectorum (a)	b354	a232	a253	b327	15.76	1.60	7.67	11.57
G	Elymus cinereus	4	-	-	-	.06	-	-	-
G	Koeleria cristata	2	-	-	2	.00	-	-	.03
G	Oryzopsis hymenoides	b36	a22	ab21	ab24	.81	.49	.50	1.01
G	Poa fendleriana	9	-	-	16	.22	-	-	.25
G	Poa pratensis	1	-	2	4	.03	-	.03	.01
G	Poa secunda	bc257	c309	ab241	a186	6.25	7.15	4.35	4.29
G	Sitanion hystrix	a22	a13	a24	b61	.23	.04	.31	1.29
G	Stipa comata	a2	b31	b31	b31	.03	1.09	.50	.91
Total for Annual Grasses		354	232	253	327	15.76	1.60	7.67	11.57
Total for Perennial Grasses		422	500	437	431	9.30	11.10	8.85	12.18
Total for Grasses		776	732	690	758	25.07	12.71	16.53	23.76
F	Agoseris glauca	-	-	2	-	-	-	.00	-
F	Alyssum alyssoides (a)	a-	a-	a2	b12	-	-	.00	.03
F	Antennaria rosea	-	5	4	9	-	.01	.18	.01
F	Arabis drummondii	b12	a-	a-	ab5	.03	.03	-	.04
F	Astragalus beckwithii	2	-	3	4	.03	-	.03	.03
F	Astragalus convallarius	a2	b15	ab8	ab8	.01	.16	.10	.15
F	Astragalus utahensis	5	5	-	2	.03	.06	-	.00
F	Chaenactis douglasii	1	3	1	3	.00	.00	.03	.01
F	Chenopodium album (a)	-	-	7	-	-	-	.04	-
F	Cordylanthus sp. (a)	-	-	-	3	-	-	-	.03
F	Crepis acuminata	-	-	-	1	-	-	-	.06
F	Cryptantha sp.	a-	a-	a13	b21	.03	-	.22	.19
F	Descurainia pinnata (a)	6	2	6	17	.04	.00	.07	.08
F	Erigeron pumilus	-	1	4	-	-	.00	.03	-
F	Gayophytum ramosissimum(a)	a-	a-	a-	b49	-	-	-	.20
F	Gilia sp. (a)	a-	a-	b12	b13	-	-	.05	.10
F	Holosteum umbellatum (a)	-	-	1	-	-	-	.00	-
F	Lappula occidentalis (a)	a-	a7	a5	b34	-	.04	.03	.27
F	Orobancha sp.	5	-	-	7	.01	-	-	.04
F	Phlox hoodii	6	6	1	1	.04	.04	.03	.00
F	Phlox longifolia	a3	a4	ab17	b34	.00	.01	.14	.14
F	Ranunculus testiculatus (a)	a-	a-	b17	b26	-	-	.05	.05
F	Sisymbrium altissimum (a)	-	-	-	5	-	-	.00	.18
F	Tragopogon dubius (a)	-	3	-	2	-	.01	-	.01
Total for Annual Forbs		6	12	50	161	0.04	0.05	0.25	0.96
Total for Perennial Forbs		36	39	53	95	0.20	0.31	0.78	0.70
Total for Forbs		42	51	103	256	0.24	0.37	1.04	1.67

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	'11	'96	'01	'06	'11
B	Artemisia tridentata wyomingensis	83	86	85	94	10.83	11.01	12.12	13.35
B	Atriplex canescens	0	0	0	0	-	.03	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	58	54	52	55	2.68	1.89	.91	1.36
B	Gutierrezia sarothrae	0	0	1	1	-	-	-	-
B	Juniperus osteosperma	7	8	8	9	6.98	8.26	10.63	8.86
B	Opuntia sp.	13	6	4	2	.16	.00	-	-
B	Tetradymia canescens	3	3	5	5	.01	-	-	-
Total for Browse		164	157	155	166	20.67	21.20	23.67	23.57

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 15

Species	Percent Cover		
	'01	'06	'11
Artemisia tridentata wyomingensis	-	13.43	22.01
Chrysothamnus viscidiflorus viscidiflorus	-	2.38	4.00
Juniperus osteosperma	11.19	15.63	15.76
Opuntia sp.	-	.26	.20
Tetradymia canescens	-	-	.16

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 15

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	1.2	1.3	1.6

POINT-QUARTER TREE DATA--

Management unit 04, Study no: 15

Species	Trees per Acre			Average diameter (in)		
	'01	'06	'11	'01	'06	'11
Juniperus osteosperma	93	117	94	7.4	5.3	6.3

BASIC COVER--

Management unit 04, Study no: 15

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	44.31	37.37	41.52	48.75
Rock	3.07	1.93	2.13	2.34
Pavement	10.89	13.43	17.09	13.18
Litter	46.23	47.56	42.37	32.19
Cryptogams	2.21	4.95	4.09	4.11
Bare Ground	7.96	14.96	13.99	10.61

PELLET GROUP DATA--

Management unit 04, Study no: 15

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	13	25	32	13	-	-	-
Horse	1	-	-	1	1 (3)	-	1 (2)
Elk	7	1	2	5	-	-	3 (8)
Deer	28	34	4	14	31 (76)	18 (45)	78 (192)
Cattle	6	12	18	8	34 (84)	36 (88)	43 (106)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 15

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Artemisia tridentata wyomingensis</i>									
96	3300	18	48	33	1100	19	.60	5	18/36
01	5480	29	49	23	360	21	.72	.36	17/28
06	4700	19	63	19	7760	5	.42	19	18/27
11	6860	26	57	17	320	27	7	10	13/22
<i>Atriplex canescens</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	14/27
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Ceratoides lanata</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	9/16
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	2540	7	87	6	80	0	0	2	13/20
01	2340	3	86	11	-	0	0	3	10/15
06	2180	15	83	3	20	2	0	0	10/16
11	2260	4	96	1	-	0	0	.88	10/16

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	5/8	
06	20	0	100	-	-	0	0	0	6/7	
11	20	0	100	-	-	0	0	0	8/14	
<i>Juniperus osteosperma</i>										
96	140	0	100	0	-	0	0	0	-/-	
01	180	11	89	0	-	0	0	0	-/-	
06	180	11	78	11	20	0	0	11	-/-	
11	200	10	80	10	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
96	420	29	67	5	-	0	0	0	4/15	
01	300	47	33	20	-	0	0	20	3/10	
06	120	33	67	0	-	0	0	0	3/12	
11	100	0	100	0	20	0	0	0	4/12	
<i>Purshia tridentata</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	9/29	
11	0	0	0	-	-	0	0	0	-/-	
<i>Symphoricarpos oreophilus</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	19/18	
11	0	0	0	-	-	0	0	0	22/47	
<i>Tetradymia canescens</i>										
96	80	0	100	-	-	0	0	0	12/23	
01	80	0	100	-	-	0	0	0	8/20	
06	140	14	86	-	-	14	14	0	7/13	
11	140	0	100	-	-	0	0	0	8/13	

ABOVE TOON RANCH - TREND STUDY NO. 4-17-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: Private

Elevation: 5,846 ft (1,782 m)

Aspect: South

Slope: 19%

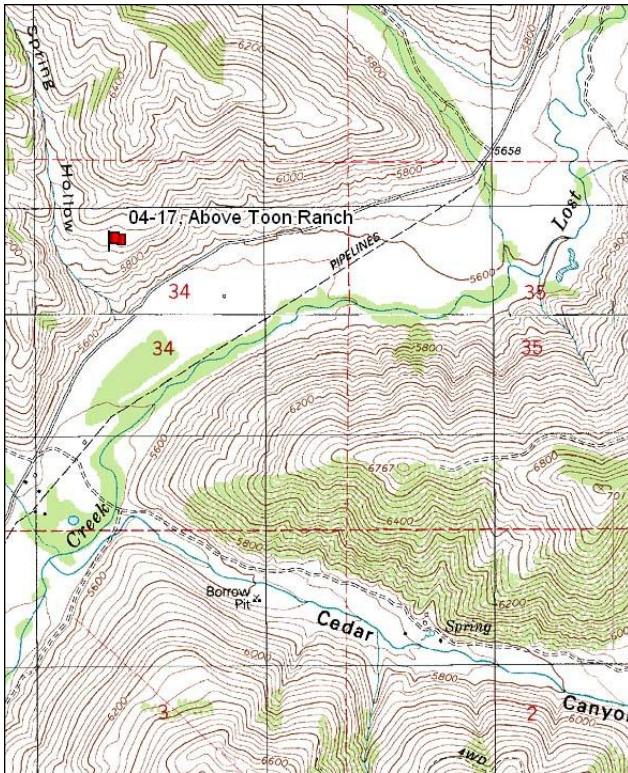
Transect bearing: 6° magnetic

Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft). No rebar on lines 1,2,3, & 4.

Directions:

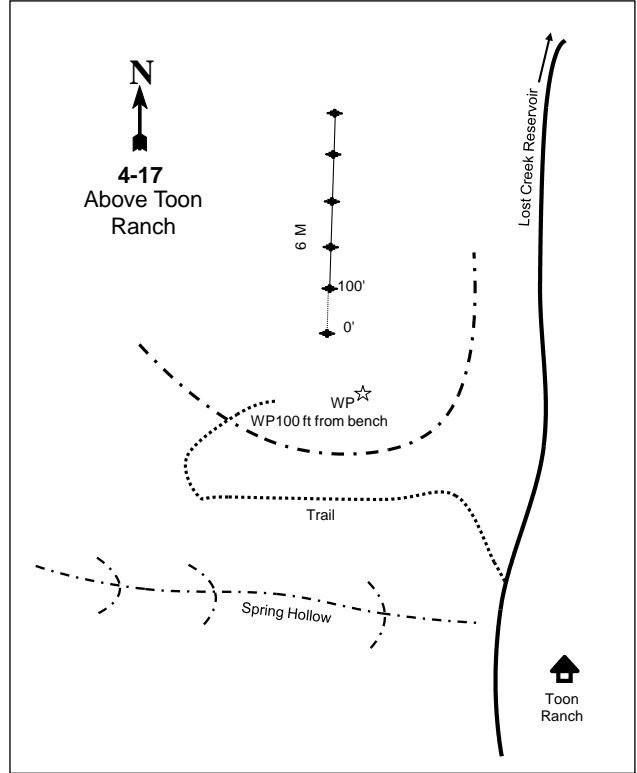
From Croyden drive up the main road towards Lost Creek Reservoir about 4 miles. Stop at Spring Hollow. Walk up the trail (up Spring Hollow) on the west side of the road until you reach the top of the bench. A witness post will be visible about 100 feet from the edge of the bench. From the witness post 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



Township: 5N Range: 4E Section: 34

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 459264 E 4553010 N

Site Information

Site Description: This study is located on private land on a gently sloping bench above the Lost Creek Valley, where deer congregate during the winter. Vegetation in the area is comprised of a dense stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). The site is isolated from the road, and some of the sagebrush is tall enough to provide protective cover for deer. Deer pellet groups have been sampled in high abundance since 2001. A deer was seen on the study area in 2006. Elk and sheep pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data). The land owner grazes sheep during the fall and winter.

Browse: The area supports a dense stand of mature and vigorous mountain big sagebrush in association with some stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). Sagebrush individuals appear to be hybrids of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and mountain big sagebrush, but all plants were classified as mountain big sagebrush. Individual plants with characteristics more like mountain big sagebrush appear to be more preferred and more heavily utilized. Utilization on the majority of the population has been mostly light, though use was more moderate in 2011. Density of sagebrush has steadily decreased over the course of the study. Decadence of sagebrush has increased from low to high levels since 1996. Poor vigor has also increased steadily since 2001. Recruitment of young sagebrush plants has been fairly poor over the course of the study. Stickyleaf low rabbitbrush has been the only other shrub sampled within density measurements. Density has steadily decreased over the course of the study (Table - Browse Characteristics). The decline in browse on the site is likely due to competition with a robust herbaceous understory.

Herbaceous Understory: Grasses are dominated by cheatgrass, which provides over half of the grass cover. Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Agropyron spicatum*) are the only common perennial grass species. Perennial forbs are not particularly diverse, but have increased substantially in cover since 1996. Western yarrow (*Achillea millefolium*) and American vetch (*Vicia americana*) are responsible for the large increase in cover, and these two species now dominate the herbaceous understory. The majority of the other sampled forb species have been annuals (Table - Herbaceous Trends).

Soil: The soil is in the Isbell loam series, which occurs on mountainsides. Parent material consists of slope alluvium and/or colluvium derived from sandstone and shale. These soils are characterized as deep and well drained (Soil Survey Staff 2011). Soil texture is a loam with a slightly acidic soil reaction (pH 6.5) (Table - Soil Analysis Data). There is little bare ground cover, with a high amount of vegetation and litter cover provided by the herbaceous understory (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density of mountain big sagebrush decreased slightly from 2,880 plants/acre to 2,700 plants/acre, but cover increased from 28% to 33%. Decadence increased from 10% to 21%, but poor vigor decreased from 10% to 2%.
- **2001 to 2006 - slightly down (-1):** Sagebrush density decreased 16% to 2,280 plants/acre, and cover decreased to 27%. Decadence increased to 34%, and poor vigor increased to 10%. Recruitment of young sagebrush plants decreased from 7% to 4%.
- **2006 to 2011 - down (-2):** Density of sagebrush decreased 20% to 1,820 plants/acre, and cover decreased to 19%. Decadence increased to 43%, and poor vigor increased to 32%. There was no new recruitment of young sagebrush plants sampled.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased 62%, and cover increased from 3% to 6%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 32% to 12%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 10%, but cover increased to 7%. Nested frequency of cheatgrass remained similar, but cover increased to 17%.
- **2006 to 2011 - slightly up (+1):** There was little change in the sum of nested frequency of perennial grasses, though cover decreased slightly to 6%. However, cheatgrass decreased significantly in nested frequency, and cover decreased to 8%.

Forb:

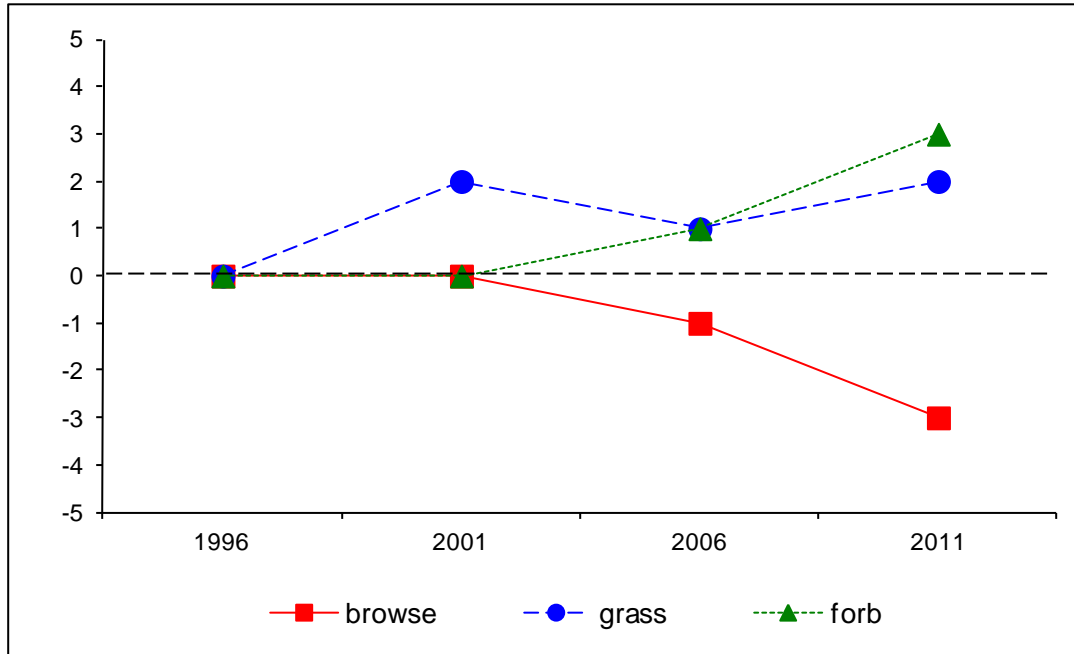
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, though cover increased from 8% to 14%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased only slightly, but cover increased to 22%. There was a significant increase in the nested frequency of American vetch.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased 22%, and cover increased to 37%. There was a significant increase in the nested frequency of American vetch.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 4, study no: 17

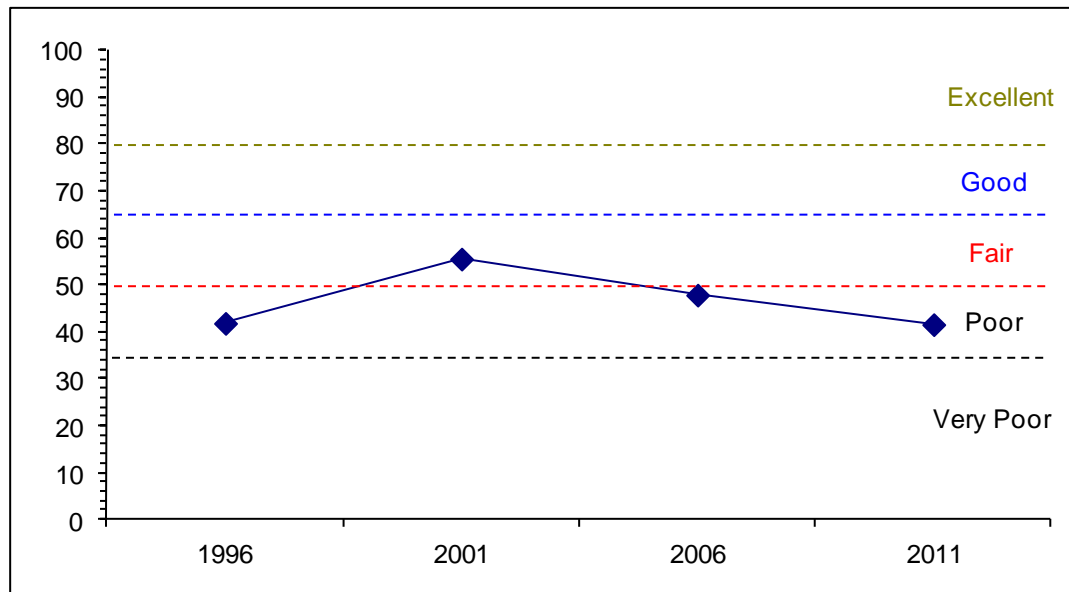
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	12.0	3.5	6.3	-20.0	10.0	0.0	41.8	Poor
01	30.0	8.7	3.5	12.0	-8.7	10.0	0.0	55.5	Fair
06	30.0	4.8	2.0	14.1	-13.1	10.0	0.0	47.8	Poor
11	23.7	2.1	0.0	11.9	-6.1	10.0	0.0	41.6	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 17



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 17



HERBACEOUS TRENDS--

Management unit 04, Study no: 17

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron dasystachyum</i>	-	-	1	4	-	-	.00	.01
G	<i>Agropyron spicatum</i>	33	40	23	38	.87	1.79	1.44	1.99
G	<i>Bromus japonicus</i> (a)	8	3	11	2	.04	.00	.07	.01
G	<i>Bromus tectorum</i> (a)	c452	b369	b389	a296	31.50	11.57	17.39	8.15
G	<i>Elymus cinereus</i>	5	18	13	15	.82	1.60	.89	1.15
G	<i>Melica bulbosa</i>	-	-	5	-	-	-	.15	-
G	<i>Poa pratensis</i>	a-	a-	a2	b20	-	-	.03	.28
G	<i>Poa secunda</i>	a68	b114	ab111	ab83	1.46	2.60	4.55	2.51
Total for Annual Grasses		460	372	400	298	31.54	11.58	17.47	8.16
Total for Perennial Grasses		106	172	155	160	3.16	6.00	7.07	5.96
Total for Grasses		566	544	555	458	34.71	17.58	24.54	14.13
F	<i>Achillea millefolium</i>	a100	ab139	bc159	c182	4.02	6.30	9.32	10.70
F	<i>Agoseris heterophylla</i> (a)	ab22	a7	b28	b34	.09	.01	.39	.52
F	<i>Allium</i> sp.	12	23	13	27	.03	.16	.06	.13
F	<i>Alyssum alyssoides</i> (a)	a131	a106	b204	c270	1.25	.74	1.78	8.53
F	<i>Artemisia ludoviciana</i>	1	6	2	5	.63	.03	.03	.18
F	<i>Aster chilensis</i>	b77	b63	a16	a23	.66	.94	.40	.36
F	<i>Camelina microcarpa</i> (a)	b68	a24	a13	a5	.26	.12	.04	.00
F	<i>Castilleja linariaefolia</i>	-	4	-	-	-	.03	-	-
F	<i>Cirsium undulatum</i>	12	7	-	-	.03	.16	-	-
F	<i>Collinsia parviflora</i> (a)	a24	b90	b129	c281	.06	1.00	.70	2.46
F	<i>Collomia linearis</i> (a)	a12	b54	a23	a14	.02	.26	.11	.06
F	<i>Comandra pallida</i>	-	-	-	3	-	-	-	.00
F	<i>Cryptantha</i> sp.	b14	a-	b14	a-	.07	-	.19	-
F	<i>Cymopterus</i> sp.	-	-	1	-	-	-	.03	-
F	<i>Delphinium nuttallianum</i>	-	-	-	1	-	-	-	.00
F	<i>Descurainia pinnata</i> (a)	6	2	-	2	.02	.01	-	.00
F	<i>Draba</i> sp. (a)	a18	b55	b63	b76	.06	.24	.15	.89
F	<i>Erodium cicutarium</i> (a)	-	-	3	-	-	-	.00	-
F	<i>Galium</i> sp.	5	13	-	-	.01	.09	-	-
F	<i>Gayophytum ramosissimum</i> (a)	a-	a-	b10	a5	-	-	.18	.03
F	<i>Holosteum umbellatum</i> (a)	a61	b195	a79	a88	.33	2.66	.62	1.64
F	<i>Lactuca serriola</i> (a)	1	-	2	3	.00	-	.01	.03
F	<i>Lappula occidentalis</i> (a)	5	7	6	2	.01	.19	.01	.00
F	<i>Lomatium</i> sp.	-	-	-	1	-	-	-	.03
F	<i>Machaeranthera</i> spp	4	-	-	4	.01	-	-	.00
F	<i>Microsteris gracilis</i> (a)	a-	c79	c79	b41	-	.82	.31	.13
F	<i>Polygonum douglasii</i> (a)	9	9	4	-	.01	.01	.00	-
F	<i>Ranunculus testiculatus</i> (a)	a-	a5	a2	b17	-	.03	.00	.60
F	<i>Sisymbrium altissimum</i> (a)	6	6	2	-	.02	.04	.00	-
F	<i>Sphaeralcea grossulariifolia</i>	-	-	-	2	-	-	-	.00
F	<i>Taraxacum officinale</i>	-	-	-	8	-	-	-	.02
F	<i>Tragopogon dubius</i> (a)	a-	ab2	a-	b9	-	.03	.03	.04

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Veronica biloba (a)	2	3	1	-	.03	.03	.03	-
F	Vicia americana	_{ab} 289	_a 250	_b 324	_c 377	2.44	5.84	11.96	24.53
F	Viola sp.	_a -	_a -	_a 5	_b 20	-	-	.01	.48
Total for Annual Forbs		365	644	648	847	2.19	6.23	4.41	14.98
Total for Perennial Forbs		514	505	534	653	7.92	13.58	22.01	36.46
Total for Forbs		879	1149	1182	1500	10.11	19.82	26.42	51.44

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	86	77	70	65	27.64	33.43	26.70	18.92
B	Chrysothamnus viscidiflorus viscidiflorus	69	53	54	41	3.37	2.83	3.36	1.25
Total for Browse		155	130	124	106	31.01	36.27	30.06	20.18

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 17

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	29.01	24.46
Chrysothamnus viscidiflorus viscidiflorus	3.46	1.28

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 17

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.2	2.7	3.2

BASIC COVER--

Management unit 04, Study no: 17

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	64.87	66.75	66.01	77.97
Rock	.22	.44	.97	.43
Pavement	.20	.51	.67	.51
Litter	75.83	57.01	47.29	54.57
Cryptogams	.52	.77	.06	.19
Bare Ground	1.00	6.30	5.23	4.91

SOIL ANALYSIS DATA --

Management unit 04, Study no: 17, Study Name: Above Toon Ranch

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.2	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	3	-	2	-	-	12 (30)	4 (10)
Rabbit	2	6	11	1	-	-	-
Elk	4	-	6	4	1 (2)	11 (26)	3 (8)
Deer	29	22	31	12	70 (174)	52 (127)	50 (122)
Cattle	-	3	-	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 17

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata vaseyana</i>									
96	2880	7	83	10	40	6	0	10	34/52
01	2700	7	72	21	60	7	0	2	41/53
06	2280	4	62	34	40	18	7	10	36/48
11	1820	0	57	43	200	44	4	32	36/52
<i>Chrysothamnus nauseosus albicaulis</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	24/23
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	3320	10	88	2	20	0	0	.60	13/21
01	2460	11	85	3	-	0	0	0	10/14
06	2120	9	90	1	-	8	2	.94	13/16
11	1160	19	79	2	-	2	0	2	11/16
<i>Purshia tridentata</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	11/27
11	0	0	0	-	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Tetradymia canescens										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	21/23	
11	0	0	0	-	-	0	0	0	-/-	

DESERET MAIN GATE - TREND STUDY NO. 4-18-11

Vegetation Type: Wyoming Big Sagebrush

Range Type: Substantial Deer Year-long, Crucial Elk Winter

NRCS Ecological Site Description: [Semidesert Loam \(Wyoming Big Sagebrush\), R034XY212UT](#)

Land Ownership: Private

Elevation: 6,400 ft (1,951 m)

Aspect: Level (South)

Slope: 0%

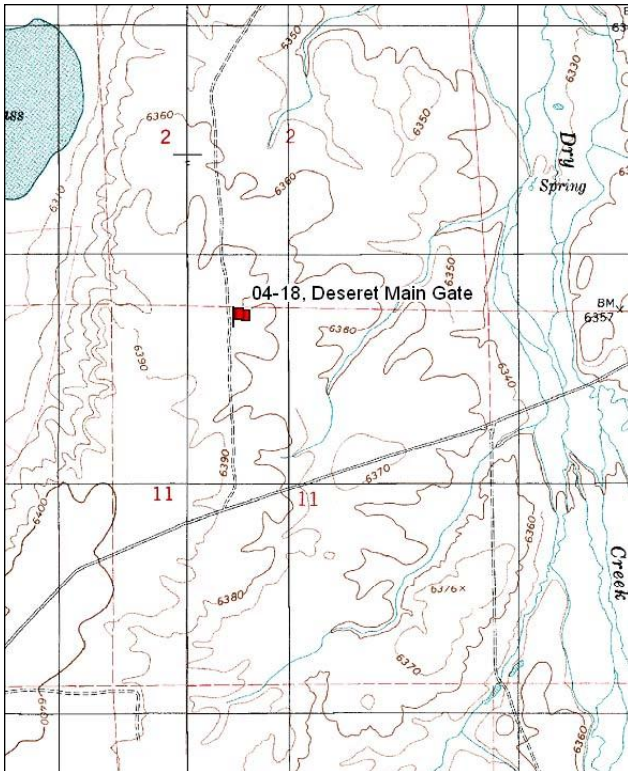
Transect bearing: 12° magnetic

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

Directions:

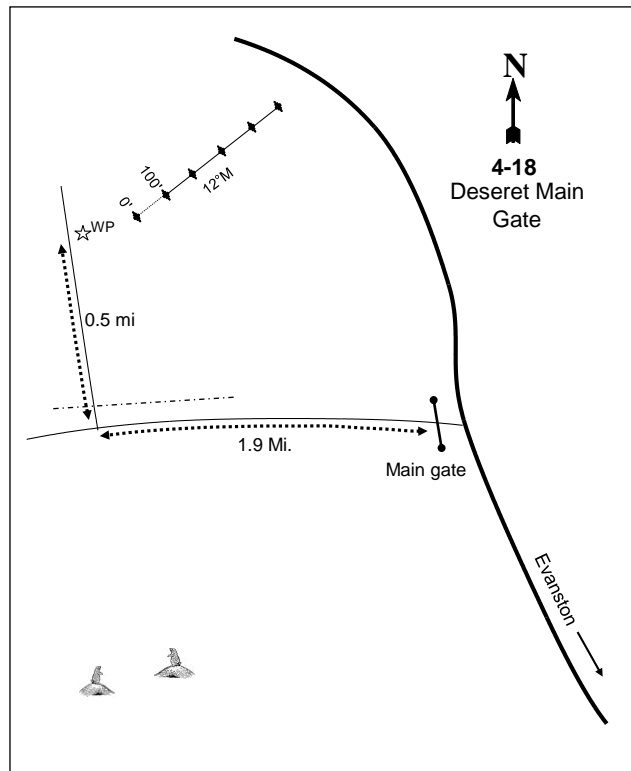
From the Deseret Land & Livestock main gate on highway 16 between Evanston and Woodruff, proceed west towards the Deseret ranch house 1.9 miles. Turn right and go 0.5 miles north to a witness post on the east side of the road. The 0-foot stake is 9 paces at 48 degrees magnetic.

Map Name: Neponset Reservoir NE



Township: 8N Range: 6E Section: 11

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 489699 E 4588882 N

DESERET MAIN GATE - TREND STUDY NO. 4-18

Site Information

Site Description: This study is located on the Deseret Land and Livestock ranch, near the east entrance off of Highway 16. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and crested wheatgrass (*Agropyron cristatum*) community. This area is occupied by elk, mule deer, pronghorn, cattle, and sage grouse. Deer/pronghorn pellet groups have been sampled in low abundance since 2001. Elk pellet groups were sampled in low abundance in 2001, but increasing to high abundance in 2006, and more moderate pellet group abundance in 2011. Sampled cattle sign has been high in abundance since 2001. Sage grouse pellets have also been common (Table - Pellet Group Data).

Browse: The key browse species is Wyoming big sagebrush, which provides nearly all of the browse cover on the site (Table - Browse Trends). The population was dense at the outset of the study, but density has steadily decreased since 2001. Utilization of sagebrush has been mostly light to moderate, with some years of heavy use. Decadence and poor vigor are high within the population. The sagebrush defoliator moth (*Aroga websteri*) was identified on 10% of the sampled population in 2006, which likely increased poor vigor in that year. Recruitment of young sagebrush plants has been fair, but the density have young plants has been consistently lower than the density of dead plants sampled (Table - Browse Characteristics). Recruitment may be limited by the robust herbaceous understory.

Herbaceous Understory: Crested wheatgrass is the dominant understory species, and with the decrease in sagebrush has become the dominant species on the site. Some utilization has been noted on crested wheatgrass in multiple sample years. Other grass species occur infrequently. Forbs are sparse and have provided less than 1% cover since 1997 (Table - Herbaceous Trends).

Soil: The soil is in the Woodpass loam series, which occurs on upland slopes and alluvial fans. Parent material consists of alluvium derived from limestone and sandstone. These soils are characterized as very deep and well drained (Soil Survey Staff 2011). The soil has a loam texture and a slightly acidic soil reaction (pH 6.3) (Soil Analysis Data). There is little rock or pavement on the soil surface or within the profile. Bare ground cover is moderately high, with only moderate vegetation and litter cover that is provided primarily from crested wheatgrass and Wyoming big sagebrush (Table - Basic Cover). Erosion is minimal due to the gentle slope, but moderate pedestaling around sagebrush stems and crested wheatgrass clumps provide some evidence of past erosion. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1997 to 2001 - stable (0):** Density of Wyoming big sagebrush increased 9% from 5,280 plants/acre to 5,780 plants/acre, but cover remained similar at 12%. Decadence increased from 27% to 43%.
- **2001 to 2006 - down (-2):** Wyoming big sagebrush density decreased 33% to 3,900 plants/acre, and cover decreased to 6%. Decadence remained high at 45%, and poor vigor increased from 11% to 36%.
- **2006 to 2011 - down (-2):** Density of Wyoming big sagebrush decreased 29% to 2,780 plants/acre, and cover decreased slightly to 5%. Decadence and poor vigor decreased, but remained high at 31% and 32%, respectively.

Grass:

- **1997 to 2001 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 14%, and cover increased from 12% to 19%.
- **2001 to 2006 - slightly up (+1):** The perennial grass sum of nested frequency increased 16%, and cover increased to 38%.

- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover decreased slightly to 32%.

Forb:

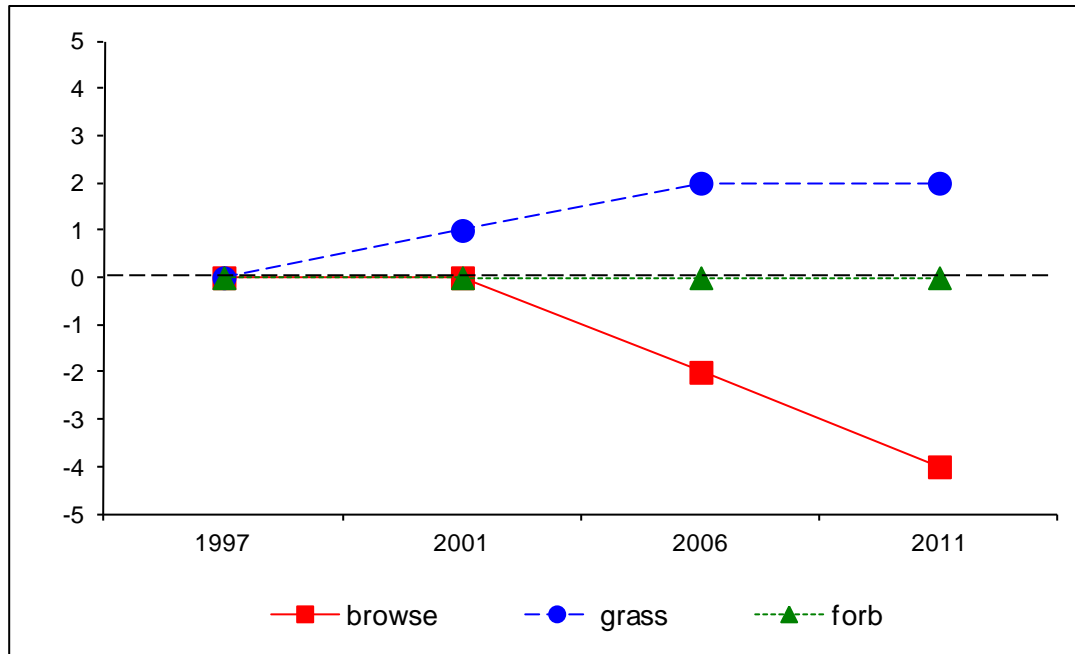
- **1997 to 2001 - stable (0):** Forb species are rare on the site.
- **2001 to 2006 - stable (0):** Forb species are rare on the site.
- **2006 to 2011 - stable (0):** Forb species are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 4, study no: 18

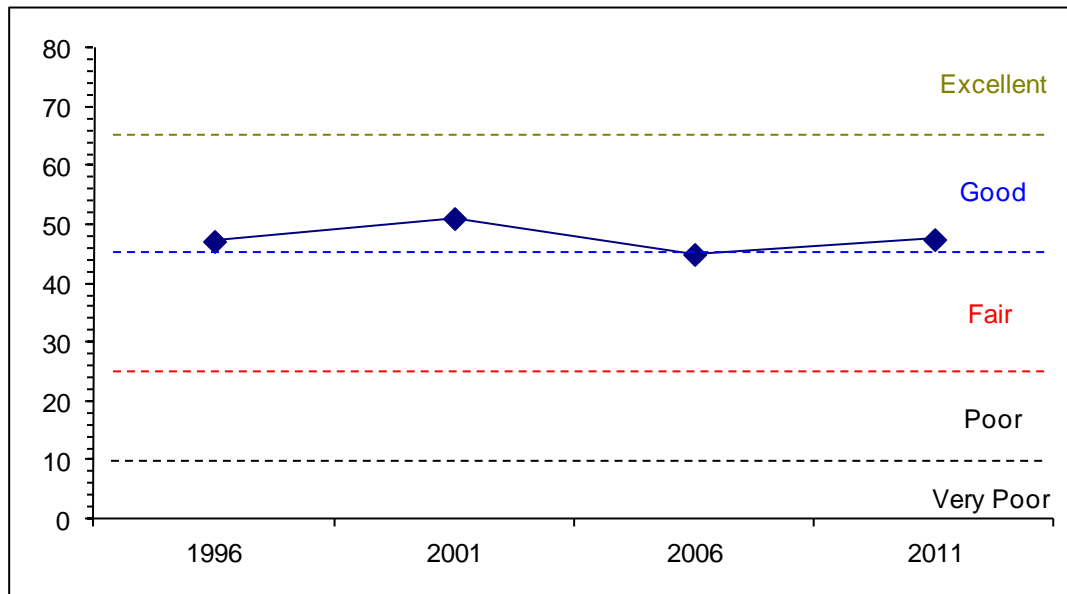
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
97	14.5	6.9	2.0	23.5	0.0	0.3	0.0	47.2	Good
01	14.5	2.1	4.0	30.0	0.0	0.4	0.0	51.1	Good
06	7.4	1.5	5.0	30.0	0.0	1.0	0.0	45.0	Fair-Good
11	6.1	5.7	5.0	30.0	0.0	0.7	0.0	47.5	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 4 Study no: 18



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 4, Study no: 18



HERBACEOUS TRENDS--
 Management unit 04, Study no: 18

Type	Species	Nested Frequency				Average Cover %			
		'97	'01	'06	'11	'97	'01	'06	'11
G	<i>Agropyron cristatum</i>	_a 373	_{ab} 403	_b 417	_b 423	11.72	18.31	37.15	30.38
G	<i>Agropyron smithii</i>	-	-	-	2	-	-	-	.03
G	<i>Oryzopsis hymenoides</i>	-	3	-	-	-	.03	-	-
G	<i>Poa secunda</i>	_a 6	_a 27	_b 83	_b 110	.03	.26	1.28	1.24
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		379	433	500	535	11.75	18.60	38.43	31.66
Total for Grasses		379	433	500	535	11.75	18.60	38.43	31.66
F	<i>Alyssum alyssoides</i> (a)	-	5	-	8	-	.03	-	.02
F	<i>Antennaria rosea</i>	-	-	4	-	-	-	.06	-
F	<i>Astragalus convallarius</i>	-	11	2	7	-	.07	.01	.01
F	<i>Descurainia pinnata</i> (a)	-	1	1	-	-	.00	.00	-
F	<i>Phlox hoodii</i>	_a 10	_{ab} 22	_b 35	_{ab} 23	.05	.14	.34	.32
F	<i>Phlox longifolia</i>	10	-	19	8	.10	-	.10	.02
F	<i>Trifolium</i> sp.	-	2	1	-	-	.00	.00	-
Total for Annual Forbs		0	6	1	8	0	0.03	0.00	0.01
Total for Perennial Forbs		20	35	61	38	0.15	0.22	0.52	0.34
Total for Forbs		20	41	62	46	0.15	0.26	0.53	0.37

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	'11	'97	'01	'06	'11
B	Artemisia tridentata wyomingensis	90	95	82	71	11.57	11.61	5.93	4.88
B	Atriplex gardneri falcata	3	9	9	9	.06	.31	.10	.21
B	Ceratoides lanata	0	2	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	60	46	26	21	1.27	.57	.30	.39
Total for Browse		153	152	117	101	12.91	12.50	6.33	5.48

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 18

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	4.28	5.25
Atriplex gardneri falcata	.20	.13
Chrysothamnus viscidiflorus viscidiflorus	.10	.25

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 18

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	0.9	1.3	2.3

BASIC COVER--

Management unit 04, Study no: 18

Cover Type	Average Cover %			
	'97	'01	'06	'11
Vegetation	21.86	28.14	47.08	37.16
Rock	.64	.08	.38	.08
Pavement	5.08	1.01	.69	.44
Litter	22.24	47.11	33.21	39.82
Cryptogams	9.64	10.44	3.49	2.48
Bare Ground	33.04	32.00	36.12	29.96

SOIL ANALYSIS DATA --

Management unit 04, Study no: 18, Study Name: Deseret Main Gate

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
14.6	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	'11	'01	'06	'11
Rabbit	1	2	6	15	-	-	-
Grouse	1	-	1	-	17.4 Groups/A cre	52 Groups/ Acre	-
Elk	24	5	57	14	19 (48)	62 (154)	34 (83)
Deer/Pronghorn	22	8	2	4	9 (23)	11 (28)	7 (17)
Cattle	9	15	25	27	53 (131)	44 (109)	70 (172)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 18

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Artemisia tridentata wyomingensis</i>									
97	5280	4	69	27	40	48	42	10	14/22
01	5780	8	49	43	60	29	10	11	12/20
06	3900	10	45	45	80	42	11	36	13/21
11	2780	10	59	31	-	22	24	32	11/19
<i>Atriplex gardneri falcata</i>									
97	260	15	85	-	-	0	0	0	4/5
01	980	33	67	-	-	0	0	0	3/4
06	880	32	68	-	-	30	11	0	5/9
11	660	24	76	-	-	3	0	0	4/9
<i>Ceratoides lanata</i>									
97	0	0	0	-	-	0	0	0	-/-
01	40	0	100	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
97	2720	0	100	0	-	0	0	0	6/8
01	1820	10	77	13	-	0	0	0	4/6
06	620	35	52	13	-	13	16	13	5/7
11	520	15	85	0	-	0	0	4	6/10
<i>Opuntia sp.</i>									
97	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	3/5
11	0	0	0	-	-	0	0	0	-/-

DESERET BURN - TREND STUDY NO. 4-19-11

Vegetation Type: Burned and Seeded

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Semidesert Stony Loam \(Black Sagebrush\), R047XB252UT](#)

Land Ownership: Private

Elevation: 6,700 ft (2,042 m)

Aspect: East

Slope: 12%

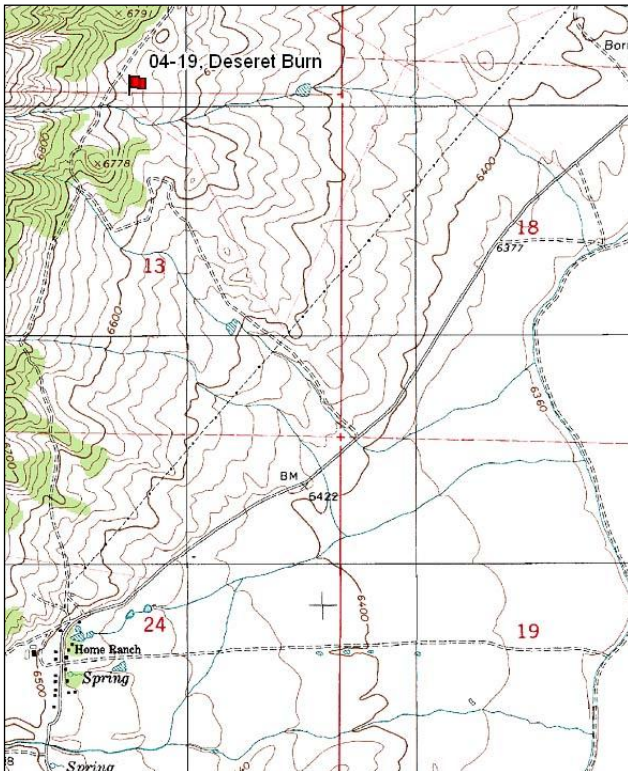
Transect bearing: 320° magnetic

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

Directions:

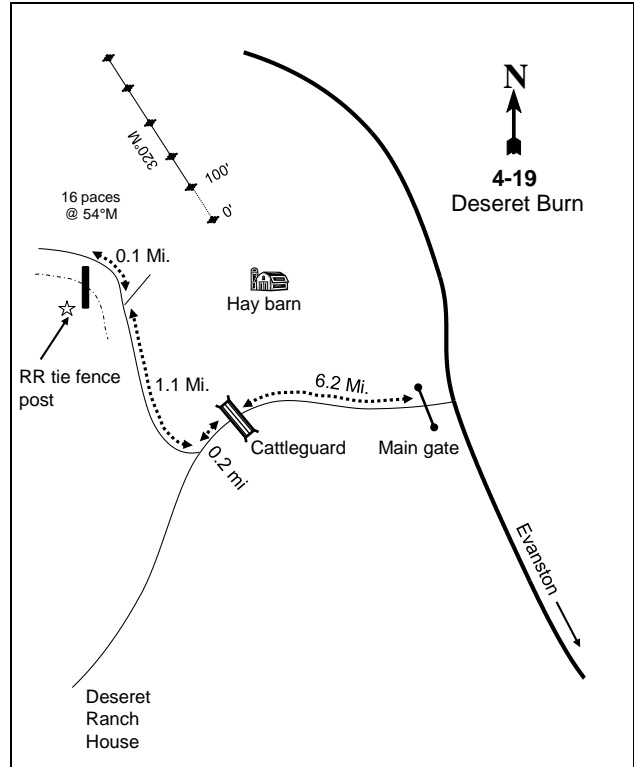
From the Deseret Land & Livestock main gate on highway 16 between Evanston and Woodruff, proceed west towards the Deseret ranch house 6.2 miles to a cattleguard. Continue 0.2 miles and turn right onto a two track. Follow the two track for 1.2 miles staying left. The 0-foot stake is 16 paces at 54 degrees magnetic from a rail road tie in the fence line. The baseline runs at 320 degrees magnetic.

Map Name: Neponset Reservoir NW



Township: 8N Range: 6E Section: 13

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 489699 E 4588882 N

DESERET BURN - TREND STUDY NO. 4-19

Site Information

Site Description: This study is located on Deseret Land and Livestock land, approximately one and a half miles north of the ranch house. 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 presence when the study was established in 1997, but has since increased. Elk pellet groups have been sampled in moderate to high abundance since 2001. Deer/pronghorn pellet groups have been sampled in low abundance since 2001. Sampled cattle sign has been moderate to high in abundance since 2001. A heavy rabbit presence was noted in 2011 (Table - Pellet Group Data).

Browse: Even though there was a high effort to establish browse by seeding and planting root stock, browse has remained sparse. The predominant browse species is the increaser species stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), but it provides little cover (Table - Browse Trends). Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and fourwing saltbush (*Atriplex canescens*) are present in very low densities. Utilization has been mostly light on sagebrush, and mostly moderate on fourwing saltbush (Table - Browse Characteristics).

Herbaceous Understory: Vegetation on the site is dominated by grasses. Crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) have both steadily increased in cover throughout the study, and combined have provided the majority of vegetation cover. Other common perennial grass species include intermediate wheatgrass (*Agropyron intermedium*) and western wheatgrass (*A. smithii*), with less abundant species including needle-and-thread (*Stipa comata*), sedge (*Carex* sp.), and bottlebrush squirreltail (*Sitanion hystrix*). The annual grass cheatgrass (*Bromus tectorum*) was abundant in 2001, but has been rare in other sample years. Perennial forbs are rare on the site, and have steadily decreased since 1997. With the exception of pale alyssum (*Alyssum alyssoides*), annual forbs are infrequent as well (Table - Herbaceous Trends).

Soil: The soil is in the Duckree gravelly loam series, which occurs on valley sides and hillslopes. Parent material consists of colluvium and/or slope alluvium derived from quartzite, sandstone, and chert. These soils are characterized as very deep, well drained, and moderately permeable (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). Vegetation and litter cover were both very low, and bare ground cover was high in 1997. Vegetation cover has increased greatly, and is fairly high. Litter cover has also increased, but is only moderately high. Bare ground cover decreased, but remains moderately high (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1997 to 2001 - slightly down (-1):** Fourwing saltbush density decreased from 360 plants/acre to 100 plants/acre, and cover remained minimal. Most of the young plants sampled in 1997 apparently did not persist.
- **2001 to 2006 - stable (0):** Density of Wyoming big sagebrush and fourwing saltbush remained very low.
- **2006 to 2011 - stable (0):** Density of Wyoming big sagebrush and fourwing saltbush remained very low.

Grass:

- **1997 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased 27%, and cover increased from 10% to 18%. However, the annual grass cheatgrass also increased significantly in nested frequency, and cover increased from 1% to 6%.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial grasses increased 32%, and cover increased to 28%. Crested wheatgrass and Sandberg bluegrass increased significantly in nested frequency and dominate the site. Cheatgrass decreased significantly in nested frequency, and cover decreased to less than 1%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, though cover increased to 35%. There was a significant increase in the nested frequency of crested wheatgrass.

Forb:

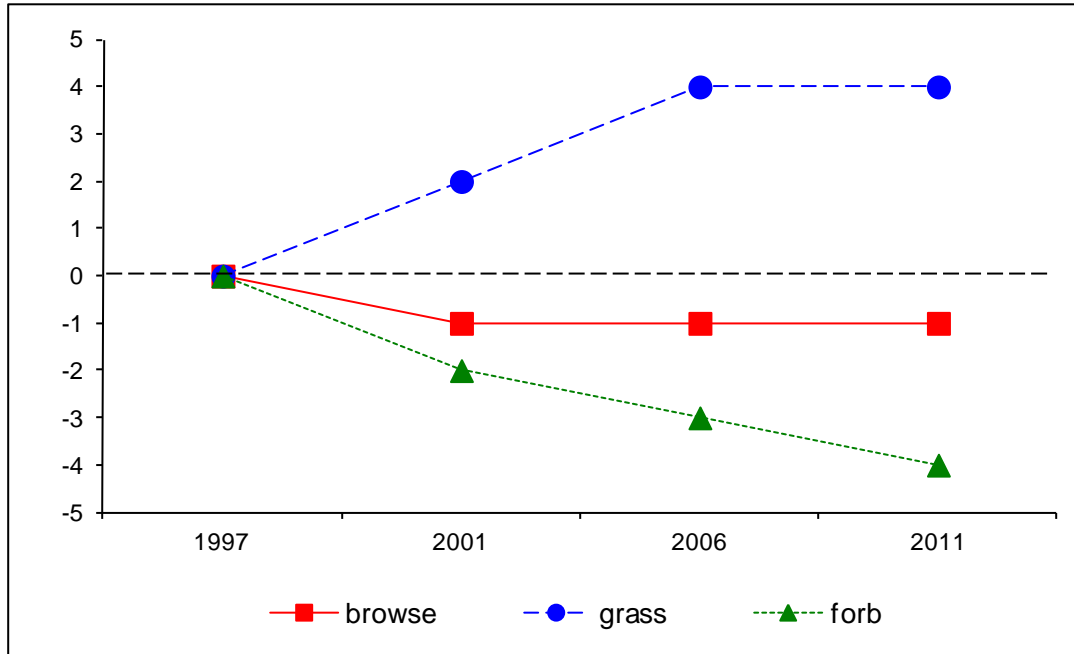
- **1997 to 2001 - down (-2):** Perennial forb sum of nested frequency decreased 65%, and cover decreased from 3% to 2%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased, but were already rare on the site. The number of species sampled had decreased substantially.
- **2006 to 2011 - slightly down (-1):** Almost no perennial forbs were sampled, and cover decreased to near 0%. The forb composition is dominated by the annual species pale alyssum.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 4, study no: 19

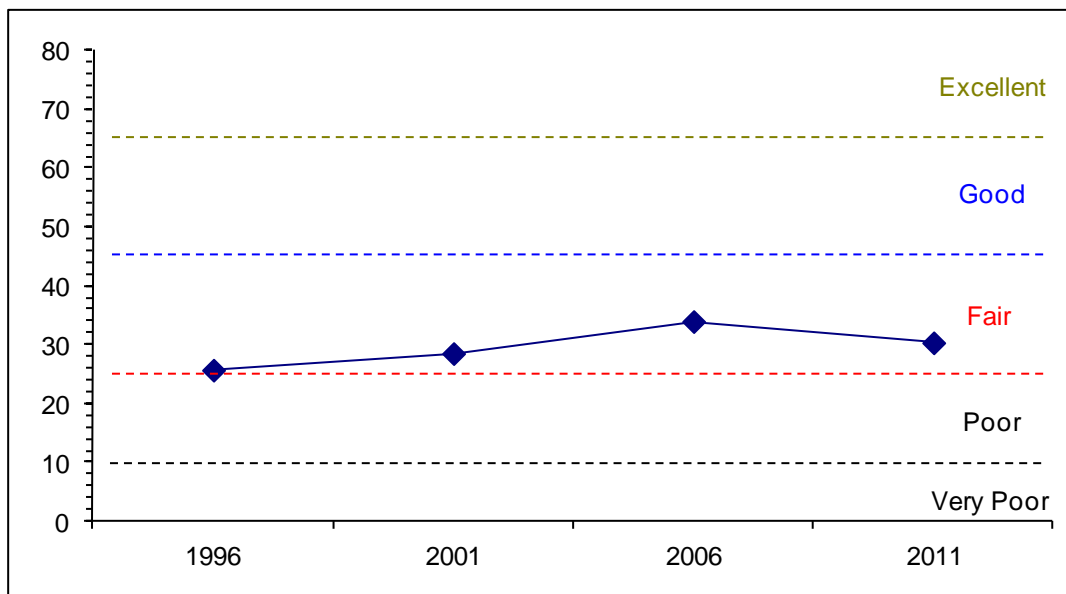
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
97	0.1	0.0	0.0	20.2	-0.5	5.9	0.0	25.7	Poor-Fair
01	0.0	0.0	0.0	30.0	-4.7	3.2	0.0	28.5	Fair
06	0.4	0.0	0.0	30.0	-0.1	3.7	0.0	34.0	Fair
11	0.3	0.0	0.0	30.0	0.0	0.1	0.0	30.3	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 19



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 4, Study no: 19



HERBACEOUS TRENDS--
Management unit 04, Study no: 19

Type	Species	Nested Frequency				Average Cover %			
		'97	'01	'06	'11	'97	'01	'06	'11
G	Agropyron cristatum	a153	a148	b216	c259	3.52	5.30	8.50	15.53
G	Agropyron intermedium	a93	b160	ab113	a75	1.70	4.90	4.03	1.94
G	Agropyron smithii	a47	b95	c134	bc100	1.10	2.47	2.14	2.75
G	Agropyron spicatum	b30	a1	a-	a3	.51	.00	-	.01
G	Bromus japonicus (a)	-	2	-	-	-	.00	-	-
G	Bromus tectorum (a)	a56	b295	a25	a27	.65	6.25	.19	.06
G	Carex sp.	22	25	6	13	.72	.51	.03	.07
G	Elymus cinereus	-	1	-	3	-	.03	.03	.18
G	Oryzopsis hymenoides	3	-	1	2	.15	-	.15	.15
G	Poa fendleriana	6	-	-	-	.18	-	-	-
G	Poa secunda	a144	a175	b340	b299	2.12	4.11	11.85	13.11
G	Sitanion hystrix	a-	a1	a3	b9	.00	.00	.00	.03
G	Stipa comata	a7	b34	b31	b48	.06	.31	1.20	.99
Total for Annual Grasses		56	297	25	27	0.64	6.25	0.19	0.06
Total for Perennial Grasses		505	640	844	811	10.09	17.67	27.97	34.79
Total for Grasses		561	937	869	838	10.74	23.93	28.17	34.85
F	Agoseris glauca	-	1	7	-	-	.00	.02	-
F	Allium sp.	b32	a-	a-	a-	.11	-	-	-
F	Alyssum alyssoides (a)	a-	c292	b228	d400	-	1.38	.84	4.48
F	Arabis sp.	3	-	-	1	.00	-	-	.00
F	Astragalus sp.	2	3	-	3	.03	.01	.01	.01
F	Balsamorhiza sagittata	2	1	1	2	.06	.33	.03	.03
F	Chenopodium sp. (a)	-	-	-	-	.41	-	-	-
F	Crepis acuminata	-	2	-	-	-	.03	-	-
F	Cymopterus sp.	-	1	-	-	-	.00	-	-
F	Erigeron sp.	b14	a-	a-	a-	.24	-	-	-
F	Gayophytum ramosissimum(a)	b76	a-	a-	a5	1.69	-	-	.02
F	Gilia sp. (a)	b18	b27	a-	a-	.26	.07	-	-
F	Lactuca serriola (a)	-	-	-	-	.06	-	-	-
F	Lappula occidentalis (a)	a14	b72	a-	a7	.26	.18	-	.01
F	Linum lewisii	b13	a-	a-	a-	.09	-	-	-
F	Medicago sativa	12	17	14	-	.24	.63	1.49	-
F	Phlox longifolia	b54	ab35	a24	a7	.21	.08	.13	.02
F	Ranunculus testiculatus (a)	a-	a-	a2	b12	-	-	.00	.08
F	Sanguisorba minor	b65	a4	a-	a-	1.84	.01	-	-
F	Sphaeralcea coccinea	2	3	4	-	.03	.15	.15	-
F	Tragopogon dubius (a)	-	4	-	-	-	.03	-	-
F	Unknown forb-perennial	3	4	-	-	.03	.31	-	-
Total for Annual Forbs		108	395	230	424	2.69	1.67	0.84	4.59
Total for Perennial Forbs		202	71	50	13	2.91	1.57	1.84	0.06
Total for Forbs		310	466	280	437	5.60	3.25	2.68	4.66

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

BROWSE TRENDS--

Management unit 04, Study no: 19

T y p e	Species	Strip Frequency				Average Cover %			
		'97	'01	'06	'11	'97	'01	'06	'11
B	Artemisia tridentata wyomingensis	0	3	3	5	-	.03	.18	.03
B	Atriplex canescens	14	5	3	4	.04	.00	.15	.18
B	Chrysothamnus viscidiflorus viscidiflorus	33	35	38	39	.83	1.58	2.30	2.67
B	Eriogonum microthecum	0	1	0	0	-	-	-	-
B	Opuntia sp.	2	3	3	3	-	.00	-	-
Total for Browse		49	47	47	51	0.87	1.62	2.63	2.88

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 19

Species	Percent Cover	
	'06	'11
Artemisia tridentata wyomingensis	.15	.31
Atriplex canescens	.38	-
Chrysothamnus viscidiflorus viscidiflorus	2.61	5.11
Opuntia sp.	.10	.10

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 19

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata wyomingensis	-	2.0	3.4
Atriplex canescens	4.0	9.0	15.5

BASIC COVER--

Management unit 04, Study no: 19

Cover Type	Average Cover %			
	'97	'01	'06	'11
Vegetation	16.43	38.72	41.27	44.18
Rock	3.81	1.23	1.19	.37
Pavement	10.35	2.20	2.62	2.19
Litter	5.63	55.69	39.09	27.98
Cryptogams	.48	.30	.33	.42
Bare Ground	51.37	23.37	25.48	32.91

SOIL ANALYSIS DATA --

Management unit 04, Study no: 19, Study Name: Deseret Burn

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
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			Days use per acre (ha)		
	'01	'06	'11	'01	'06	'11
Rabbit	5	29	49	-	-	-
Moose	-	2	-	-	-	-
Elk	14	44	21	36 (88)	64 (157)	19 (46)
Deer/Pronghorn	5	5	11	4 (10)	3 (7)	6 (15)
Cattle	13	30	12	33 (82)	54 (134)	33 (82)

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 19

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata wyomingensis</i>									
97	0	0	0	-	-	0	0	0	-/-
01	60	33	67	-	-	0	0	0	8/9
06	60	0	100	-	-	0	100	0	11/17
11	100	40	60	-	-	20	0	0	17/30
<i>Atriplex canescens</i>									
97	360	50	50	-	20	0	0	0	23/23
01	100	20	80	-	20	60	0	0	19/18
06	60	0	100	-	-	33	0	0	32/41
11	80	0	100	-	-	75	0	0	39/48
<i>Ceratoides lanata</i>									
97	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	9/11
11	0	0	0	-	-	0	0	0	17/22
<i>Chrysothamnus nauseosus</i>									
97	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	32/17
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
97	1480	1	97	1	-	0	0	1	12/17
01	1600	3	73	25	-	0	0	3	10/18
06	1400	7	84	9	320	16	10	3	11/22
11	1680	20	80	0	-	0	0	0	13/26
<i>Eriogonum microthecum</i>									
97	0	0	0	-	-	0	0	0	-/-
01	20	0	100	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Opuntia</i> sp.										
97	40	0	100	-	-	0	0	0	3/8	
01	100	20	80	-	-	0	0	0	3/6	
06	80	0	100	-	20	0	0	0	4/12	
11	80	0	100	-	-	0	0	0	5/16	
<i>Tetradymia canescens</i>										
97	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	25/22	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	

SUMMARY

WILDLIFE MANAGEMENT UNIT 4 - MORGAN-SOUTH RICH

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Thirteen interagency range trend studies were sampled in Unit 4 during the summer of 2011.

Eight of the studies [Heiner's Creek (4-1), Echo Canyon (4-2), Tank Canyon (4-3), Owen's Canyon (4-4), Harris Canyon (4-6), Shell Hollow (4-8), Scott Rees Ranch (4-9), and Above Toon Ranch (4-17)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush communities. All of the studies are also considered to be elk winter range. The remaining five studies [Wheatgrass Hollow (4-13), Chapman Canal (4-14), Woodruff Creek South (4-15), Deseret Main Gate (4-18), and Deseret Burn (4-19)] are classified as low potential deer winter range sites, and sample Wyoming big sagebrush communities. All of the studies are also considered to be elk winter range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains (Division 5). The Northern Mountains had a historic annual mean precipitation of 19.16 inches from 1895 to 2011. The mean annual PDSI of the Northern Mountains displays a cycle of several wet years followed by several drought years, over the course of study years in the unit. Over the course of the study wetter than normal years

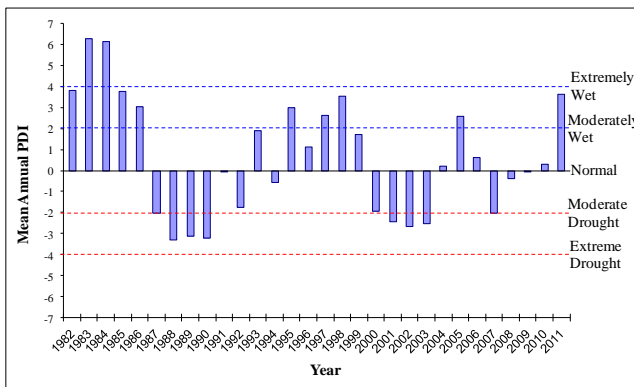


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

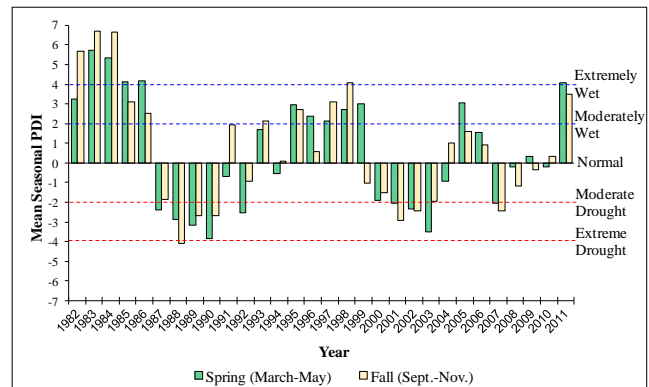


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

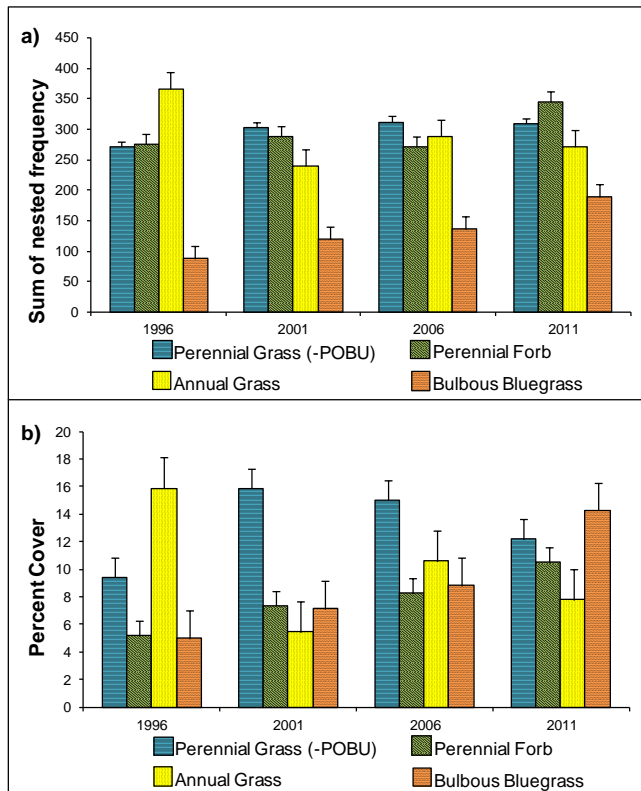


Figure 3. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass (*Poa bulbosa*) sum of nested frequency by year for WMU 4, Morgan-South Rich. b) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 4. Bars indicate standard error for species among years.

in the Northern Mountains included 1982-1986, 1993, 1995-1999, 2005, and 2011. Drought years included 1987-1992, 2000-2003 and 2007 (Figure 1 and Figure 2) (Time Series Data 2012).

The 1961-1990 mean annual precipitation was 8-10 in. on the Deseret Main Gate study; 10-12 in. on the Wheatgrass Hollow, Chapman Canal, and Deseret Burn studies; 16-18 in. on the Heiner's Creek, Tank Canyon, and Woodruff Creek South studies; 18-20 in. on the Echo Canyon study; 20-24 in. on the Owen's Canyon, Harris Canyon, Shell Hollow, and Above Toon Ranch studies; and 24-28 in. on the Scott Rees Ranch study (PRISM Climate Group 2011).

Mountain Big Sagebrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse trend decreased slightly in 1990, and again in 2006 and 2011 (Figure 8). The dominant browse species on the majority of the mid-level potential studies is mountain big sagebrush. A wildfire removed most of the browse from the Owen's Canyon study in 1999. The mean density of mountain big sagebrush has steadily decreased since 1996. Most of the decrease in 2001 was due to the wildfire on the Owen's Canyon study in 1999 (Figure 4a). Mean cover of mountain big sagebrush remained similar from 1996 to 2001, then decreased significantly in 2006 and remained lower in 2011 (Figure 4b). The mean decadence of mountain big sagebrush was moderate in 1996 and 2001, but increased to high levels in 2006 (Figure 4c).

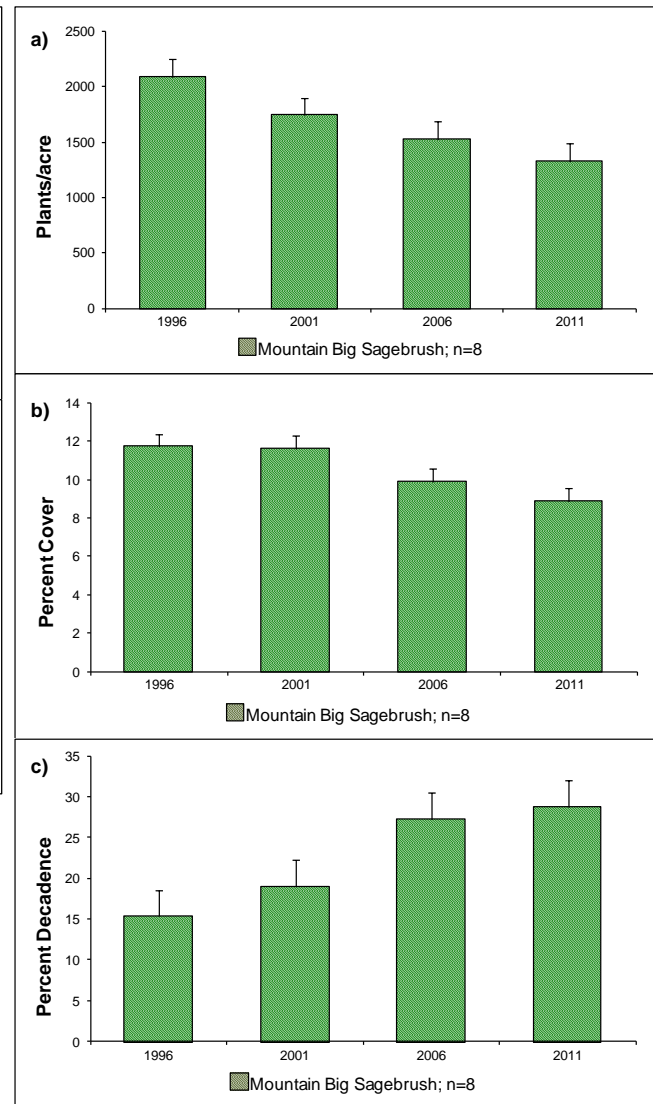


Figure 4. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) by year for WMU 4, Morgan-South Rich. b) Mid-level potential sites mean cover of mountain big sagebrush by year for WMU 4. c) Mid-level potential sites mean decadence of mountain big sagebrush by year for WMU 4. Bars indicate standard error for species among years.

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit increased substantially from 1984 to 2001, but has remained relatively stable since that time (Figure 8). Desirable perennial grass species are generally diverse and abundant on these studies, but less desirable species are also abundant. Annual grass species such as cheatgrass (*Bromus tectorum*), Japanese chess (*B. japonicus*), and rattail fescue (*Festuca myuros*) are prevalent and often dominate the herbaceous component. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) is also common on many of the studies, and appears to be increasing throughout the unit. The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased significantly in 2001 and has remained similar since that time (Figure 3a). Mean cover of perennial grass also increased significantly in 2001, but decreased significantly again by 2011 (Figure 3b). The mean sum of nested frequency and cover of annual grasses have fluctuated since 1996, decreasing significantly in 2001, then increasing again in 2006, and decreasing slightly again in 2011. The mean nested frequency and cover of bulbous bluegrass has steadily increased since 1996 with the largest increase in 2011 (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend for the unit was down in 1990, but increased again in 1996. The cumulative trend remained stable from 1996 to 2006, then was up in 2011 (Figure 8). Perennial forbs have been diverse and abundant, but generally provide less cover than perennial grasses within the sampled communities. The mean sum of nested frequency of perennial forbs remained similar from 1996 to 2006, then increased significantly in 2011 (Figure 3a). The mean cover of perennial forbs has steadily increased since 1996 (Figure 3b).

Browse Utilization & Animal Presence: Mountain big sagebrush plants on many of the mid-level potential studies have displayed light to moderate use throughout the study years. Utilization of sagebrush has been moderate to heavy on the Heiner's Creek, Tank Hollow, Owen's Canyon, and Harris Canyon studies, but browse is limited on these sites and animal use does not appear to be affecting these small populations of mountain big sagebrush adversely. The mountain big sagebrush on the Echo Canyon study has displayed moderate to heavy use since 1984. Coupled with the stresses of competition from the exotic species bulbous bluegrass and cheatgrass, as well as damage from insects, continued prolonged heavy utilization on the Echo Canyon study could have detrimental effects on the sagebrush population on this site. It does not appear that animal utilization of mountain big sagebrush is a primary concern for the other mid-level potential studies on this unit.

Pellet group transect data indicates that deer have historically predominately occupied these studies, but elk presence has increased and become an important aspect. The mean abundance of sampled deer pellet groups decreased from high abundance in 2001 and 2006 to more moderate abundance in 2011. Deer pellet groups were sampled in the highest abundance on the Heiner's Creek, Echo Canyon, Harris Canyon, and Above Toon Ranch studies. Abundance of deer pellets was much lower on the Heiner's Creek, Echo Canyon, and Shell Hollow studies in 2011. The mean abundance of sampled elk pellet groups was low in 2001, increasing to moderately high in 2006, and decreasing to more moderate abundance in 2011. The abundance of pellet groups of both wildlife species may have been lower in 2011 due to the severe winter of 2010-2011. Elk pellet groups were sampled in the highest abundance on the Tank Hollow, Owen's Canyon, and Scott Rees Ranch studies. Livestock sign has been sampled in mostly low abundance on the studies, but has increased since 2001. Cattle sign was sampled in the highest abundance on the Tank Hollow study, but abundance has been low on the other studies where it was sampled. (Figure 9a).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has increased slightly in 2001, but has steadily decreased since that time. Rankings have ranged from poor to fair since 1996. Attributes of preferred browse species have steadily decreased since 1996 (Table 1 and Figure 7).

Discussion: The decline of sagebrush populations on these important winter ranges gives reason for concern. While there have been several periods of drought over the course of the study years (Figure 1 and Figure 2), lack of precipitation does not appear to be the primary cause of the decline. The cause of decline in the sagebrush populations in more recent years on this unit may be due to a sagebrush defoliator moth (*Aroga*

websteri) outbreak that occurred between the 2001 and 2006 sample years. The sagebrush defoliator moth is an obligate parasite of sagebrush (*Artemisia spp.*) that can have periodic outbreaks that cause substantial damage. This pest reduces the production and flowering of plants or, in high enough concentrations, can kill host plants. The defoliator moth was detected on the Harris Canyon and Shell Hollow studies in 2006, but may have affected other sites in the area at this time as well.

The abundance of weedy annual species and the increase of the exotic weedy perennial grass bulbous bluegrass are also likely causes of sagebrush decline. These weedy species can form dense mats of cover that compete with seedling and young sagebrush plants which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event. Bulbous bluegrass is most prevalent on the Echo Canyon and Tank Canyon studies, but has also shown marked increases on the Owen's Canyon study. Annual grass species are prevalent on the Echo Canyon, Owen's Canyon, Harris Canyon, Shell Hollow, Scott Rees Ranch, and Above Toon Ranch studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.0	9.4	6.2	18.3	-11.4	7.2	-0.3	48.3	Poor-Fair
01	17.8	7.4	3.8	23.3	-4.1	8.4	-0.5	56.2	Fair
06	17.2	5.7	3.8	23.4	-7.9	9.1	-0.3	50.9	Poor-Fair
11	15.5	4.8	3.8	20.3	-5.8	8.1	0.0	46.6	Poor

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=13) by year for WMU 4, Morgan-South Rich. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

Wyoming Big Sagebrush Communities (Low Potential)

Browse: The low potential site cumulative median browse trend has been relatively stable throughout the study years (Figure 8). Wyoming big sagebrush is the dominant browse species on all of the low potential studies. The mean density of Wyoming big sagebrush was similar in 1996/1997, 2006, and 2011, but was significantly higher in 2001 (Figure 6a). Much of the increase in 2001 was due to a large amount of recruitment of young plants on the Wheatgrass Hollow and Woodruff Creek South studies. Mean cover of Wyoming big sagebrush increased slightly from 1996/1997 to 2001, but the increase was not significant, then decreased significantly in 2006, and remained similar in 2011 (Figure 6b). Mean decadence of Wyoming big sagebrush has been high since 1996, but was significantly higher in 2006 (Figure 6c). Most of the increase was due to a large increase in decadence on the Chapman Canal study.

Herbaceous Understory: The low potential median cumulative grass trend for the unit increased from 1996 through 2006, but remained stable in 2011 (Figure 8). Perennial grasses comprise the majority of the herbaceous understory on most of these studies. Grasses within these communities are moderately diverse and abundant. Annual grass species are much less common within these low potential communities than the mid-level potential communities, and comprise only a small component of the herbaceous understory. Bulbous bluegrass (*Poa bulbosa*) was not sampled on any of the studies. Mean sum of nested frequency and cover of perennial grasses steadily increased from 1996 to 2006, then remained similar in 2011 (Figure 5a and Figure 5b).

The low potential median cumulative forb trend for the unit increased from 1984 to 1996, but decreased slightly in 2001. The cumulative trend remained stable from 2001 through 2011 (Figure 8). Perennial forbs are not nearly as abundant as perennial grasses within the sampled communities. The mean sum of nested frequency and cover of perennial forbs has remained similar since 1996 (Figure 5a and Figure 5b).

Browse Utilization & Animal Presence: Utilization of Wyoming big sagebrush has generally been light to moderate on the low potential studies in the unit over the course of the study years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of Wyoming big sagebrush is a primary concern for the low potential studies on this unit.

Pellet group transect data indicates that deer predominantly occupy these study areas. The mean abundance of sampled deer pellet groups increased from moderate abundance in 2001, to moderately high abundance in 2006 and 2011. The mean abundance of sampled elk pellet groups increased from low abundance in 2001 to moderate abundance in 2006, and then decreased to low abundance again in 2011. The mean abundance of sampled livestock sign has been moderate, with the highest abundance occurring on the two studies on the Deseret Land and Livestock Ranch (Figure 9b).

Deer Desirable Components Index (DCI): The low potential deer DCI has remained relatively stable since 1996 with rankings ranging from fair-good to good. The DCI shows that preferred browse cover has decreased as perennial grass cover increased since 1996 (Table 2 and Figure 7).

Discussion: Wyoming big sagebrush populations appear to be fairly stable within this unit. Weedy annual species and bulbous bluegrass are much less common on these low potential studies than the mid-level potential communities, and do not appear to be adversely affecting most communities in the unit.

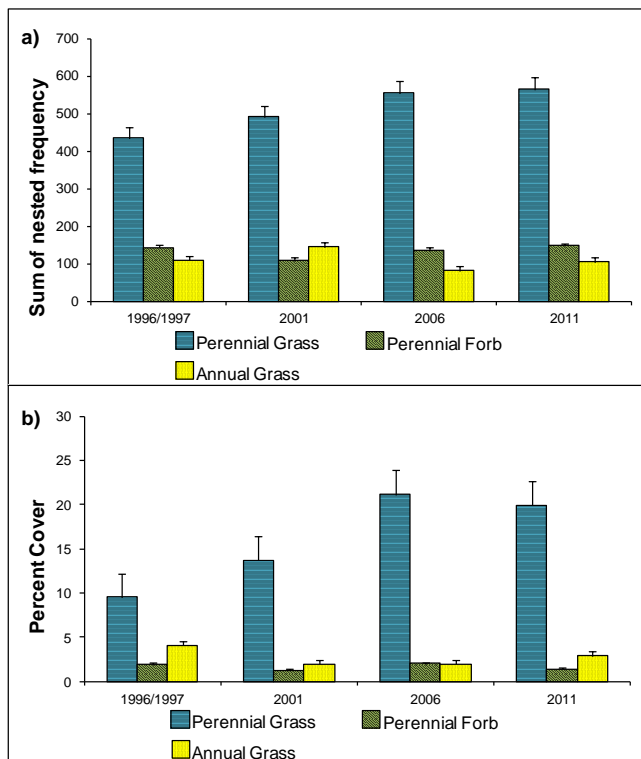


Figure 5. a) Low potential sites mean perennial grass, perennial forb, and annual grass sum of nested frequency by year for WMU 4, Morgan-South Rich. b) Low potential sites mean perennial grass, perennial forb, and annual grass cover by year for WMU 4. Bars indicate standard error for species among years.

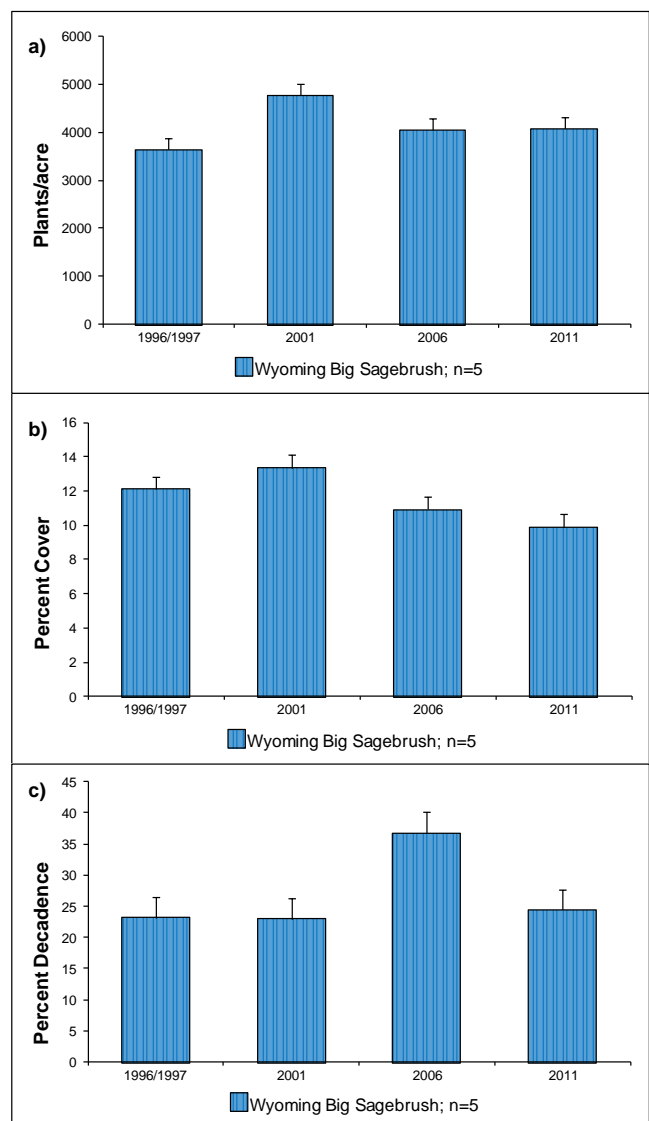


Figure 6. a) Low potential sites mean density of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) by year for WMU 4, Morgan-South Rich. b) Low potential sites mean cover of Wyoming big sagebrush by year for WMU 4. c) Low potential sites mean decadence of Wyoming big sagebrush by year for WMU 4. Bars indicate standard error for species among years.

Annual grasses are prevalent on the Woodruff Creek South study and may limit future sagebrush recruitment. High annual grass cover also increases the chances of a catastrophic fire. Increases in the seeded perennial grass species crested wheatgrass (*Agropyron cristatum*) appear to be limiting recruitment of young sagebrush plants on the Deseret Main Gate and Deseret Burn studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96/97	15.2	5.1	3.5	19.1	-2.5	3.9	0.0	44.4	Fair-Good
01	16.3	5.1	6.1	24.9	-1.2	2.6	0.0	53.7	Good
06	13.2	1.1	4.3	26.3	-1.2	4.1	0.0	47.8	Good
11	12.5	4.8	5.5	25.3	-1.8	2.9	0.0	49.2	Good

Table 2. Low potential scale mean deer DCI scores and rankings (n=5) by year for WMU 4, Morgan-South Rich. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

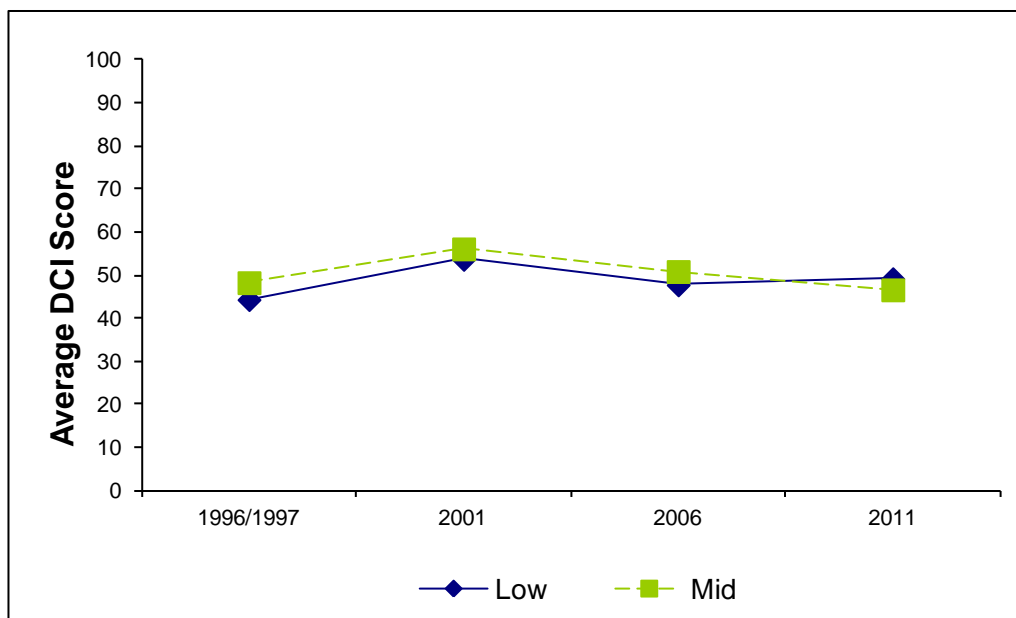


Figure 7. Mean low (n=5) and mid-level (n=13) potential scale deer DCI scores by year for WMU 4, Morgan-South Rich. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

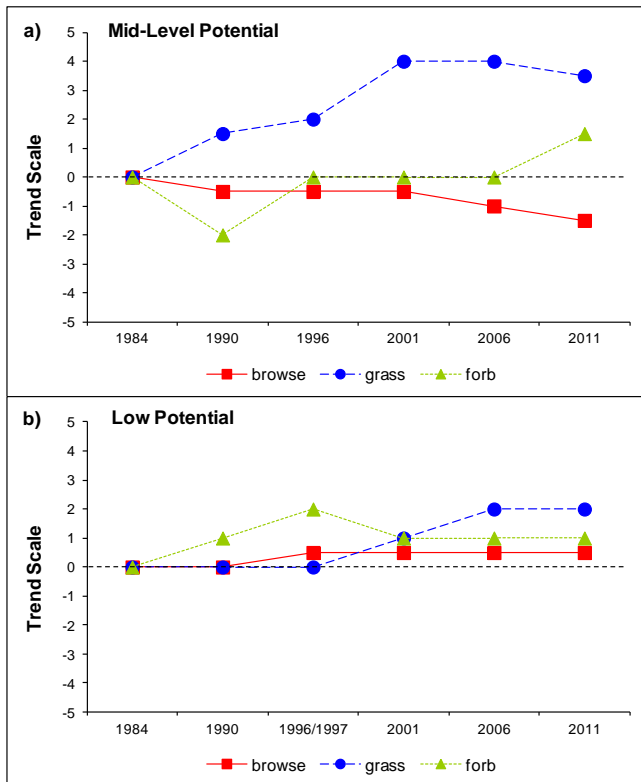


Figure 8. a) Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 4, Morgan-South Rich. b) low potential sites cumulative median browse, grass and forb trends by year for WMU 4.

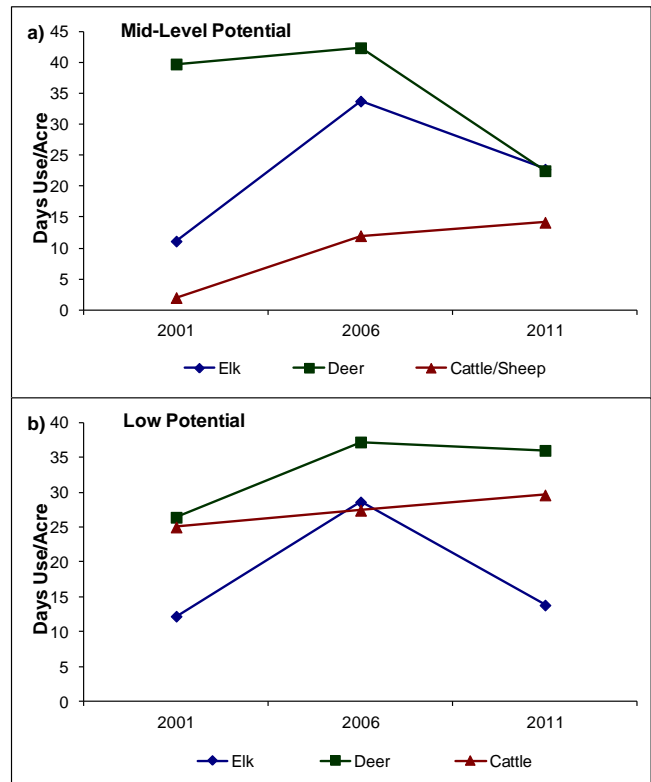
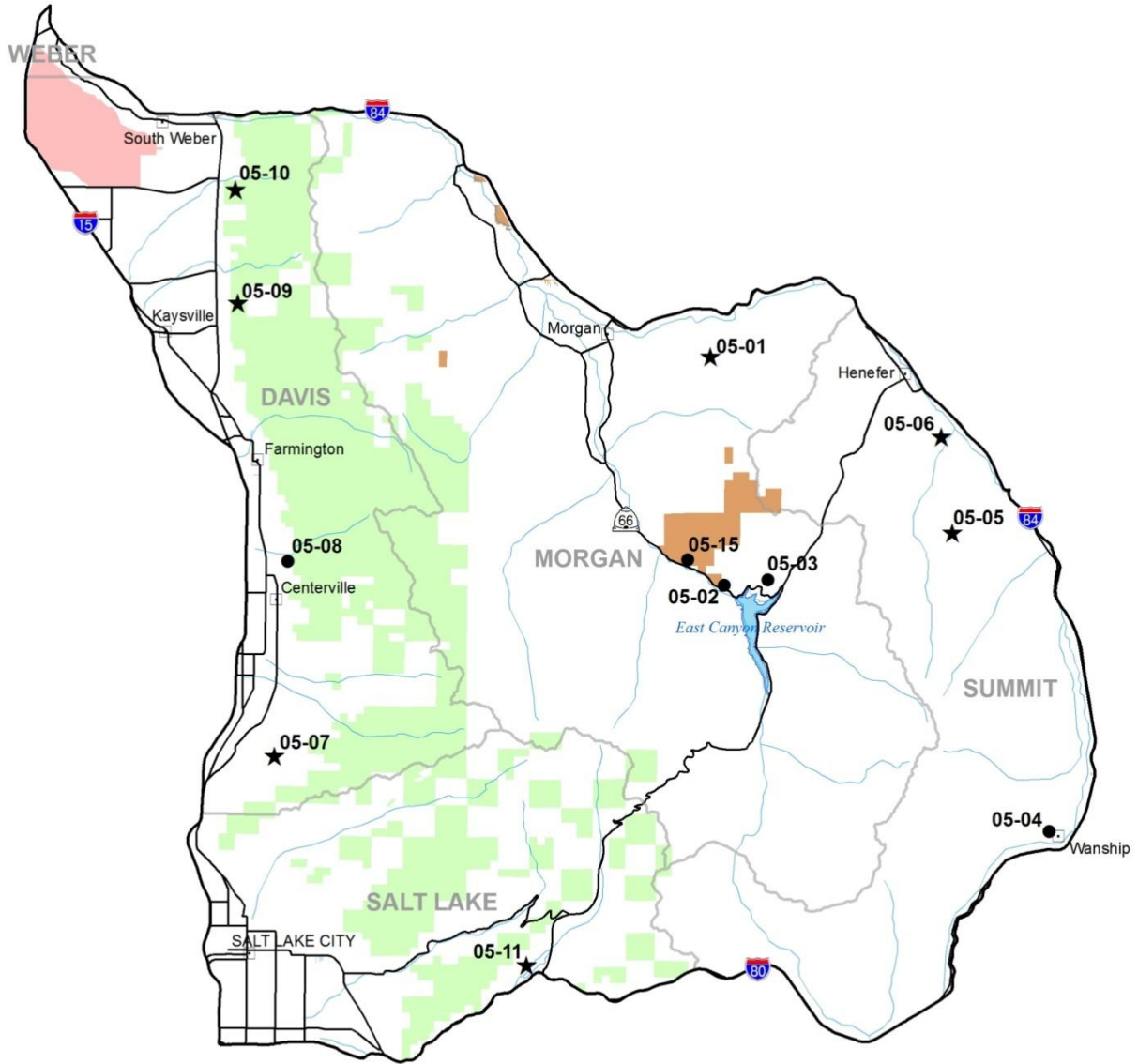
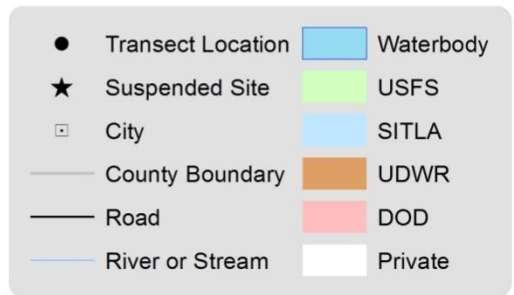
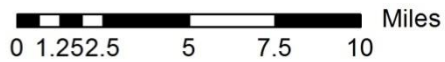


Figure 9. a) Mid-level potential sites mean animals days use/acre (n=13) by year for WMU 4, Morgan-South Rich. b) Low potential sites mean animal days use/acre (n=5) by year for WMU 4.

Management Unit 5



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 Management 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 limit of normal winter range is 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. According the most current Big Game Management Plan (2006) for the unit, there is approximately 87,750 acres of winter range and 237,461 acres of summer range. Approximately 75% of the deer winter range and 79% of the summer range is under private ownership. 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 in 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.

Range Trend Studies

Five interagency range trend studies were sampled in Unit 5 during the summer of 2011. A total of twelve studies have been established within Unit 5 since 1984. One study [Mountain Dell Reservoir (5-11)] was established in 1983, and samples a basin big sagebrush community. Six studies were established in 1984, and of these studies two studies [East Canyon Reservoir (5-3) and Franklin Canyon (5-6)] sample mountain big sagebrush communities; one study [Wanship (5-4)] samples a burned site; one study [Geary Hollow (5-1)] samples a Gambel Oak community; one study [Upper Franklin Canyon (5-5)] samples a mountain brush

community; and one study [Baskin Spring (5-7)] samples a perennial grass community. Three studies were established in 1985, and of these studies two studies [Barnard Creek (5-8) and Davis County Rifle Range (5-9)] sample antelope bitterbrush communities, and one study [Junction 89-193 (5-10)] samples a basin big sagebrush community. Two studies were established in 1996, and of these studies one study [Tucson Hollow (5-2)] samples a mountain brush community, and one study [Red Rock Canyon (5-15)] samples a burned site.

In 1990, one study (Junction 89-193) was suspended. In 1996, four studies (Upper Franklin Canyon, Franklin Canyon, Baskin Spring, and Mountain Dell Reservoir) were suspended. In 2001, one study (Geary Hollow) was suspended. In 2006, one study (Davis County Rifle Range) was suspended. These studies were suspended for various reasons. If the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

TUCSON HOLLOW - TREND STUDY NO. 5-2-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: Private

Elevation: 5,720 ft (1,744 m)

Aspect: South

Slope: 3%

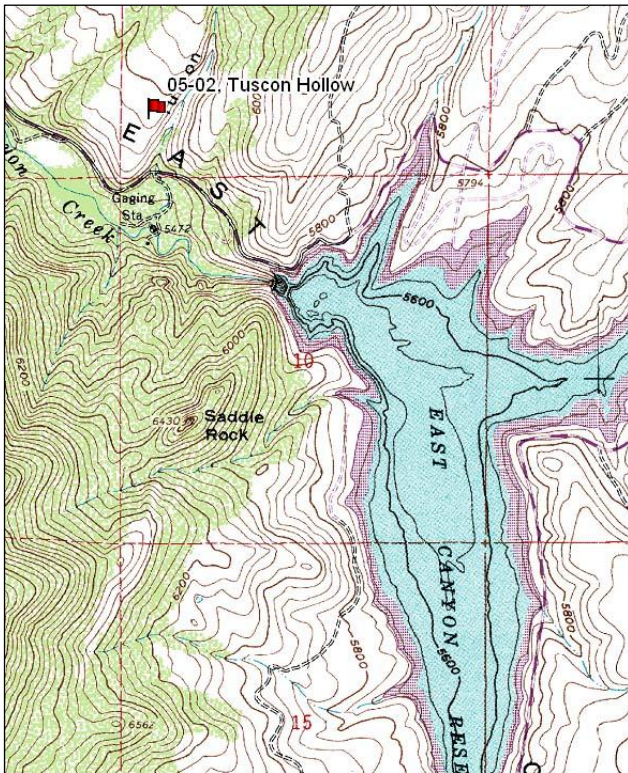
Transect bearing: 204° magnetic

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

Directions:

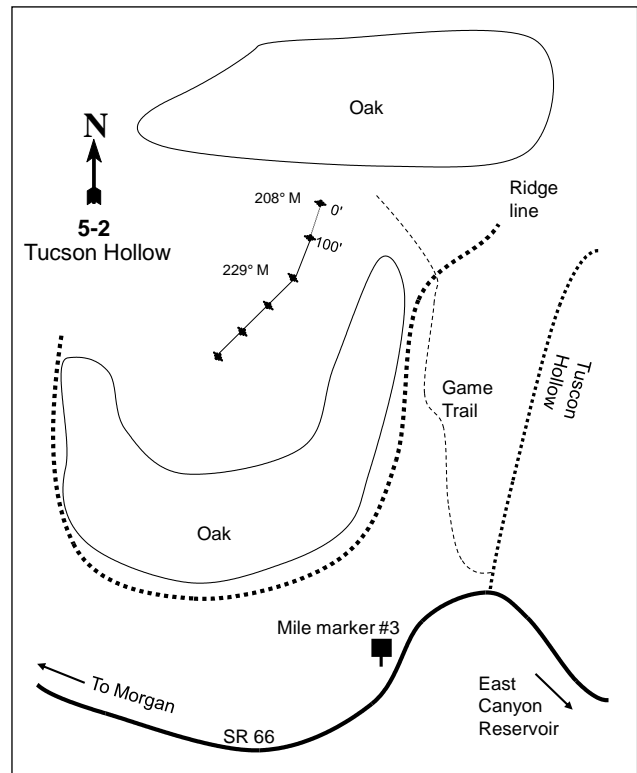
From the dam at East Canyon Reservoir, proceed 0.2 miles northwest past Tucson Hollow, and stop near mile marker 3. Walk up the slope following a game trail (to the northeast) to the plateau. Walk through the oak stand bordering the ridge line continuing northeast to an opening in the oak. Look for a 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



Township: 2N Range: 3E Section: 3

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 448863 E 4530807 N

TUCSON HOLLOW - TREND STUDY NO. 5-2

Site Information

Site Description: This study is located on a nearly level bench just northwest of East Canyon Reservoir. It was originally placed in a nearby thick patch of Gambel oak (*Quercus gambelii*) 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 basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and grass opening about 25 to 30 acres in size that is surrounded on three sides by oak clones. In 1990, three winter-killed deer and several shed antlers were found in the immediate vicinity. Deer and elk pellet groups are scattered throughout the area. In addition, deer pellet groups were sampled in moderate abundance in 2001, high abundance in 2006, and low abundance in 2011. Elk pellet groups were sampled in moderate abundance in 2006, but low abundance in 2011 (Table - Pellet Group Data).

Browse: The site supports a variety of browse species, but basin big sagebrush and stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) have provided the majority of the browse cover. Sagebrush on the site displays characteristics of both basin big sagebrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and is considered the key browse species. All sagebrush was classified as basin big sagebrush for the purposes of this study. The sagebrush population is moderately dense and is centered within the mature demographic. The decadent age class within the sagebrush population has varied little and is a moderate component of the population. The sagebrush population is all available for browsing, and is lightly to moderately hedged. Decadence in the population is moderate, but poor vigor is low. Recruitment of young basin big sagebrush plants was nominal over the early years of the study, but was good in 2011. The average height and crown measurements increased steadily from 1996-2006, but decreased slightly in 2011. Although the defoliator moth (*Aroga websteri*) was identified on the East Canyon Reservoir study (5-3) less than 1.5 miles to the east, no evidence of the moth was identified on this study (Table - Browse Characteristics).

Other common shrub species sampled on the site include stickyleaf low rabbitbrush and Oregon grape (*Mahonia repens*). Less frequent shrubs found on the site are antelope bitterbrush (*Purshia tridentata*), Saskatoon serviceberry (*Amelachier alnifolia*) and chokecherry (*Prunus virginiana*), which are scattered throughout the site and display moderate to heavy hedging. Bitterbrush has displayed the heaviest use with most of the available plants exhibiting a clubbed growth form (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is productive with high diversity. The weedy annual species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) have dominated the understory throughout the duration of the study. The undesirable perennial grass species bulbous bluegrass (*Poa bulbosa*) has increased steadily over the course of the study. Other common perennial species include Sandberg bluegrass (*P. secunda*), Kentucky bluegrass (*P. pratensis*), bluebunch wheatgrass (*Agropyron spicatum*), and Great Basin wildrye (*Elymus cinereus*). A compositional transition took place in 2001 with a decline in annual grasses, and an increase in perennial grasses. The forb community is highly diverse. Some of the common forbs include silvery lupine (*Lupinus argenteus*), cutleaf balsamroot (*Balsamorhiza macrophylla*), oneflower helianthella (*Helianthella uniflora*), yellow salsify (*Tragopogon dubius*), and Pacific aster (*Aster chilensis*). Other forbs occur in relatively low numbers and contribute little to the overall herbaceous understory cover (Table - Herbaceous Trends).

Soil: The soil is part of the Manila component, which is found on lake terraces and mountain slopes. The parent material consists of slope alluvium and/or colluvium derived from sandstone and quartzite (Soil Survey Staff 2011). The soil texture is a clay loam and is slightly acidic (pH 6.5). Few rocks were encountered in the soil profile. Bare ground cover is fairly low. Protective ground cover consists of a high amount of vegetation and litter cover that preclude soil erosion (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - slightly down (-1):** The density of basin big sagebrush decreased 13% from 1,400 plants/acre to 1,220 plants/acre, though cover increased slightly from 7% to 8%. The sagebrush population decreased slightly in decadence from 19% to 15%. The sagebrush population had a negligible decrease in poor vigor from 9% to 8%. Recruitment of young sagebrush decreased from 6% to 0% of the overall population.
- **2001 to 2006 - down (-2):** The density for basin big sagebrush decreased 30% to 860 plants/acre, but cover increased to 10%. Decadence within the sagebrush population increased to 23%. The sagebrush population decreased slightly in poor vigor to 5%. Recruitment of young sagebrush increased to 5% of the overall population.
- **2006 to 2011 - slightly up (+1):** The density of basin big sagebrush increased 19% to 1,020 plants/acre, but cover decreased to 7%. Most of the increase in density was due to an increase in the recruitment of young plants, which increased to 25% of the population. Decadence within the sagebrush population decreased to 16%. The sagebrush population increased in poor vigor to 14%.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased over two-fold. The perennial grass species Sandberg bluegrass and Kentucky bluegrass increased significantly in nested frequency. Sandberg bluegrass increased in cover from 3% to 20%, and comprised the bulk of herbaceous production. The undesirable species bulbous bluegrass was sampled for the first time at 2% cover. The weedy annual species Japanese chess decreased significantly in nested frequency, and decreased in cover from 15% to 1%.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 25%. Oniongrass (*Melica bulbosa*) and thickspike wheatgrass (*Agropyron dasystachyum*) had a significant increase in nested frequency. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to 11%. The weedy annual species cheatgrass increased significantly in nested frequency, and increased in cover from 2% to 10%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. Bluebunch wheatgrass and Kentucky bluegrass increased significantly in nested frequency. The weedy species bulbous bluegrass increased significantly in nested frequency, and increased in cover from 2% to 4%. The weedy annual species cheatgrass decreased significantly in nested frequency, and decreased in cover from 10% to 4%.

Forb:

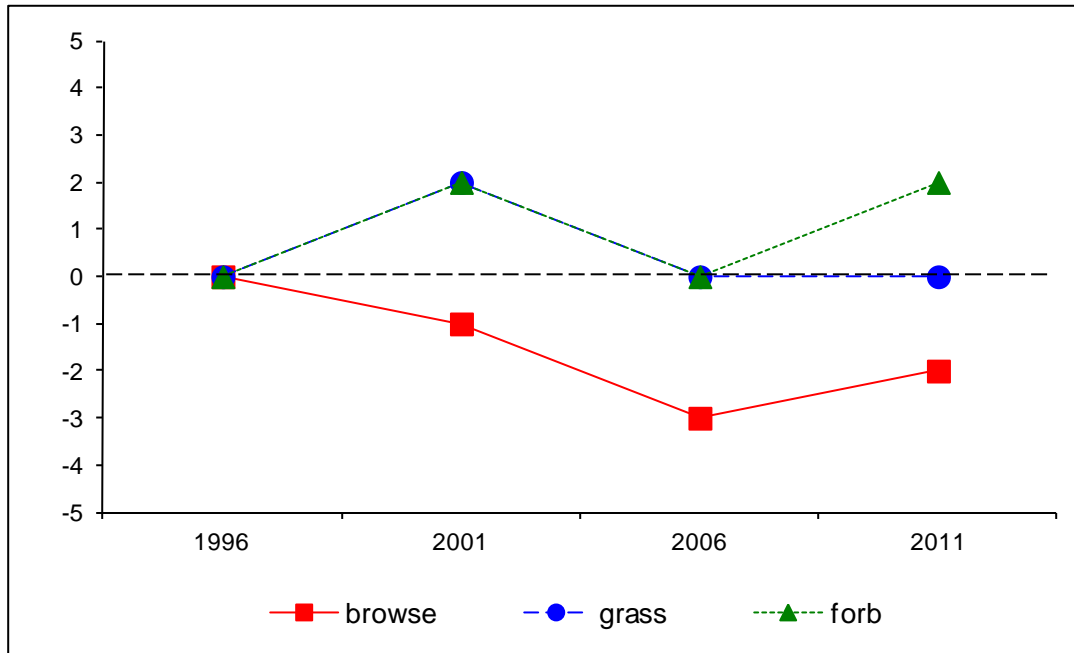
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial forbs increased over two-fold. Wild onion (*Allium sp.*), Pacific aster, and American vetch (*Vicia americana*) increased significantly in nested frequency. Hoary aster (*Machaeranthera canescens*) had a significant decrease in nested frequency. Silvery lupine increased in cover from 2% to 3%.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial forbs decreased 22%. American vetch increased significantly in nested frequency and maintained cover near 3%. Wild onion decreased significantly in nested frequency.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 54%. Wild onion and woodland-star (*Lithophragma sp.*) had a significant increase in nested frequency. The annual species prickly lettuce (*Lactuca serriola*) increased significantly in nested frequency.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 5, study no: 2

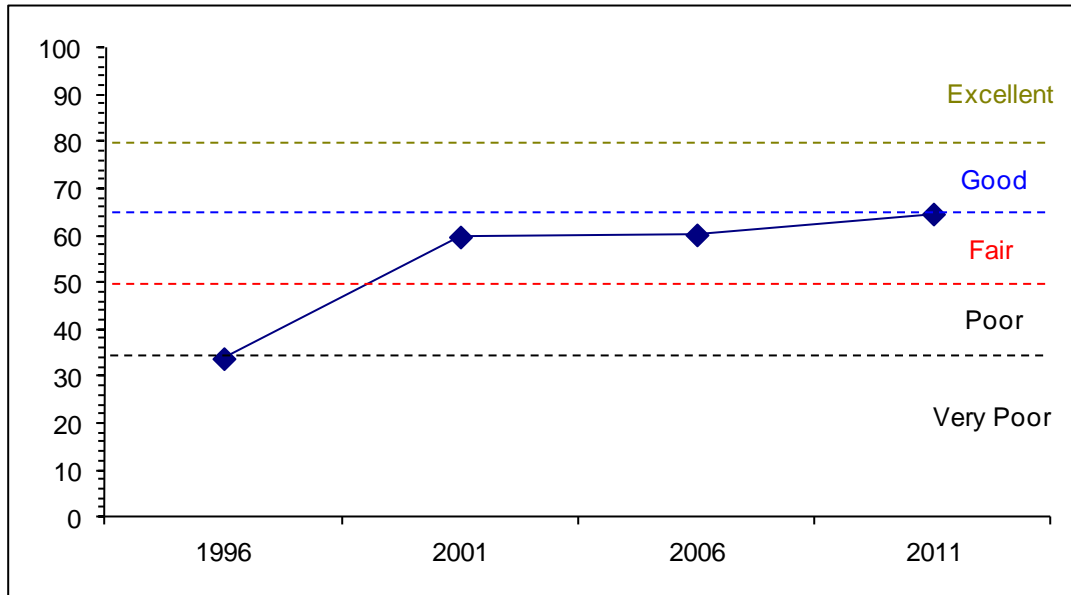
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	15.4	11.3	2.6	9.0	-14.5	10.0	0.0	33.8	Very Poor-Poor
01	15.4	6.5	0.0	30.0	-2.1	10.0	0.0	59.7	Fair
06	15.8	8.7	4.3	29.1	-7.6	10.0	0.0	60.2	Fair
11	11.4	11.4	9.5	30.0	-7.6	10.0	0.0	64.6	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 5 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 5, Study no: 2



HERBACEOUS TRENDS--
 Management unit 05, Study no: 2

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a-	a4	b19	a3	-	.03	.04	.15
G	Agropyron intermedium	-	3	-	-	-	.06	-	-
G	Agropyron spicatum	a33	a33	a32	b73	1.09	1.66	2.26	4.44
G	Bromus japonicus (a)	c344	a114	ab150	b180	14.94	.69	.65	6.05
G	Bromus tectorum (a)	b216	a136	c334	ab177	4.38	2.17	9.53	4.08
G	Elymus cinereus	2	1	8	3	.01	.63	.53	.85
G	Melica bulbosa	a-	a5	b21	ab9	-	.15	.38	.36
G	Poa bulbosa	a-	b41	b49	c93	-	1.50	1.64	4.21
G	Poa pratensis	a19	b71	a25	c117	.25	2.20	.58	3.00
G	Poa secunda	a141	c315	b220	a122	3.16	19.95	10.71	8.24
Total for Annual Grasses		560	250	484	357	19.32	2.86	10.19	10.13
Total for Perennial Grasses		195	473	374	420	4.51	26.21	16.17	21.27
Total for Grasses		755	723	858	777	23.84	29.07	26.36	31.40
F	Achillea millefolium	a49	a61	ab69	b96	1.00	1.93	3.67	6.02
F	Agoseris glauca	-	16	19	7	-	.08	.15	.04
F	Allium sp.	a-	c137	b33	d194	-	1.44	.10	3.17
F	Alyssum alyssoides (a)	a17	b65	ab57	c146	.08	.73	.15	2.01
F	Artemisia ludoviciana	-	1	-	-	-	.03	-	-
F	Aster chilensis	a27	b50	ab30	a27	2.05	1.79	.79	1.04
F	Astragalus convallarius	ab3	b15	ab10	a1	.05	.25	.11	.00
F	Balsamorhiza macrophylla	11	14	13	17	.91	2.16	2.37	1.81
F	Balsamorhiza sagittata	-	5	4	8	-	.81	.54	.18
F	Camelina microcarpa (a)	3	17	13	5	.01	.13	.03	.03

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Cirsium undulatum</i>	b24	a4	a3	a-	.33	.07	.03	.00
F	<i>Collinsia parviflora</i> (a)	a-	c117	b53	b37	-	1.07	.24	.33
F	<i>Collomia grandiflora</i> (a)	5	6	9	4	.00	.03	.04	.03
F	<i>Comandra pallida</i>	17	24	22	16	.21	.42	.43	.08
F	<i>Crepis acuminata</i>	6	14	1	8	.06	.57	.24	.04
F	<i>Cynoglossum officinale</i>	4	4	3	-	.21	.15	.03	-
F	<i>Descurainia pinnata</i> (a)	b28	a-	a-	b20	.59	-	-	.22
F	<i>Draba sp.</i> (a)	a2	a10	b46	c89	.00	.04	.09	1.19
F	<i>Epilobium brachycarpum</i> (a)	a-	a3	c108	b80	-	.01	.68	2.58
F	<i>Erodium cicutarium</i> (a)	a-	a5	ab11	b30	-	.15	.16	.41
F	<i>Galium aparine</i> (a)	a23	a29	b59	c104	.17	.61	.47	2.81
F	<i>Gayophytum ramosissimum</i> (a)	b57	a-	a-	a9	.55	-	-	.03
F	<i>Helianthella uniflora</i>	a12	a19	ab28	b42	1.76	1.92	6.05	5.30
F	<i>Heterotheca villosa</i>	-	5	-	-	-	1.58	-	-
F	<i>Holosteum umbellatum</i> (a)	a18	a25	b56	b56	.40	.66	.15	.46
F	<i>Lactuca serriola</i> (a)	b29	ab22	a4	b44	.13	.76	.03	.66
F	<i>Lappula occidentalis</i> (a)	a5	ab48	b34	c172	.15	.14	.08	2.33
F	<i>Lithophragma sp.</i>	a-	a-	a-	b23	-	-	-	.11
F	<i>Lithospermum ruderales</i>	-	-	-	6	.03	-	-	.18
F	<i>Lomatium sp.</i>	8	-	-	-	.04	-	-	-
F	<i>Lupinus argenteus</i>	28	37	41	41	1.93	3.34	2.73	1.99
F	<i>Machaeranthera canescens</i>	b12	a-	a-	a-	.05	-	-	-
F	<i>Melilotus officinalis</i>	-	-	1	-	-	-	.15	-
F	<i>Microsteris gracilis</i> (a)	a-	a-	b39	b45	-	-	.08	.50
F	<i>Nemophila breviflora</i> (a)	-	-	8	8	-	-	.06	.21
F	<i>Phlox longifolia</i>	-	22	-	-	-	.09	-	-
F	<i>Polygonum douglasii</i> (a)	b51	a6	b49	b43	.19	.01	.11	.37
F	<i>Ranunculus testiculatus</i> (a)	-	7	21	14	-	.01	.09	.05
F	<i>Senecio integerrimus</i>	-	2	1	9	-	.03	.05	.36
F	<i>Sisymbrium altissimum</i> (a)	a13	b33	a12	ab29	.27	1.25	.25	.56
F	<i>Taraxacum officinale</i>	a-	b12	b6	b30	-	.16	.25	.36
F	<i>Tragopogon dubius</i> (a)	a41	b153	a31	a48	.55	4.56	.21	1.21
F	<i>Veronica biloba</i> (a)	a-	a-	a-	b23	-	-	-	1.08
F	<i>Vicia americana</i>	a21	b117	c155	bc150	.10	2.57	3.14	4.53
Total for Annual Forbs		292	546	610	1006	3.14	10.21	2.97	17.14
Total for Perennial Forbs		222	559	439	675	8.77	19.45	20.87	25.26
Total for Forbs		514	1105	1049	1681	11.92	29.66	23.85	42.40

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

BROWSE TRENDS--

Management unit 05, Study no: 2

T y p e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	2	3	2	1	.18	.00	.15	.00
B	Artemisia tridentata tridentata	46	39	35	35	6.76	7.79	9.46	6.59
B	Chrysothamnus nauseosus albicaulis	2	0	2	1	.38	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	43	45	43	35	6.92	8.61	6.84	4.80
B	Gutierrezia sarothrae	0	1	1	5	-	.03	-	.78
B	Mahonia repens	41	42	49	40	2.50	1.93	3.28	4.68
B	Purshia tridentata	8	6	7	8	4.13	3.76	2.48	2.09
B	Symphoricarpos oreophilus	6	4	6	5	1.06	.91	1.75	1.51
Total for Browse		148	140	145	130	21.95	23.06	23.97	20.48

CANOPY COVER, LINE INTERCEPT--

Management unit 05, Study no: 2

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.11	.23
Artemisia tridentata tridentata	10.44	6.08
Chrysothamnus nauseosus albicaulis	.33	.26
Chrysothamnus viscidiflorus viscidiflorus	8.83	5.55
Mahonia repens	3.08	4.43
Purshia tridentata	4.83	3.09
Symphoricarpos oreophilus	1.46	1.43

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 05, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata tridentata	3.8	3.7	2.8
Purshia tridentata	3.2	2.0	1.6

BASIC COVER--

Management unit 05, Study no: 2

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	57.73	72.55	68.09	78.29
Rock	1.45	1.56	1.25	1.30
Pavement	.71	.32	.44	.06
Litter	68.56	52.19	47.06	38.18
Cryptogams	.01	0	.22	.00
Bare Ground	3.37	3.33	3.50	4.11

SOIL ANALYSIS DATA --

Management unit 05, Study no: 2, Study Name: Tucson Hollow

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
12.5	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	6	1	7	1	-	-	-
Elk	5	1	-	-	-	24 (60)	8 (20)
Deer	17	17	32	8	31 (76)	69 (170)	7 (17)
Cattle	-	1	-	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 05, Study no: 2

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
96	40	0	100	-	-	50	50	0	27/29
01	60	33	67	-	-	0	67	0	34/28
06	40	0	100	-	-	50	50	0	34/33
11	20	0	100	-	-	0	100	0	41/39
Artemisia tridentata tridentata									
96	1400	6	76	19	-	31	0	9	26/35
01	1220	0	85	15	-	5	0	8	31/38
06	860	5	72	23	140	42	12	5	33/44
11	1020	25	59	16	-	22	0	14	29/39
Chrysothamnus nauseosus albicaulis									
96	60	33	67	-	-	0	0	33	53/68
01	0	0	0	-	-	0	0	0	-/-
06	60	33	67	-	-	0	0	0	33/41
11	20	0	100	-	-	0	0	0	23/33
Chrysothamnus viscidiflorus viscidiflorus									
96	1620	1	96	2	-	1	0	0	20/37
01	1740	1	94	5	-	0	0	0	21/33
06	1540	4	70	26	-	4	0	5	20/31
11	1120	11	89	0	-	0	0	0	12/23
Gutierrezia sarothrae									
96	0	0	0	-	-	0	0	0	12/9
01	60	0	100	-	-	0	0	0	-/-
06	20	0	100	-	-	0	0	0	14/25
11	140	29	71	-	-	14	0	0	12/13

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Mahonia repens									
96	8680	16	84	-	80	0	0	0	5/6
01	18740	4	96	-	-	0	0	0	4/5
06	16360	3	97	-	-	0	0	0	4/5
11	17720	0	100	-	-	0	0	0	5/6
Prunus virginiana									
96	0	0	0	-	-	0	0	0	21/15
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	73/66
Purshia tridentata									
96	200	0	100	0	-	0	100	0	38/63
01	180	0	44	56	-	11	89	22	30/66
06	260	23	62	15	-	0	46	8	34/60
11	200	0	100	0	-	60	10	0	30/62
Quercus gambelii									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	77/57
11	0	0	0	-	-	0	0	0	-/-
Rosa woodsii									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	16/11
Sambucus cerulea									
96	0	0	0	-	-	0	0	0	93/81
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	63/69
Symphoricarpos oreophilus									
96	240	17	83	0	-	0	17	0	21/30
01	140	0	100	0	-	0	0	0	24/41
06	160	13	75	13	-	0	0	13	23/42
11	120	0	100	0	-	0	0	0	31/55

EAST CANYON RESERVOIR - TREND STUDY NO. 5-3-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: State Parks & Recreation

Elevation: 5,900 ft (1,798 m)

Aspect: Southeast

Slope: 20%

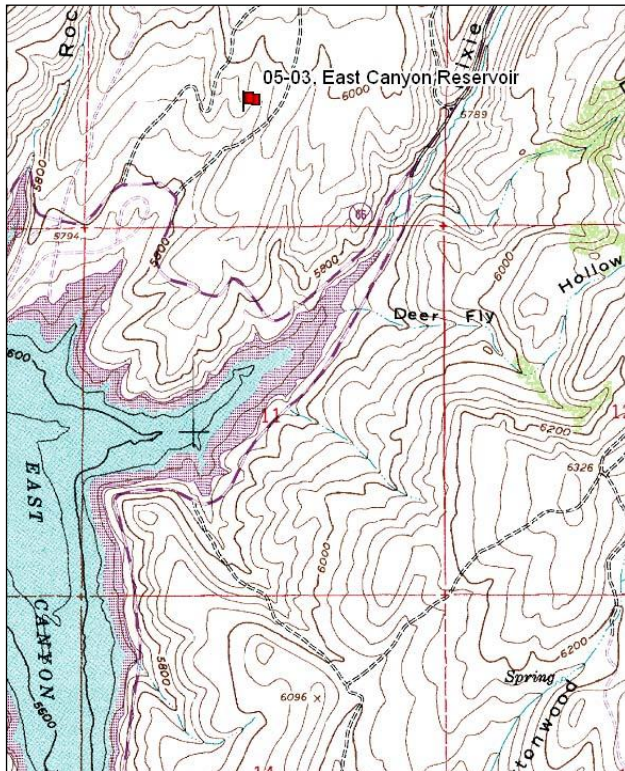
Transect bearing: 186° magnetic

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

Directions:

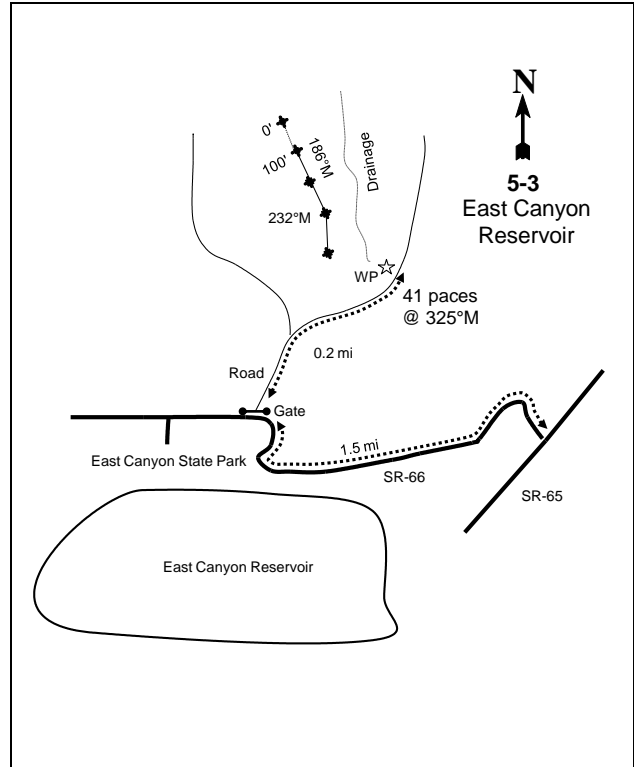
Begin to note mileage at the junction of U-65 and U-66. Proceed towards Porterville on U-66 1.15 miles to a gate on the right. There should be a picnic/campground area on left side of road. Proceed through gate on foot (gate locked), travel 0.2 miles to the witness post on the left hand side of the road. 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



Township: 2N Range: 3E Section: 2

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 451058 E 4531058 N

EAST CANYON RESERVOIR - TREND STUDY NO. 5-3

Site Information

Site Description: This study is located immediately north of East Canyon Reservoir. The vegetation is comprised of a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community with a substantial amount of antelope bitterbrush (*Purshia tridentata*). Deer pellet groups were noted to be abundant in 1996. Three winter-killed deer were noted in 1990 and deer shed antlers were also noted in 2006. Deer pellet groups were sampled in high abundance in 2001, but moderate abundance in 2006 and 2011. Elk pellet groups were moderate in abundance and low in abundance in 2006 and 2011, respectively. Sheep pellet groups were sampled in low abundance in 2001; in addition, a flock of sheep were seen on site one week prior to the 2001 reading. Cattle pats were sampled in low abundance in 2006. Grouse pellets have also been encountered within the pellet group transect (Table - Pellet Group Data).

Browse: Mountain big sagebrush and antelope bitterbrush are the preferred browse species. The sagebrush population is mostly mature plants, and moderately dense. The sagebrush population has been moderately to lightly hedged over the duration of the study. Decadence was very high in 1984, 1990, and 2006, but more moderate in the other sample years. Poor vigor was very high in 2006, but has been moderate to low in the other sample years. In 2006, nearly half of the sagebrush population was infested by the sagebrush defoliator moth (*Aroga websteri*). This explains the high decadence and poor vigor in that year. The infested plants were frequently observed within the decadent age class. Recruitment of young, mountain big sagebrush plants have been mostly poor, but with good recruitment in 1996 and 2011 (Table - Browse Characteristics). The poor recruitment could be due to dense cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*) cover (Table - Herbaceous Trends).

Antelope bitterbrush has a sparse population. Due to low density and high preference by big game, use has been heavy during all sampling periods. The bitterbrush population displays good vigor, but experiences heavy hedging. Recruitment of young bitterbrush plants to the population has been very poor over the sample years except in the 1990 sample year when recruitment was good. Other browse species occurring on site are Oregon grape (*Mahonia repens*), prickly pear cactus (*Opuntia* sp.), white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*), Saskatoon serviceberry (*Amelachier alnifolia*), and Woods rose (*Rosa woodsii*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant and diverse. However, the composition is dominated by the weedy species bulbous bluegrass, cheatgrass, and Japanese chess (*Bromus japonicus*). The nested frequency for bulbous bluegrass has increased, while the annual grass species cheatgrass and Japanese chess decreased in nested frequencies and cover values over the course of the study. Other perennial grass species include Great Basin wildrye (*Elymus cinereus*), Sandberg bluegrass (*Poa secunda*), Kentucky bluegrass (*P. pratensis*), and intermediate wheatgrass (*Agropyron intermedium*). The forb community is very diverse, but with few species commonly occurring. Many species are small annuals that add very little to the herbaceous cover. Forb composition includes few desirable species, but species with the most abundant production include western yarrow (*Achillea millefolium*), Louisiana sagebrush (*Artemisia ludoviciana*), and wavyleaf thistle (*Cirsium undulatum*) (Table - Herbaceous Trends).

Soil: The soil is part of the Manila component, which is found on mountainsides. The parent material consists of slope alluvium and/or colluviums derived from sandstone and quartzite (Soil Survey Staff 2011). The soil texture is a loam with a slightly acidic soil reaction (pH 6.3) (Table - Soil Analysis Data). Bare ground cover is minimal, while protective ground cover is provided by relatively high amounts of vegetation and litter (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density for mountain big sagebrush decreased 13% from 1,998 plants/acre to 1,732 plants/acre. Decadence within the sagebrush population remained high, and decreased from 68% to 65%. The sagebrush population increased in poor vigor from 3% to 15%. Recruitment of young sagebrush increased from 3% to 4% of the overall population. The density for antelope bitterbrush increased 33% from 199 plants/acre to 264 plants/acre. Due to bitterbrush having a sparse population, any change within the population likely does not affect trend.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the sagebrush population decreased to 21%, but is still considered to be moderately high. The sagebrush population decreased in poor vigor to 8%. Recruitment of young sagebrush increased to 15% of the overall population. The antelope bitterbrush population decreased in decadence to 0%. Poor vigor was not observed within the bitterbrush population.
- **1996 to 2001 - slightly down (-1):** The density for mountain big sagebrush decreased 17% from 1,900 plants/acre to 1,580 plants/acre. Decadence within the sagebrush population increased slightly to 23%. Poor vigor within the sagebrush population decreased to 6%. Recruitment of young sagebrush decreased to 6% of the overall population. The density for antelope bitterbrush decreased 17% from 120 plants/acre to 100 plants/acre. Decadence within the bitterbrush population increased to 20%. Poor vigor was not observed within the population.
- **2001 to 2006 - down (-2):** The density for mountain big sagebrush decreased 34% to 1,040 plants/acre. Decadence within the sagebrush population increased to 53%. The sagebrush population increased in poor vigor to 46%. Young sagebrush recruitment decreased to 2% of the overall population. Antelope bitterbrush decreased in density by 20% to 80 plants/acre. Decadence and poor vigor within the bitterbrush population increased to 25%. Recruitment of young bitterbrush was not observed.
- **2006 to 2011 - stable (0):** The density for mountain big sagebrush increased 6% to 1,100 plants/acre. Decadence within the sagebrush population decreased to 16%. The sagebrush population decreased in poor vigor to 24%. Young sagebrush recruitment increased to 13% of the overall population. The density for antelope bitterbrush increased over two-fold. Decadence and poor vigor within the bitterbrush population decreased to 10%. Recruitment of young bitterbrush was not observed.

Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 80%. The perennial species Sandberg bluegrass increased significantly in nested frequency. The weedy perennial bulbous bluegrass was sampled for the first time in 1990.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 36%. However, the weedy species bulbous bluegrass increased significantly in nested frequency and provided a large proportion of the grass cover. Annual species were included in the sample for the first time in 1996, and cheatgrass was the most frequently occurring grass species.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 33%. However, the weedy species bulbous bluegrass increased significantly in nested frequency, and increased in cover from 8% to 27%. The weedy annual species cheatgrass had a significant decrease in nested frequency, and decreased in cover from 8% to 4%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. Bulbous bluegrass and annual grass nested frequency and cover also remained similar.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar, though cover increased from 8% to 18%. Bulbous bluegrass and annual grass nested frequency and cover also remained similar.

Forb:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 12%. The increase in the sum of nested frequency is not due to any one specific species, and is likely due to small, accumulative increases in nested frequency across the perennial forb community.
- **1990 to 1996 - up (+2):** The sum of nested frequency for perennial forbs increased 59%. Western yarrow, Pacific aster (*Aster chilensis*), and low fleabane (*Erigeron pumilus*) increased significantly in nested frequency, and had covers of 1%, 3%, and 4%, respectively.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial forbs decreased 46%. Wavyleaf thistle, low fleabane, and wayside gromwell (*Lithospermum ruderale*) decreased significantly in nested frequency.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial forbs decreased 38%. Pacific aster and wavyleaf thistle decreased significantly in nested frequency. Pacific aster decreased in cover from 1% to less than 1%
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 34%. The increase in the sum of nested frequency is not due to any one specific species, and is likely due to small, accumulative increases in nested frequency across the perennial forb community; however, western yarrow increased in cover from 1% to 3%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

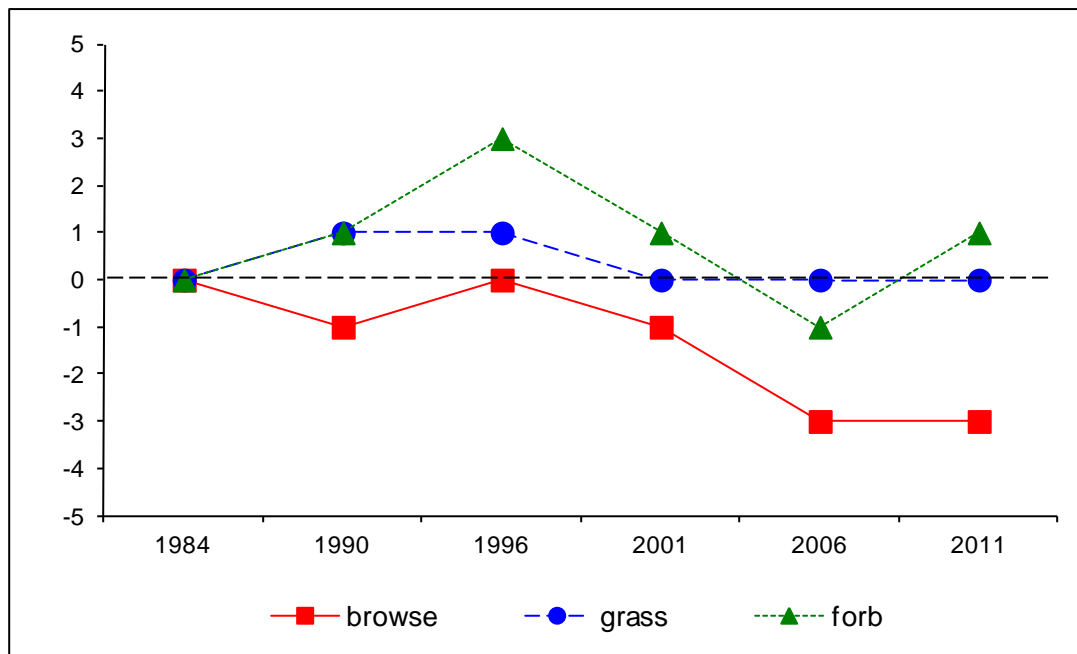
Management unit 5, study no: 3

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	21.6	9.6	6.4	10.9	-6.6	10.0	0.0	51.8	Poor-Fair
01	25.6	8.2	2.7	15.8	-3.2	5.7	0.0	54.7	Fair
06	18.7	-1.1	0.9	15.7	-1.9	8.4	0.0	40.7	Poor
11	19.0	10.3	6.2	30.0	-2.9	10.0	0.0	72.6	Good

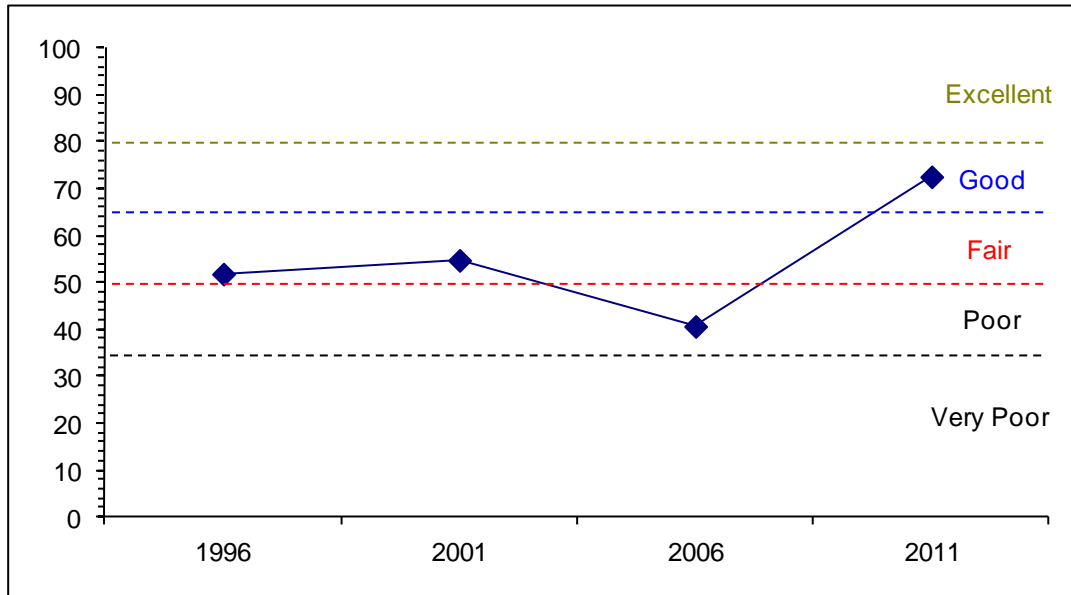
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 5 Study no: 3



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 5, Study no: 3



HERBACEOUS TRENDS--
 Management unit 05, Study no: 3

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron intermedium	a7	a10	a9	ab22	bc33	b53	.18	.91	2.11	5.23
G	Agropyron smithii	-	-	-	4	2	2	-	.53	.03	.15
G	Agropyron spicatum	a3	a18	b48	ab21	ab24	a16	2.04	.34	1.75	.51
G	Bromus japonicus (a)	-	-	41	62	45	37	.39	.32	.26	.31
G	Bromus tectorum (a)	-	-	b283	a135	a177	a153	7.92	3.98	2.29	3.55
G	Carex sp.	-	-	3	7	7	-	.03	.03	.06	-
G	Elymus cinereus	-	-	29	24	24	27	2.53	3.04	2.55	3.92
G	Poa bulbosa	a-	b41	c149	d267	d292	d251	7.90	26.96	28.90	23.59
G	Poa pratensis	ab19	a3	a6	b50	ab19	a15	.04	2.20	.36	.70
G	Poa secunda	a21	bc59	ab27	abc34	c56	abc61	.58	.79	.96	7.84
G	Vulpia octoflora (a)	-	-	6	1	-	-	.53	.00	-	-
Total for Annual Grasses		0	0	330	198	222	190	8.84	4.31	2.56	3.87
Total for Perennial Grasses		50	131	271	429	457	425	13.33	34.84	36.75	41.97
Total for Grasses		50	131	601	627	679	615	22.17	39.16	39.32	45.84
F	Achillea millefolium	a26	ab35	c62	bc53	a24	ab40	1.19	.86	1.14	3.37
F	Agoseris glauca	-	-	-	1	3	-	-	.00	.00	-
F	Allium sp.	-	-	1	3	1	4	.00	.00	.00	.01
F	Alyssum alyssoides (a)	-	-	4	7	12	8	.01	.04	.03	.06
F	Arabis sp.	-	-	4	-	-	-	.03	-	-	-
F	Artemisia ludoviciana	b51	b45	a17	ab26	ab26	ab35	.51	.73	1.97	2.95
F	Aster chilensis	a38	a36	b89	b89	a10	a11	3.00	.69	.07	.54
F	Aster sp.	-	-	-	-	-	6	-	-	-	.18
F	Astragalus sp.	5	-	12	-	6	3	.52	-	.01	.06

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cirsium sp.	-	-	-	-	-	7	-	-	-	.36
F	Cirsium undulatum	abc17	bc27	c41	ab9	a7	abc18	1.10	.10	.07	1.37
F	Collinsia parviflora (a)	-	-	a3	ab21	b39	c73	.00	.08	.08	.71
F	Collomia linearis (a)	-	-	a12	ab30	a14	b46	.03	.10	.04	.21
F	Cruciferae	-	4	-	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	a-	a6	a3	b39	-	.04	.00	.95
F	Draba sp. (a)	-	-	a-	b54	b84	c141	-	.15	.17	4.61
F	Epilobium brachycarpum (a)	-	-	a-	a8	b57	c160	-	.01	.17	1.80
F	Erigeron pumilus	c54	bc51	d125	a2	ab22	bc35	3.91	.00	.25	.76
F	Erodium cicutarium (a)	-	-	a22	a33	b55	ab41	.16	.80	.27	.78
F	Gayophytum ramosissimum(a)	-	-	b43	a-	a-	c83	.15	-	-	3.19
F	Haplopappus acaulis	-	-	1	-	-	-	.00	-	-	-
F	Hedysarum boreale	-	-	2	1	-	-	.15	.00	.03	-
F	Holosteum umbellatum (a)	-	-	a9	b78	b93	b81	.02	.31	.43	1.06
F	Lactuca serriola (a)	a-	a1	a1	a-	a4	b34	.00	-	.01	.48
F	Lappula occidentalis (a)	-	-	a6	a-	a18	b119	.03	-	.06	1.50
F	Lithophragma sp.	-	-	-	-	-	3	-	-	-	.01
F	Lithospermum ruderales	c24	c31	bc16	a1	a2	ab6	1.06	.00	.03	.21
F	Lomatium sp.	-	-	2	4	1	-	.00	.01	.00	-
F	Lupinus argenteus	a-	a-	ab11	b22	ab8	a3	.10	.35	.02	.38
F	Machaeranthera canescens	-	-	-	-	1	-	-	-	.00	-
F	Microsteris gracilis (a)	-	-	-	2	1	1	-	.00	.00	.00
F	Oenothera caespitosa	3	2	3	2	-	-	.15	.00	-	-
F	Phlox longifolia	-	-	-	-	-	3	-	-	-	.00
F	Polygonum douglasii (a)	-	-	b35	a14	ab27	ab16	.08	.03	.06	.07
F	Ranunculus testiculatus (a)	-	-	-	3	3	-	-	.00	.00	-
F	Sisymbrium altissimum (a)	-	-	-	-	-	1	-	-	-	.00
F	Sphaeralcea grossulariifolia	-	-	-	-	-	-	-	-	.00	-
F	Sphaeralcea munroana	16	13	15	9	7	6	.55	.05	.26	.44
F	Taraxacum officinale	-	-	2	-	3	-	.00	-	.00	-
F	Tragopogon dubius (a)	ab19	ab18	b19	a4	a1	ab5	.25	.01	.00	.04
F	Veronica biloba (a)	-	-	-	-	-	3	-	-	-	.00
F	Viguiera multiflora	-	17	11	1	16	4	.04	.00	.26	.06
F	Zigadenus paniculatus	-	-	-	2	3	4	-	.04	.01	.01
Total for Annual Forbs		19	19	154	260	411	851	0.76	1.60	1.37	15.52
Total for Perennial Forbs		234	261	414	225	140	188	12.37	2.87	4.19	10.76
Total for Forbs		253	280	568	485	551	1039	13.13	4.47	5.57	26.29

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	64	53	41	44	14.37	18.14	13.68	14.30
B	Chrysothamnus nauseosus albicaulis	1	1	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	12	13	13	9	.33	.18	.18	.68
B	Leptodactylon pungens	-	-	-	-	-	-	.03	-
B	Mahonia repens	22	21	24	22	.83	.45	.60	1.50
B	Opuntia sp.	6	5	2	4	.03	-	.03	-
B	Purshia tridentata	4	5	4	6	2.40	1.94	1.06	.74
Total for Browse		32	31	30	32	17.98	20.71	15.60	17.23

CANOPY COVER, LINE INTERCEPT--

Management unit 05, Study no: 3

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	20.38	15.85
Chrysothamnus viscidiflorus viscidiflorus	.73	1.39
Mahonia repens	.80	1.16
Opuntia sp.	.03	.03
Purshia tridentata	1.01	.65

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 05, Study no: 3

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.3	2.2	4.0
Purshia tridentata	1.9	1.5	1.4

BASIC COVER--

Management unit 05, Study no: 3

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.50	6.00	50.76	60.62	61.56	75.20
Rock	5.25	6.75	5.53	3.97	3.74	4.13
Pavement	.50	2.00	1.27	1.48	.67	.72
Litter	79.50	71.00	61.27	49.72	45.27	44.14
Cryptogams	.50	0	.13	.95	.73	.18
Bare Ground	10.75	14.25	4.19	8.60	3.04	2.92

SOIL ANALYSIS DATA --

Management unit 05, Study no: 3, Study Name: East Canyon Reservoir

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	-	4	-	-	15 (38)	-	-
Rabbit	-	-	10	1	-	-	-
Grouse	-	1	-	-	2 (17) Groups/Acre	-	-
Elk	5	-	4	1	-	38 (93)	3 (8)
Deer	32	26	38	11	79 (195)	36 (89)	21 (51)
Cattle	-	-	-	-	1 (2)	1 (2)	-

BROWSE CHARACTERISTICS--

Management unit 05, Study no: 3

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier alnifolia</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	37/60
01	0	0	0	-	-	0	0	0	51/55
06	0	0	0	-	-	0	0	0	32/44
11	0	0	0	-	-	0	0	0	35/46
<i>Artemisia tridentata vaseyana</i>									
84	1998	3	28	68	-	42	58	3	25/24
90	1732	4	31	65	399	44	25	15	29/38
96	1900	15	64	21	20	32	2	8	30/45
01	1580	6	71	23	-	23	3	6	32/47
06	1040	2	42	56	-	31	0	46	32/52
11	1100	13	71	16	160	9	0	24	24/40
<i>Chrysothamnus nauseosus albicaulis</i>									
84	33	0	0	100	-	0	100	0	-/-
90	33	0	100	0	-	100	0	0	26/28
96	20	0	100	0	-	0	0	0	-/-
01	20	0	100	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	31/46
11	0	0	0	0	-	0	0	0	31/27
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	33	0	0	100	-	0	0	100	-/-
90	33	0	100	0	-	100	0	100	14/15
96	320	6	94	0	-	0	0	6	15/27
01	320	0	94	6	-	0	0	0	12/17
06	340	0	100	0	-	0	0	0	13/22
11	320	13	88	0	-	0	0	0	10/18

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Mahonia repens									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	2960	22	78	-	40	0	0	0	5/6
01	4460	14	86	-	-	0	0	0	3/4
06	4480	16	84	-	100	0	0	0	3/4
11	5580	4	96	-	-	0	0	0	3/4
Opuntia sp.									
84	66	0	100	0	-	0	0	0	10/13
90	66	0	0	100	-	0	0	0	-/-
96	380	32	68	0	-	0	0	5	5/15
01	180	11	89	0	-	0	0	0	5/14
06	80	0	100	0	-	0	0	0	6/14
11	100	0	100	0	-	0	0	0	4/12
Purshia tridentata									
84	199	0	33	67	-	17	83	0	20/9
90	264	38	38	25	-	25	75	0	35/47
96	120	0	100	0	-	0	100	0	35/80
01	100	0	80	20	-	20	80	0	33/61
06	80	0	75	25	20	0	100	25	32/61
11	200	0	90	10	-	10	80	10	24/41
Rosa woodsii									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	24/17
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	12/7
11	0	0	0	-	-	0	0	0	-/-

WANSHIP - TREND STUDY NO. 5-4-11

Vegetation Type: Forage Kochia (Seeded)

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: Private

Elevation: 6,200 ft (1,890 m)

Aspect: Southwest

Slope: 3-5%

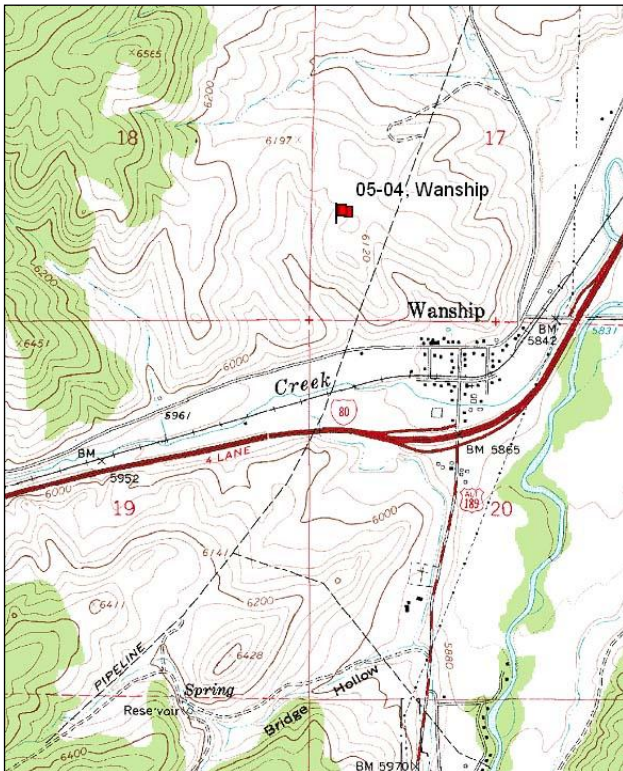
Transect bearing: 161° magnetic

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

Directions:

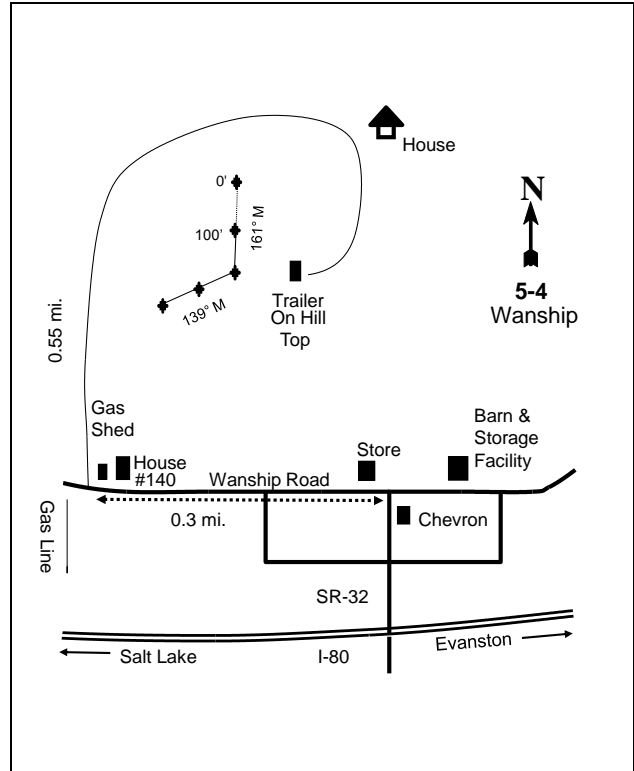
From the I-80 overpass in Wanship (Exit 155), proceed north on 189 to the "T" junction in town with Buck's Chevron on the right. Turn left and go 0.3 miles. Turn right here and go up the draw 0.55 miles to a house on top of the hill. The owner of this home would like to be contacted when the site is 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



Township: 1N Range: 5E Section: 17

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 465100 E 4518498 N

WANSHIP - TREND STUDY NO. 5-4

Site Information

Site Description: The site was established in 1984 and samples crucial winter range north of Wanship and west of the Weber River that is privately owned. A wildfire burned the entire area sometime after the 1990 reading and eliminated most of the browse, which was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Deer use during the winter of 1983-84 was light because of deep crusted snow and deer were supplementary fed a pelleted ration of alfalfa at feeding stations located along the frontage road near Wanship. Gopher activity was noted in 1996. Deer pellet groups were sampled in high abundance in 2001 and 2006, but moderate abundance in 2011. Elk pellet groups were sampled in low abundance in 2006, but moderate abundance in 2001 and 2011. 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. The landowner also said that cattle heavily graze the area later in the summer. Cattle pats were sampled in low abundance in 2001 (Table - Pellet Group Data).

Browse: The key browse species are mountain big sagebrush and forage kochia (*Kochia prostrata*). Sagebrush density was considered high between 1984 and 1990; however, the fire that burned the site eliminated most of the sagebrush. It is unclear whether the burn was seeded with sagebrush or if it was seeded naturally. Moreover, the density of sagebrush has steadily decreased over the duration of the study. Prior to the fire the sagebrush population was mostly decadent with high amounts of poor vigor. Since the fire however, the demographic has transitioned to the mature age class with low decadence and good vigor. Utilization of mountain big sagebrush has been moderate to heavy over the course of the study. Since the fire, the average height/crown of sagebrush plants has increased over the sample years. Young sagebrush recruitment peaked in 1996, but has been minimal for the majority of the study (Table - Browse Characteristics).

Forage kochia was seeded after the fire and has established well. The kochia population is dense, but decreased markedly in density in 2006; moreover, the population has decreased in density over the duration of the study. The kochia population is centered within the mature age class with very little decadence and good vigor in the population. Utilization of forage kochia has been light to moderate. The kochia population has been strongly vigorous. Young forage kochia recruitment is active, but has steadily decreased since 1996. Other browse species include antelope bitterbrush (*Purshia tridentata*), white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*), Saskatoon serviceberry (*Amelachier alnifolia*), broom snakeweed (*Gutierrezia sarothrae*), pricklypear cactus (*Opuntia* sp.), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is dominated by the perennial grass community. No specific seed mix is available, but seeded grass species sampled after the fire include crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*A. intermedium*), and orchard grass (*Dactylis glomerata*). Crested wheatgrass and intermediate wheatgrass have established well, but orchard grass has decreased since 1996. Crested wheatgrass has steadily increased every year in nested frequency since 1996, and is the dominant herbaceous species. The native grass species bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) have persisted after the fire. Sandberg bluegrass has steadily increased in cover since 1996. Cheatgrass (*Bromus tectorum*) was abundant in 1996, but has since decreased significantly in nested frequency and cover. The forb community is moderately diverse, but perennial species are deficient. The seeded species alfalfa (*Medicago sativa*) occurs occasionally, and the seeded species small burnet (*Sanguisorba minor*) was only sampled in 1996 (Table - Herbaceous Trends).

Soil: The study is located within the Ayoub-Dunford-Melling complex, and the soil is likely part of the Ayoub component. The component is located on mountain slopes. The parent material consists of colluvium and slope alluvium derived from andesite (Soil Survey Staff 2011). The soil is fairly deep but rocky on the surface. The soil texture is a loam with a neutral soil reaction (pH 6.6) (Table - Soil Analysis Data). Bare ground cover

is moderately low, and a high amount of protective ground cover is provided by rock, vegetation, and litter (Table - Basic Cover). Erosion is minimal because of the gentle terrain and soil permeability. Thus, the soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density for mountain big sagebrush decreased 13% from 3,531 plants/acre to 3,065 plants/acre. Decadence within the sagebrush population increased from 50% to 62%. The sagebrush population increased in poor vigor from 10% to 25%. Recruitment of young sagebrush was maintained at 8%.
- **1990 to 1996 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. The wildfire removed most of the mature plants from the study and therefore most of the available winter browse. However, recruitment of young plants was very good and comprised 98% of the population. Decadence and poor vigor within the mountain big sagebrush population decreased to 0%. The seeded species forage kochia was sampled for the first time and had a density of 11,980 plants/acre. The addition of forage kochia has added value to the browse component.
- **1996 to 2001 - slightly up (+1):** The density for mountain big sagebrush decreased 13% from 2,880 plants/acre to 2,500 plants/acre. Most of the young plants sampled in 1996 have established and mature plants increased from 60 plants/acre to 2,360 plants/acre. With the increase in mature plants the average sagebrush crown diameter increased from 9 inches to 13 inches, and average sagebrush cover increased from 1% to 2%. Decadence within the sagebrush population was maintained at 0%. Poor vigor increased slightly to 2%. Recruitment of young sagebrush decreased to 6% of the overall population. The density of forage kochia decreased 4% to 11,500 plants/acre, and cover decreased from 8% to 4%. Decadence and poor vigor was not observed within the kochia population.
- **2001 to 2006 - down (-2):** The density for mountain big sagebrush decreased 14% to 2,160 plants/acre. Decadence within the sagebrush population increased to 8%. Recruitment of young sagebrush increased to 9% of the overall population. The average sagebrush crown diameter increased to 17 inches. The density for forage kochia decreased 48% to 5,980 plants/acre. Decadence and poor vigor change was negligible at less than 1%, respectively.
- **2006 to 2011 - down (-2):** The density for mountain big sagebrush decreased 17% for 1,800 plants/acre. Decadence and poor vigor within the sagebrush population was maintained at 8% and 3%, respectively. The average sagebrush crown diameter increased to 22 inches, and average sagebrush cover increased from 2% to 4%. The density for forage kochia decreased 54% to 2,740 plants/acre and cover decreased to 2%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency for perennial grasses increased 56%. The perennial species Sandberg bluegrass was the most dominant grass, and had a significant increase in nested frequency.
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses decreased 24%. Sandberg bluegrass had a significant decrease in nested frequency, and provided 2% cover. However as a seeded species after the fire, crested wheatgrass became the dominant perennial species, and had a cover of 5%. Annual species were measured for the first time, and cheatgrass occurred most frequently of all the grass species, and had a cover of 6%.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses increased 96%. Sandberg bluegrass had a significant increase in nested frequency, and increased in cover to 6%. Crested wheatgrass increased significantly in nested frequency, and increased in cover to 16%. Intermediate wheatgrass increased significantly in nested frequency, and increased in cover from 2% to 3%. The

weedy annual species cheatgrass had a significant decrease in nested frequency, and decreased in cover to less than 1%.

- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses increased 8%. Crested wheatgrass had a significant increase in nested frequency, and increased in cover to 21%. No other notable significant changes were observed.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 17%. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) had a significant increase in nested frequency, and increased in cover from less than 1% to 3%. The annual species cheatgrass decreased significantly in nested frequency, and decreased in cover to less than 1%.

Forb:

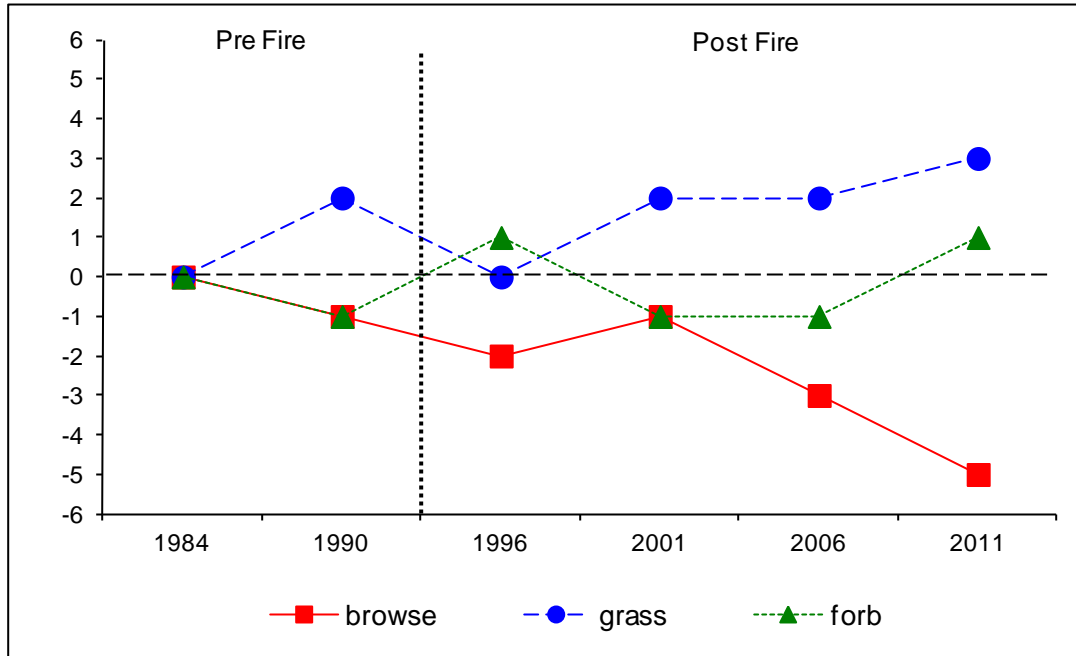
- **1984 to 1990 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 41%, but perennial forbs were already rare.
- **1990 to 1996 - up (+2):** The sum of nested frequency for perennial forbs increased over four-fold. The perennial species longstalk springparsley (*Cymopterus longipes*), longleaf phlox (*Phlox longifolia*), alfalfa, and small burnet increased significantly in nested frequency. Alfalfa and small burnet each provided 1% cover.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial forbs decreased 35%. The seeded species small burnet had a significant decrease in nested frequency, and decreased in cover to less than 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forb species remained similar. No notable significant changes were observed, and perennial forbs remain rare.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forb species increased 95%. Tapertip onion (*Allium acuminatum*) had a significant increase in nested frequency, and increased in cover from less than 1% to 1%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 5, study no: 4

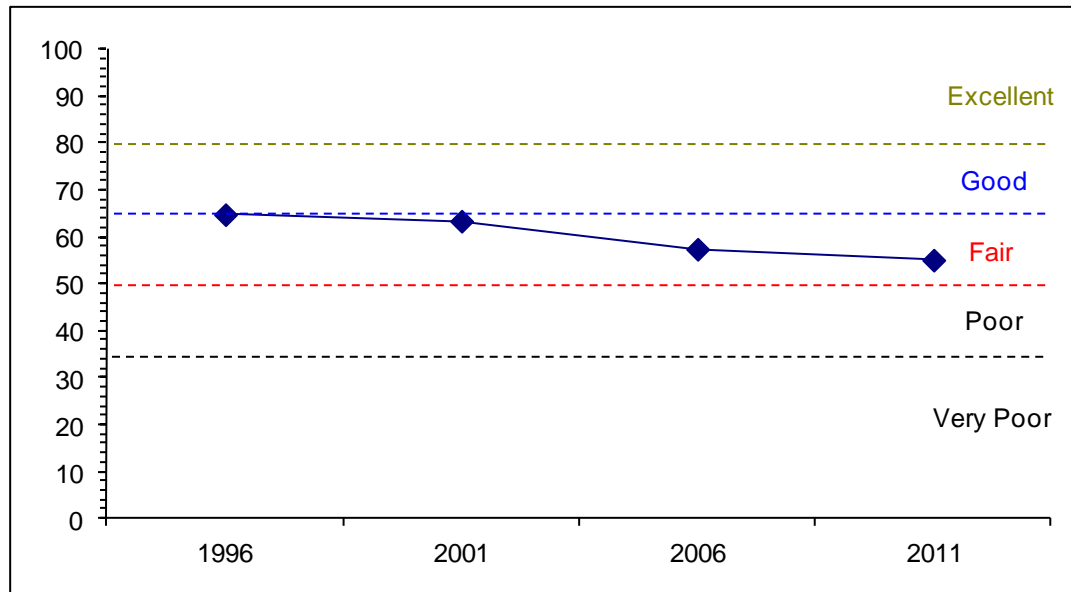
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.8	15.0	15.0	20.4	-4.8	6.3	0.0	64.8	Fair-Good
01	8.9	15.0	6.0	30.0	-0.2	3.7	0.0	63.4	Fair-Good
06	5.6	13.7	6.1	30.0	-0.2	2.1	0.0	57.4	Fair
11	6.3	13.0	2.0	30.0	-0.1	3.7	0.0	55.1	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 5, Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 5, Study no: 4



HERBACEOUS TRENDS--
Management unit 05, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a-	a-	b103	c192	d232	d248	5.33	16.42	20.63	18.48
G	Agropyron dasystachyum	-	-	-	3	-	-	-	.03	-	-
G	Agropyron intermedium	a-	a-	b24	c79	c85	c104	1.51	3.19	3.20	4.63
G	Agropyron spicatum	bc25	c27	c35	abc12	a10	ab11	1.13	.81	.68	.36
G	Bromus tectorum (a)	-	-	c315	ab55	b81	a24	6.34	.28	.23	.09
G	Dactylis glomerata	a-	a-	b11	a1	a3	a-	.21	.03	.03	-
G	Festuca ovina	-	-	2	-	-	-	.00	-	-	-
G	Poa bulbosa	a-	a-	a1	a4	a19	b86	.03	.01	.22	3.31
G	Poa secunda	b187	d307	a92	c235	bc218	bc216	2.00	5.69	5.72	6.44
G	Sitanion hystrix	b15	b21	a1	a1	a-	a-	.00	.01	-	-
Total for Annual Grasses		0	0	315	55	81	24	6.34	0.28	0.23	0.08
Total for Perennial Grasses		227	355	269	527	567	665	10.24	26.19	30.50	33.23
Total for Grasses		227	355	584	582	648	689	16.58	26.47	30.73	33.32
F	Allium acuminatum	ab25	a5	a-	ab16	b40	c138	-	.03	.20	1.21
F	Alyssum alyssoides (a)	-	-	c188	b141	a91	c199	1.45	.63	.21	.62
F	Antennaria rosea	6	5	-	-	-	-	-	-	-	-
F	Arabis sp.	-	3	-	-	2	-	-	-	.03	-
F	Astragalus beckwithii	-	-	-	-	-	-	-	-	-	.01
F	Astragalus cibarius	a-	a-	a1	ab3	b8	a1	.00	.18	.11	.03
F	Astragalus convallarius	-	-	-	4	-	-	-	.01	-	-
F	Astragalus utahensis	7	1	11	-	-	-	.21	-	-	-
F	Cirsium sp.	-	-	3	-	-	-	.00	-	-	-
F	Collinsia parviflora (a)	-	-	a3	b76	c130	b92	.01	.32	.48	1.24
F	Collomia linearis (a)	-	-	1	2	-	3	.00	.00	-	.00
F	Comandra pallida	-	-	-	4	-	-	-	.03	-	-
F	Crepis acuminata	-	2	-	1	-	1	-	.15	-	.00
F	Cryptantha sp.	6	-	-	-	-	-	-	-	-	-
F	Cymopterus longipes	a-	a10	c54	b32	ab28	ab23	.49	.21	.25	.27
F	Draba sp. (a)	-	-	a-	b105	c168	c210	-	.41	.79	.88
F	Epilobium brachycarpum (a)	-	-	-	2	6	-	-	.00	.01	-
F	Erigeron pumilus	2	3	1	-	-	2	.03	-	-	.01
F	Erodium cicutarium (a)	-	-	-	1	-	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	b14	a-	a4	a-	.03	-	.03	-
F	Holosteum umbellatum (a)	-	-	b213	b185	a136	b206	1.45	.76	.53	1.33
F	Lactuca serriola (a)	-	-	-	-	-	1	-	-	-	.03
F	Lupinus argenteus	-	-	-	5	-	-	-	.18	-	-
F	Medicago sativa	a-	a-	b18	ab10	a-	a1	.82	.95	.44	.30
F	Microsteris gracilis (a)	-	-	-	3	7	3	-	.03	.01	.03
F	Orobancha sp.	-	-	-	-	-	2	-	-	-	.00
F	Penstemon sp.	3	-	-	-	-	-	-	-	-	-
F	Phlox longifolia	a-	a-	b25	ab10	ab9	a2	.29	.07	.01	.00
F	Polygonum douglasii (a)	-	-	3	-	1	-	.00	-	.00	-
F	Ranunculus testiculatus (a)	-	-	c267	b217	c264	a139	2.44	2.87	2.50	.95

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Sanguisorba minor	a ⁻	a ⁻	b ¹⁶	a ⁻	a ⁻	a ⁻	1.29	-	-	-
F	Schoenrambe linifolia	-	-	3	1	-	-	.03	.00	-	-
F	Sisymbrium altissimum (a)	-	-	1	-	-	-	.03	-	-	-
F	Tragopogon dubius (a)	4	-	3	5	-	-	.03	.03	-	-
Total for Annual Forbs		4	0	693	737	807	853	5.47	5.10	4.59	5.10
Total for Perennial Forbs		49	29	132	86	87	170	3.17	1.83	1.05	1.86
Total for Forbs		53	29	825	823	894	1023	8.65	6.94	5.64	6.97

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	-	-	-	-	1.08	2.00	2.19	3.84
B	Chrysothamnus nauseosus albicaulis	3	3	1	0	-	.03	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	27	27	32	24	2.05	1.51	1.23	.57
B	Gutierrezia sarothrae	1	3	1	0	-	.15	-	-
B	Kochia prostrata	95	95	79	54	7.61	4.27	1.92	1.03
B	Opuntia sp.	3	3	3	3	.15	-	.41	.41
B	Tetradymia canescens	1	1	2	1	-	-	-	-
Total for Browse		130	132	118	82	10.89	7.97	5.76	5.86

CANOPY COVER, LINE INTERCEPT--

Management unit 05, Study no: 4

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	2.70	5.19
Chrysothamnus viscidiflorus viscidiflorus	1.08	.70
Kochia prostrata	2.33	1.20
Opuntia sp.	.16	.13
Tetradymia canescens	.28	.35

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 05, Study no: 4

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.9	1.4	1.9

BASIC COVER--

Management unit 05, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.00	15.75	37.70	44.98	38.54	43.72
Rock	9.00	9.00	11.57	9.17	10.86	10.65
Pavement	16.25	14.75	3.39	2.23	5.23	1.34
Litter	64.00	41.00	44.87	27.26	36.85	42.92
Cryptogams	.25	5.25	.47	.86	1.64	.28
Bare Ground	7.50	14.25	11.60	24.70	21.86	12.26

SOIL ANALYSIS DATA --

Management unit 05, Study no: 4, Study Name: Wanship

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.2	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	2	-	-	-	-	-	-
Rabbit	10	-	8	11	-	-	-
Elk	3	9	22	27	24 (60)	14 (35)	39 (96)
Deer	36	34	43	24	67 (165)	96 (236)	27 (66)
Cattle	1	1	2	-	13 (32)	-	-

BROWSE CHARACTERISTICS--

Management unit 05, Study no: 4

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	24/28
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	23/28
11	0	0	0	-	-	0	0	0	26/35
Artemisia tridentata vaseyana									
84	3531	8	42	50	833	36	61	10	33/43
90	3065	8	30	62	133	53	25	25	26/36
96	2880	98	2	0	40	0	0	0	9/9
01	2500	6	94	0	-	38	55	2	11/13
06	2160	9	82	8	-	33	28	3	12/17
11	1800	3	89	8	-	77	9	3	16/22

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Atriplex canescens</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	26/43
<i>Chrysothamnus nauseosus albicaulis</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	60	0	100	0	-	0	0	0	13/14
01	60	0	67	33	-	33	0	0	21/17
06	20	0	100	0	-	0	0	0	21/26
11	0	0	0	0	-	0	0	0	19/27
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	599	56	44	0	-	0	0	0	13/12
90	1065	3	72	25	-	16	3	63	11/12
96	820	0	100	0	-	0	0	0	12/22
01	720	6	78	17	-	3	0	3	12/22
06	800	8	80	13	-	3	3	5	12/17
11	680	6	91	3	-	0	0	3	11/14
<i>Gutierrezia sarothrae</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	20	0	100	0	-	0	0	0	8/11
01	100	0	80	20	-	0	0	20	7/11
06	40	50	50	0	-	0	0	0	5/6
11	0	0	0	0	-	0	0	0	11/23
<i>Kochia prostrata</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	11980	28	72	0	40	9	0	.16	7/11
01	11500	15	84	0	60	56	10	0	6/9
06	5980	16	84	0	780	31	19	.33	7/9
11	2740	8	91	1	60	14	0	2	7/9
<i>Opuntia sp.</i>									
84	33	100	0	0	-	0	0	0	-/-
90	365	18	45	36	-	0	0	36	3/10
96	120	33	67	0	-	0	0	0	4/8
01	80	25	75	0	-	0	0	0	5/11
06	100	20	80	0	-	0	0	0	5/15
11	80	0	100	0	-	0	0	0	5/20

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Purshia tridentata</i>										
84	133	0	100	0	-	0	100	0	29/40	
90	33	0	0	100	-	0	100	100	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
<i>Tetradymia canescens</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	0	0	11/18	
01	20	0	100	-	-	0	0	0	12/34	
06	40	0	100	-	-	0	0	0	17/18	
11	20	0	100	-	-	0	0	0	13/28	

BARNARD CREEK - TREND STUDY NO. 5-8-11

Vegetation Type: Bitterbrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Upland Gravelly Loam \(Bonneville Big Sagebrush\), R028AY306UT](#)

Land Ownership: USFS

Elevation: 4,972 ft (1,516 m)

Aspect: West

Slope: 52%

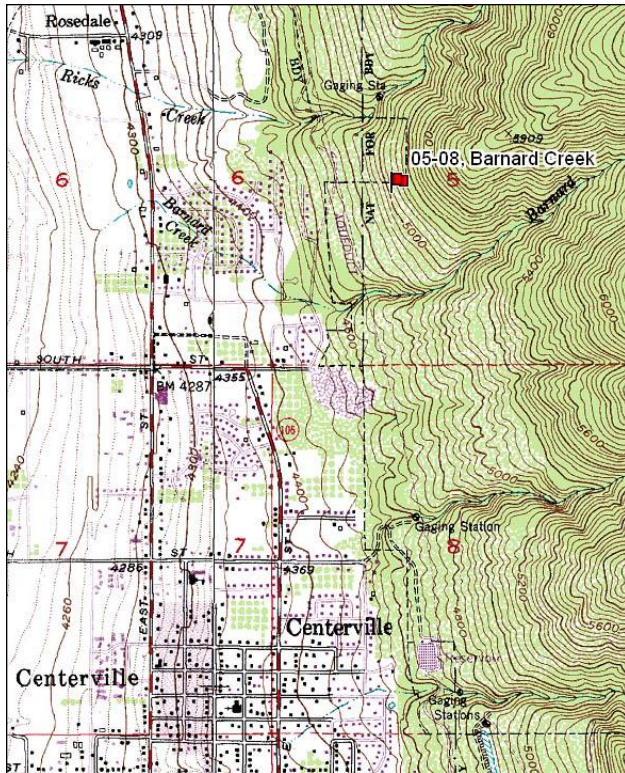
Transect bearing: 166° magnetic

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

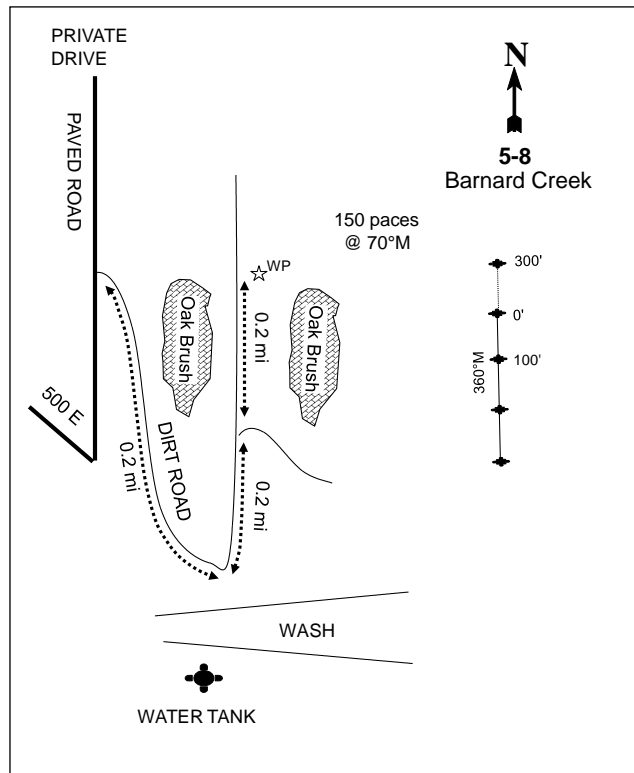
Directions:

From U-106 in Centerville (Main St.) 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

GPS: NAD 83, UTM 12S 427058 E 4532009 N

BARNARD CREEK - TREND STUDY NO. 5-8

Site Information

Site Description: This study is located within an isolated antelope bitterbrush (*Purshia tridentata*) population on crucial deer winter range on the Wasatch Face above Centerville. The study transect is about 1,000 feet from the nearest residence. The study transect is located on private land near the National Forest Service boundary. Deer presence is heavy and the range has shown some signs of intense utilization during past readings. Some elk also appear to winter on this slope. Deer pellet groups were sampled in high abundance in 2001 and 2011, but moderate abundance in 2006. Elk pellet groups were sampled in low abundance in 2001, but more moderate abundance in 2006. No elk pellet groups were observed in 2011 (Table - Pellet Group Data).

Browse: Antelope bitterbrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) are the key browse species. Bitterbrush is the dominant browse species, and has provided the majority of browse cover since 1996. The bitterbrush population is moderately dense, and has been centered within the mature demographic throughout the duration of the study. Decadence and poor vigor within the bitterbrush population are low. Utilization of antelope bitterbrush has been generally moderate over the sample years. The bitterbrush plants are large and vigorous with an average height of nearly 4 feet and a crown of about 6 feet. The recruitment of young bitterbrush plants has been poor over the course of the study (Table - Browse Characteristics).

Mountain big sagebrush provides less browse cover than bitterbrush, but has a population concentrated toward the south end of the study. Sagebrush density has increased slightly since 1996. The sagebrush population has been centered within the mature demographic. Decadence has fluctuated from low to high rates within the population, but poor vigor has been mostly low. Utilization of mountain big sagebrush has been light to moderate over the sample years. The recruitment of young sagebrush plants to the population has been poor over the sample years (Table - Browse Characteristics).

Herbaceous Understory: The study area is dominated by cheatgrass (*Bromus tectorum*). The perennial grass species are rare on the site, but include bluebunch wheatgrass (*Agropyron spicatum*), purple three-awn (*Aristida purpurea*), Sandberg bluegrass (*Poa secunda*), and sand dropseed (*Sporobolus cryptandrus*). A variety of forb species have been sampled on the study, but are not found in abundance. Common species include pale alyssum (*Alyssum Alyssoides*), storksbill (*Erodium cicutarium*), hairy goldaster (*Heterotheca villosa*), Douglas knotweed (*Polygonum douglasii*), and Louisiana sagebrush (*Artemisia ludoviciana*). The state listed noxious weeds Dyer's woad (*Isatis tinctoria*) and Dalmation toadflax (*Linaria dalmatica*) were first sampled in 1996 and have been sampled every year since. Dyer's woad has increased slightly in nested frequency every sampled year (Table - Herbaceous Trends).

Soil: The study is part of the Kilburn-Francis association, and is likely part of the Kilburn component. These soils occur on alluvial fans. The parent material consists of lacustrine deposits (Soil Survey Staff 2011). The soil texture is a sandy clay loam with neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Phosphorus may have limited availability for plant growth and development at 5.7 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover has been modest to near absent for the duration of the study, and protective ground cover is provided by ample vegetation and litter cover (Table - Basic cover). A deep layer of litter and organic matter has built up under the shrubs. There is easy access for off road vehicles and their frequent use has led to increased erosion potential. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1985 to 1990 - stable (0):** The density for antelope bitterbrush increased six-fold from 66 plants/acre to 399 plants/acre. Decadence and poor vigor was not observed within the bitterbrush population. Recruitment of young bitterbrush increased to 17% of the overall population. The density for mountain big sagebrush decreased 35% from 1,331 plants/acre to 865 plants/acre. Decadence within the sagebrush population increased from 15% to 31%. The sagebrush population decreased in poor vigor from 10% to 0%. Recruitment of young sagebrush increased from 5% to 54% of the overall population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the antelope bitterbrush population increased slightly to 3%. Poor vigor was not observed within the bitterbrush population. Decadence within the mountain big sagebrush population decreased to 18%; however, poor vigor increased slightly to 3%. Recruitment of young sagebrush decreased to 3% of the overall population.
- **1996 to 2001 - up (+2):** The density for antelope bitterbrush increased two-fold from 600 plants/acre to 1,220 plants/acre. Decadence and poor vigor within the bitterbrush population was maintained at 3% and 0%, respectively. The density for mountain big sagebrush increased 15% from 680 plants/acre to 780 plants/acre. Decadence within the sagebrush population increased to 23%. The sagebrush population maintained poor vigor at 3%. Recruitment of young sagebrush was maintained at 3% of the overall population.
- **2001 to 2006 - slightly down (-1):** The density for antelope bitterbrush decreased 25% to 920 plants/acre. Decadence and poor vigor within the bitterbrush population increased to 7%. The density for mountain big sagebrush remained at 780 plants/acre. Decadence within the sagebrush population decreased to 3%. The sagebrush population decreased in poor vigor to 0%. Recruitment of young sagebrush was not observed.
- **2006 to 2011 - up (+2):** The density for antelope bitterbrush increased 25% to 1,160 plants/acre. Decadence within the bitterbrush population remained at 7%. The bitterbrush population decreased in poor vigor to 3%. The density for mountain big sagebrush increased 8% to 840 plants/acre. Decadence within the sagebrush population increased to 10%. The sagebrush population increased in poor vigor to 14%. Recruitment of young sagebrush increased to 5% of the overall population.

Grass:

- **1985 to 1990 - stable (0):** The sum of nested frequency for perennial grasses increased 57%. Perennial grasses are scarce and the increase is likely not due to any one specific species, and is likely due to small, accumulative increases in nested frequency across the perennial grass community.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial grass species increased 64%. However, because perennial grasses are so rare that small incremental increases in nested frequency will be amplified as a change within the grass community. Annual grasses were included in the sample for the first time in 1996, and cheatgrass was measured as the most dominant grass species.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grass species increased over two-fold. Sandberg bluegrass had a significant increase in nested frequency, and increased in cover from less than 1% to 1%. The weedy annual species cheatgrass had significant decrease in nested frequency, and decreased in cover from 37% to 31%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grass species remained similar. The annual species winter rye (*Secale cereale*) was sampled for the first time, and had a cover of 1%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grass species remained similar. The annual species winter rye had a significant increase in nested frequency, and maintained cover near 1%.

Forb:

- **1985 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased 59%. The perennial species Louisiana sagebrush and Pacific aster (*Aster chilensis*) decreased significantly in nested frequency.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 13%. The increase is likely not due to any one specific perennial species, and is likely due to small, accumulative increases in nested frequency across the perennial forb community. However, the noxious weeds dyer’s woad and dalmation toadflax were observed for the first time. Dyer’s woad and dalmation toadflax were not common and had a combined cover of less than 1%. Hairy goldaster was the most commonly occurring perennial forb, and had a cover of 3%.
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial forbs increased 94%. The perennial species wild onion (*Allium sp.*) and Pacific aster increased significantly in nested frequency, but had covers that were less than 1%. The noxious weed dyer’s woad had a significant increase in nested frequency, and increased in cover to 1%. Hairy goldaster maintained cover near 3%
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial forbs decreased 31%. The perennial species wild onion and Pacific aster decreased significantly in nested frequency. Covers for these species were maintained at less than 1%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 91%. The perennial species bedstraw (*Galium sp.*) was observed for the first time, and had a cover of 3%. Wild onion had a significant decrease in nested frequency.

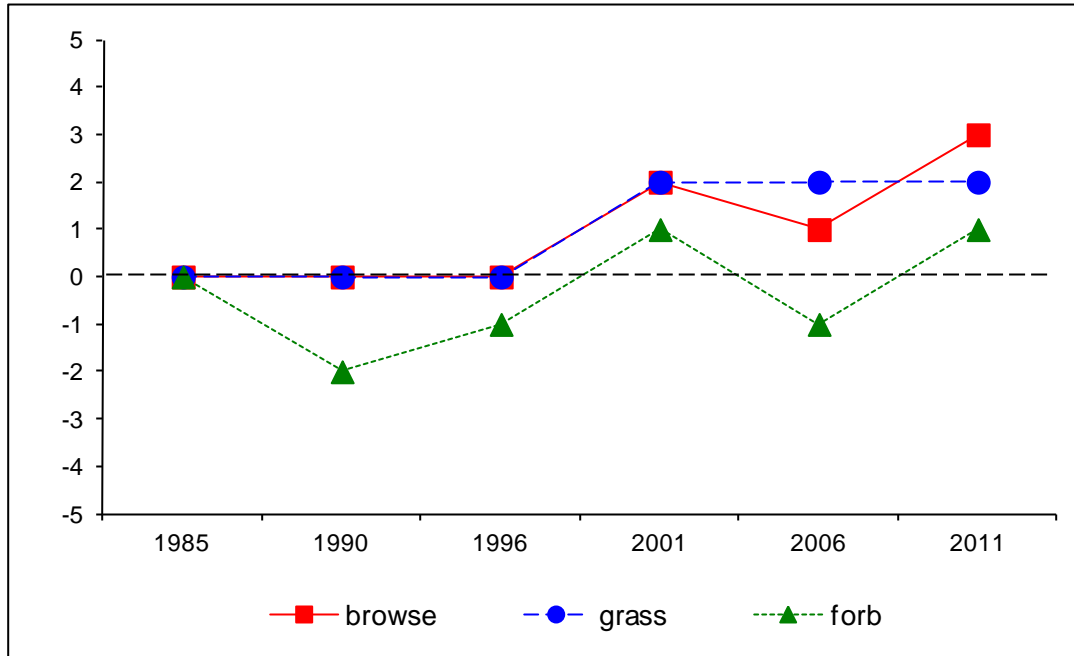
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 5, study no: 8

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	24.5	13.4	0.2	3.4	-20.0	8.7	-4.0	26.3	Very Poor
01	30.0	12.7	0.4	4.4	-20.0	10.0	-4.0	33.4	Very Poor-Poor
06	30.0	13.3	0.0	4.9	-20.0	5.5	-4.0	29.7	Very Poor
11	30.0	12.6	0.9	3.4	-20.0	10.0	-4.0	32.9	Very Poor

Trend Summary

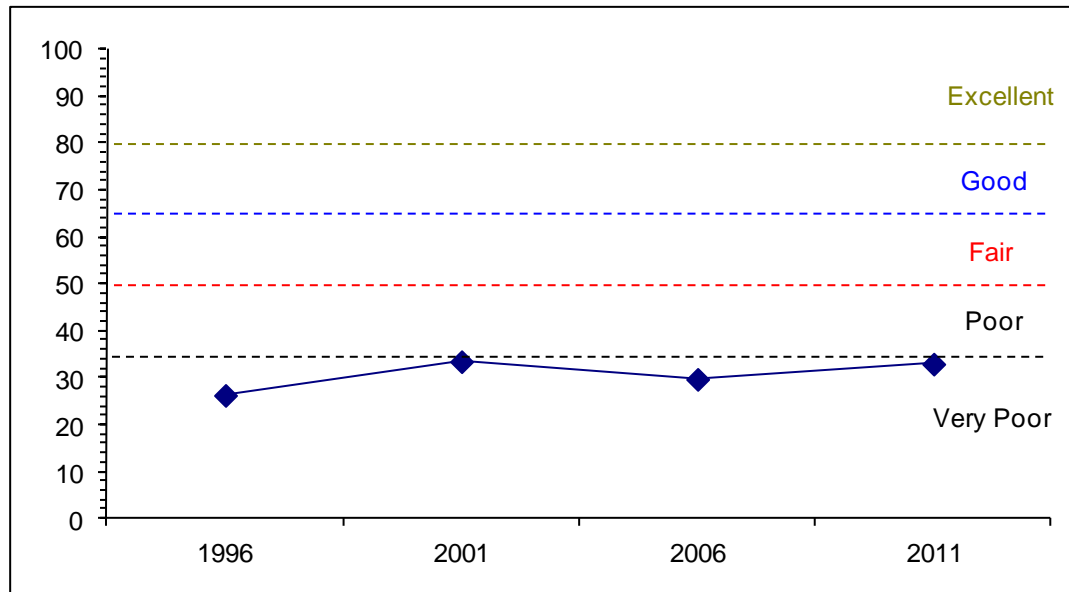
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 5 Study no: 8



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 5, Study no: 8



HERBACEOUS TRENDS--
Management unit 05, Study no: 8

Type	Species	Nested Frequency						Average Cover %			
		'85	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	ab8	a3	ab15	ab14	b23	ab22	.67	.90	1.18	1.37
G	Aristida purpurea	-	2	5	9	2	3	.09	.36	.30	.00
G	Bromus tectorum (a)	-	-	b392	a378	a373	a362	36.54	30.96	34.23	40.65
G	Festuca myuros (a)	-	-	a-	a5	a5	b62	-	.03	.31	2.50
G	Poa bulbosa	a3	a-	a-	a18	a16	b54	-	.20	.43	.76
G	Poa fendleriana	3	3	-	-	3	-	-	-	.00	-
G	Poa secunda	a-	a-	ab12	bc32	c30	a10	.10	.66	.51	.34
G	Secale cereale (a)	-	-	a-	a-	b17	c80	-	-	.54	1.38
G	Sporobolus cryptandrus	-	12	4	8	13	-	.30	.27	.42	-
G	Stipa comata	-	2	-	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	392	383	395	504	36.54	30.99	35.09	44.55
Total for Perennial Grasses		14	22	36	81	87	89	1.16	2.40	2.86	2.48
Total for Grasses		14	22	428	464	482	593	37.70	33.39	37.95	47.04
F	Agoseris glauca	-	-	-	1	-	1	-	.03	-	.03
F	Allium sp.	a11	a-	a2	b52	a18	b57	.00	.38	.07	.27
F	Alyssum alyssoides (a)	-	-	b29	a8	a3	a5	.10	.06	.03	.04
F	Ambrosia psilostachya	-	-	9	1	-	-	.27	.00	-	-
F	Artemisia ludoviciana	b49	a21	a11	a11	a14	a8	.36	.33	.50	.04
F	Aster chilensis	c63	a-	a-	b8	a-	a-	-	.03	-	-
F	Chenopodium album (a)	-	6	-	-	-	-	-	-	-	-
F	Comandra pallida	-	-	-	-	2	3	-	-	.00	.03
F	Cynoglossum officinale	-	-	3	-	3	-	.00	-	.01	-
F	Descurainia pinnata (a)	-	-	a-	a2	a1	b18	-	.01	.00	.51
F	Draba sp. (a)	-	-	a-	c59	b25	bc37	-	.26	.13	.39
F	Epilobium brachycarpum (a)	b24	a-	a4	a11	a5	a9	.01	.12	.01	.02
F	Erigeron sp.	5	3	-	-	-	1	-	-	.00	.00
F	Eriogonum umbellatum	-	-	-	-	1	1	-	-	.03	.15
F	Erodium cicutarium (a)	b18	a-	a-	c79	a-	b12	-	1.77	-	.34
F	Euphorbia sp.	-	-	3	1	-	-	.00	.00	-	-
F	Galium sp.	a-	a-	a-	a-	a-	b45	-	-	-	2.76
F	Gilia sp. (a)	-	-	-	5	-	-	-	.03	-	-
F	Helianthus annuus (a)	-	6	-	7	-	3	-	.02	-	.00
F	Heterotheca villosa	40	46	38	38	21	22	3.22	3.36	1.21	.63
F	Holosteum umbellatum (a)	-	-	a-	b18	b24	b25	-	.41	.06	.12
F	Isatis tinctoria	a-	a-	b9	bc31	c41	c53	.31	1.13	.78	1.06
F	Lactuca serriola (a)	a-	b28	a2	a-	a3	b26	.00	-	.00	.30
F	Linaria dalmanica	-	-	1	6	3	4	.15	.36	.13	.03
F	Lupinus argenteus	-	-	-	-	-	5	-	-	-	.03
F	Machaeranthera canescens	-	-	1	-	2	-	.00	-	.00	-
F	Phlox longifolia	-	-	-	4	-	-	-	.01	-	-
F	Polygonum douglasii (a)	-	-	b28	a-	a-	b17	.14	-	-	.03
F	Portulaca oleracea (a)	-	3	-	-	-	-	-	-	-	-
F	Salsola iberica (a)	-	8	-	2	-	3	-	.03	-	.00

Type	Species	Nested Frequency						Average Cover %			
		'85	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Tragopogon dubius (a)	a-	a1	b17	a2	a-	a5	.17	.06	-	.01
F	Unknown forb-perennial	3	-	-	-	-	-	-	-	-	-
F	Verbascum blattaria	-	-	2	-	-	-	.00	-	-	-
Total for Annual Forbs		42	52	80	193	61	160	0.43	2.79	0.24	1.79
Total for Perennial Forbs		171	70	79	153	105	200	4.35	5.66	2.75	5.06
Total for Forbs		213	122	159	346	166	360	4.79	8.46	3.00	6.86

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	25	27	28	29	2.73	5.09	9.18	9.31
B	Gutierrezia sarothrae	8	2	2	0	.06	-	.38	-
B	Opuntia sp.	2	2	1	0	-	-	-	-
B	Purshia tridentata	27	36	30	39	14.06	16.55	17.37	16.32
Total for Browse		62	67	61	68	16.86	21.65	26.93	25.64

CANOPY COVER, LINE INTERCEPT--

Management unit 05, Study no: 8

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	11.68	10.88
Purshia tridentata	27.93	18.39

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 05, Study no: 8

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.8	2.3	2.8
Purshia tridentata	4.4	4.6	1.6

BASIC COVER--

Management unit 05, Study no: 8

Cover Type	Average Cover %					
	'85	'90	'96	'01	'06	'11
Vegetation	7.25	4.75	55.25	60.27	65.84	69.59
Rock	5.00	6.50	5.85	5.56	4.69	5.93
Pavement	12.50	13.25	3.92	4.43	3.58	5.11
Litter	38.00	61.25	55.74	48.18	53.77	38.87
Cryptogams	0	0	.12	.06	.04	.40
Bare Ground	37.25	14.25	.56	6.14	1.91	4.29

SOIL ANALYSIS DATA --

Management unit 05, Study no: 8, Study Name: Barnard Creek

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
33.5	7.0	60.9	19.1	20.0	1.1	5.7	118.4	0.3

PELLET GROUP DATA--

Management unit 05, Study no: 8

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	1	-	-	-	-
Elk					5 (12)	-	-
Deer	20	19	14	15	46 (114)	27 (68)	74 (182)

BROWSE CHARACTERISTICS--

Management unit 05, Study no: 8

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Artemisia tridentata vaseyana</i>									
85	1331	5	80	15	199	65	10	10	26/40
90	865	54	15	31	-	23	0	0	13/22
96	680	3	79	18	-	18	0	3	19/35
01	780	3	74	23	-	0	0	3	27/40
06	780	0	97	3	-	21	0	0	28/49
11	840	5	86	10	20	21	0	14	27/43
<i>Chrysothamnus nauseosus</i>									
85	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	26/32
<i>Gutierrezia sarothrae</i>									
85	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	200	30	70	-	-	0	0	0	13/19
01	80	0	100	-	-	0	0	0	11/14
06	40	0	100	-	-	0	0	0	12/19
11	0	0	0	-	-	0	0	0	9/15
<i>Opuntia sp.</i>									
85	66	0	100	-	-	0	0	0	7/17
90	0	0	0	-	-	0	0	0	-/-
96	40	0	100	-	-	0	0	0	6/12
01	40	0	100	-	-	0	0	0	10/17
06	20	0	100	-	-	0	0	0	9/23
11	0	0	0	-	-	0	0	0	6/6

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Purshia tridentata</i>										
85	66	0	100	0	-	0	100	0	36/51	
90	399	17	83	0	-	50	0	0	50/66	
96	600	0	97	3	-	70	0	0	43/73	
01	1220	0	97	3	-	56	21	0	40/67	
06	920	0	93	7	-	37	26	7	41/72	
11	1160	0	93	7	-	19	48	3	31/45	

RED ROCK CANYON - TREND STUDY NO. 5-15-11

Vegetation Type: Burn and Seeded

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Stony Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 5,675 ft (1,730 m)

Aspect: Southeast

Slope: 10%

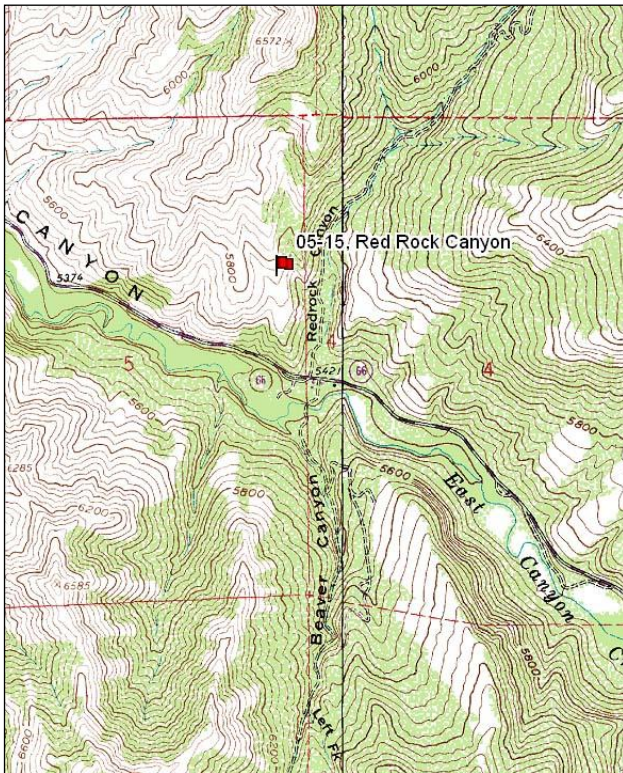
Transect bearing: 155° magnetic

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

Directions:

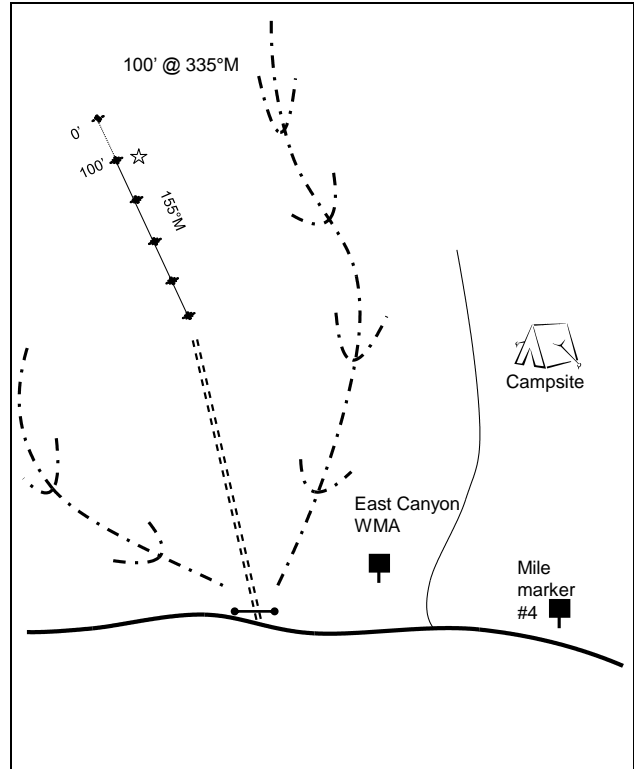
Travel east for 0.2 miles past mile marker # 4 on highway 66 heading towards Porterville and turn right (sign says East Canyon Wildlife Management Area). Travel north for 0.2 miles to a small 4-wheeler gate on the west (left) side of the road. Follow the 4-wheeler trail up and along the ridge. The 100-foot stake is marked by a full high fence post just off the trail. The 0-foot stake is 100 feet at 335 degrees magnetic. The 0-foot baseline stake is marked by a browse tag # 52.

Map Name: Porterville



Township: 2N Range: 3E Section: 5

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 447035 E 4532080 N

RED ROCK CANYON - TREND STUDY NO. 5-15

Site Information

Site Description: This trend study was established in 1996 on a small bench north of East Canyon. The site burned and was seeded in 1992 with a combination of grasses, forbs, and browse species (Table - Seed Mix). The area is considered winter range, although it also receives year round use. Big game presence was low in 1996. However, deer pellet groups were sampled in high abundance in 2001 and 2006. Deer pellet groups were not encountered in 2011. A few bedding areas were encountered in 2001 and two deer carcasses were identified in 2006. Elk pellet groups were sampled in moderate abundance in 2006. Cattle pats were sampled in high abundance in 2006, but low abundance in 2011 (Table - Pellet Group Data).

Browse: Browse species are not abundant and are likely absent due to the fire. The key browse species found on the study site is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). The most common species include stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and some broom snakeweed (*Gutierrezia sarothrae*). Mountain big sagebrush is a small population that has varied in density, and is centered within the mature age class. Young sagebrush dominated the population in 1996 and 2001, but no new recruitment has been sampled since 2006. Decadence and poor vigor of sagebrush have been low over the course of the study. Other browse species include white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) and mountain snowberry (*Symphoricarpos oreophilus*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant and diverse. Seeded grasses established well after the fire and include crested wheatgrass (*Agropyron cristatum*), bluebunch wheatgrass (*A. spicatum*), and Great Basin wildrye (*Elymus cinereus*) (Table - Seed Mix). The most frequent and dominant perennial grass species is crested wheatgrass, which is followed by the weedy species bulbous bluegrass (*Poa bulbosa*). Bulbous bluegrass was sampled in 2001 and has steadily increased over the duration of the study in frequency and cover. Other perennial grass species include Kentucky bluegrass (*P. pratensis*), Sandberg bluegrass (*P. secunda*), orchard grass (*Dactylis glomerata*), mountain rye (*Secale montanum*), and thickspike wheatgrass (*Agropyron dasystachyum*). The weedy annual species Japanese chess (*Bromus japonicus*) and cheatgrass (*B. tectorum*) were dominant species within the herbaceous understory in 1996, but have significantly decreased over the duration of the study in frequency and cover (Table - Herbaceous Trends).

Forbs are also abundant, and several useful species are found on the site. In 1996 and 2001, the annual species yellow salsify (*Tragopogon dubius*) was the dominant forb, but decreased significantly in 2006. The seeded species alfalfa (*Medicago sativa*) and small burnet (*Sanguisorba minor*) (Table - Seed Mix) were also abundant in 1996, but have varied in frequency and production over the duration of the study. Overall, seeded forbs have established well. The nested frequency of perennial forbs increased in 2001, but decreased in 2006. Some utilization was noted on alfalfa and yellow salsify. Annual species included autumn willow weed (*Epilobium brachycarpum*), Douglas knotweed (*Polygonum douglasii*), tumble mustard (*Sisymbrium altissimum*), and pale alyssum (*Alyssum alyssoides*) (Table - Herbaceous Trends).

Soil: The study is part of the Hoskin-Rock outcrop complex, and is likely part of the Hoskin component. These soils occur on mountainsides. The parent material consists of colluvium over residuum derived from conglomerate (Soil Survey Staff 2011). The soil texture is a clay loam to sandy clay loam texture with a neutral soil reaction (pH 7.2) (Table - Soil analysis Data). Bare ground cover is rare with the occasional patch of the bare soil formed by gopher activity. Protective ground cover is provided by a high amount of vegetation and litter (Table - Basic Cover). There is very little rock in the soil profile or on the soil surface. No erosion has been apparent and the soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density for mountain big sagebrush displayed no change at 220 plants/acre. Decadence and poor vigor were not observed within the sagebrush population. Recruitment of young sagebrush decreased from 100% of the population to 64%.
- **2001 to 2006 - slightly up (+1):** The density for mountain big sagebrush increased 27% to 280 plants/acre. Decadence and poor vigor were not observed within the sagebrush population. Recruitment of young sagebrush were absent to the population.
- **2006 to 2011 - slightly down (-1):** The density for mountain big sagebrush decreased 21% to 220 plants/acre. Decadence and poor vigor increased from 0% to 9%. Recruitment of young sagebrush was not observed within the population.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 69%, and cover increased from 13% to 25%. Mountain brome (*Bromus carinatus*) and Sandberg bluegrass increased significantly in nested frequency. Sandberg bluegrass increased in cover from near 0% to 6%. The weedy perennial species bulbous bluegrass increased significantly in nested frequency, and increased in cover from less than 1% to 5%. Mountain rye decreased significantly in nested frequency. The weedy annual species Japanese chess had a significant decrease in nested frequency, and decreased in cover from 21% to 3%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar, and cover decreased slightly to 20%. The perennial species crested wheatgrass and thickspike wheatgrass increased significantly in nested frequency. The weedy species bulbous bluegrass increased to 7% cover. The weedy annual species cheatgrass increased significantly in nested frequency, and increased in cover from 1% to 4%.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar, and cover increased slightly to 23%. The weedy perennial species bulbous bluegrass increased significantly in nested frequency, and increased in cover to 17%. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover from 6% to 1%. The weedy annual species Japanese chess and cheatgrass decreased significantly in nested frequency.

Forb:

- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial forbs increased 68%. Wild onion (*Allium sp.*) and American vetch (*Vicia americana*) increased significantly in nested frequency. American vetch increased in cover from less than 1% to 3%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 17%. Wild onion increased significantly in nested frequency. Alfalfa decreased significantly in nested frequency, and decreased in cover from 6% to 2%. American vetch had a significant decrease in nested frequency, and decreased in cover to 1%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 37%. Wild onion increased significantly in nested frequency, and increased in cover from 1% to 5%. Alfalfa increased significantly in nested frequency, and increased in cover from 2% to 8%. Common dandelion (*Taraxacum officinale*) and American vetch increased significantly in nested frequency, and increased in cover from less than 1% to 1% and to 4%, respectively.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 5, study no: 15

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	0.1	0.0	0.0	25.2	-18.3	10.0	0.0	17.0	Very Poor
01	0.2	0.0	0.0	30.0	-3.6	10.0	0.0	36.6	Very Poor-Poor
06	0.6	0.0	0.0	30.0	-3.7	10.0	0.0	36.8	Very Poor-Poor
11	2.0	0.0	0.0	30.0	-2.0	10.0	0.0	40.0	Poor

SEED MIX--

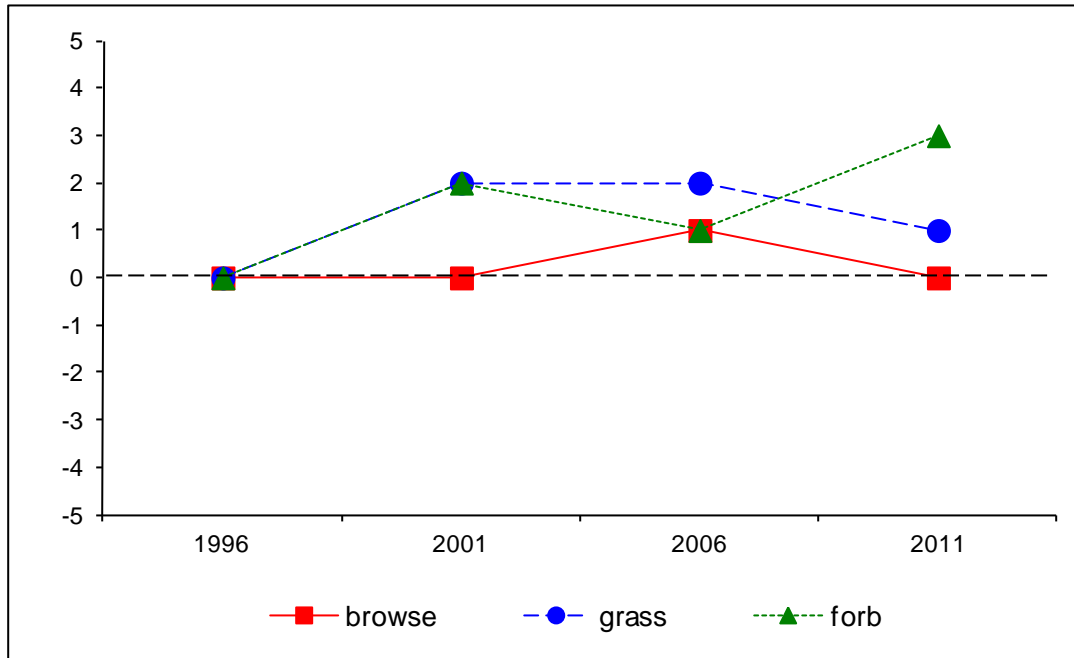
Management Unit 5, Study no: 15

Project Name: Redrock Burn	
Application: n/a	Acres: n/a
Seed Type	lbs in mix
G Big Bluegrass	600
G Bluebunch Wheatgrass 'goldar'	450
G Bromgrass, Regar	1200
G Crested Wheatgrass 'Hycrest'	1500
G Great Basin Wildrye 'Common'	200
G Orchardgrass 'Paiute'	1500
F Alfalfa 'Ladak'	3000
F Cicer Milkvetch	500
F Lewis Flax	600
F Small Burnet 'Delar'	2400
F Yellow Sweetclover	1200
B Rubber Rabbitbrush	800
B Sagebrush, Big Basin	1500
B Sagebrush, Mountain	1500
Total Pounds:	16950

Trend Summary

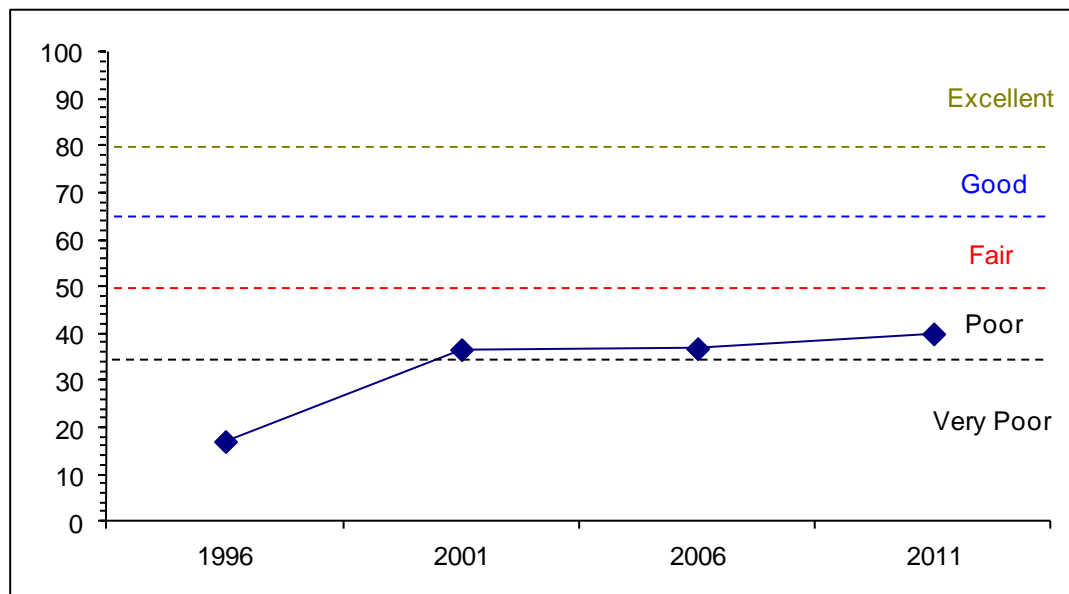
CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 5 Study no: 15



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--

Management unit 5, Study no: 15



HERBACEOUS TRENDS--
Management unit 05, Study no: 15

T y p e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a180	a183	b228	b255	9.30	12.78	12.04	17.63
G	Agropyron dasystachyum	ab6	a1	b17	ab3	.06	.03	.11	.06
G	Agropyron intermedium	-	2	1	3	-	.03	.15	.03
G	Agropyron spicatum	27	34	15	35	.66	2.72	.80	1.58
G	Bromus brizaeformis (a)	-	10	3	3	-	.22	.01	.00
G	Bromus carinatus	a-	b22	b17	b25	-	1.25	.59	.90
G	Bromus japonicus (a)	d394	c256	b156	a90	21.03	3.12	.96	1.28
G	Bromus tectorum (a)	b121	b138	c191	a47	3.38	1.42	4.00	1.42
G	Dactylis glomerata	b18	ab7	a1	a-	.16	.22	.03	-
G	Elymus cinereus	2	7	10	5	.85	.81	.30	.18
G	Festuca myuros (a)	-	-	-	3	-	-	-	.00
G	Melica bulbosa	-	-	-	1	-	-	-	.00
G	Phleum pratense	-	3	-	-	-	.00	-	-
G	Poa bulbosa	a-	b146	b180	c299	-	5.17	7.27	17.15
G	Poa fendleriana	-	-	-	3	-	-	-	.06
G	Poa pratensis	ab51	b63	a18	c120	1.11	1.50	.08	1.91
G	Poa secunda	a9	b197	b216	a40	.05	5.60	5.70	.51
G	Secale montanum	b14	a-	a1	a4	.40	.00	.03	.03
G	Stipa comata	-	-	-	5	-	-	-	.06
Total for Annual Grasses		515	404	350	143	24.41	4.76	4.97	2.72
Total for Perennial Grasses		307	665	704	798	12.61	30.14	27.12	40.13
Total for Grasses		822	1069	1054	941	37.02	34.91	32.09	42.85
F	Achillea millefolium	27	39	42	33	.23	.67	1.40	1.75
F	Agoseris glauca	a17	ab32	ab40	b46	.10	.45	.38	.53
F	Allium sp.	a-	b89	c162	d262	-	.35	.79	5.16
F	Alyssum alyssoides (a)	a11	b116	b102	c218	.03	1.15	.25	2.52
F	Artemisia ludoviciana	-	-	-	1	-	-	-	.00
F	Aster sp.	-	3	-	2	-	.00	-	.00
F	Camelina microcarpa (a)	-	21	21	4	-	.21	.05	.03
F	Chaenactis douglasii	-	3	-	-	-	.00	-	-
F	Cirsium undulatum	c39	bc21	ab11	a6	.66	.76	.08	.41
F	Collinsia parviflora (a)	a-	c69	bc41	b27	-	.35	.09	.07
F	Collomia grandiflora (a)	1	1	7	10	.00	.00	.01	.01
F	Collomia linearis (a)	13	18	2	13	.03	.06	.00	.03
F	Comandra pallida	b19	ab13	a3	a3	.08	.10	.00	.03
F	Crepis acuminata	-	-	-	6	-	-	-	.18
F	Descurainia pinnata (a)	a-	a5	a3	b45	-	.01	.00	.47
F	Draba sp. (a)	a-	a19	a24	b176	-	.08	.05	3.28
F	Epilobium brachycarpum (a)	b122	a13	c257	c238	1.10	.10	1.10	7.75
F	Erigeron pumilus	1	-	-	-	.00	-	-	-
F	Eriogonum umbellatum	-	-	-	3	-	-	-	.00
F	Erodium cicutarium (a)	a8	b77	c147	d217	.09	1.26	.93	4.88
F	Galium aparine (a)	1	5	-	11	.00	.03	-	.09

T y P e	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Gayophytum ramosissimum(a)	a ⁻	a ⁻	a ³	b ³⁸	-	-	.00	.43
F	Gilia sp. (a)	-	3	-	2	-	.00	-	.00
F	Grindelia squarrosa	a ²	a ⁻	ab ¹⁵	b ¹⁷	.03	-	.24	.92
F	Helianthus annuus (a)	a ³	a ⁻	b ²¹	a ⁻	.03	-	.09	-
F	Holosteum umbellatum (a)	-	37	67	65	-	.13	.15	.25
F	Lactuca serriola (a)	b ¹⁵⁴	a ⁶	a ³⁶	c ²⁸⁰	1.77	.18	.33	8.74
F	Lappula occidentalis (a)	a ⁻	a ³²	a ⁷	b ¹⁷⁸	-	.14	.01	3.87
F	Linum lewisii	99	98	32	2	1.39	.71	.18	.03
F	Lithophragma sp.	-	-	-	2	-	-	-	.03
F	Machaeranthera canescens	a ⁴	a ⁻	b ¹⁶	a ⁻	.18	-	.04	-
F	Medicago sativa	ab ⁴⁸	b ⁶⁰	a ³²	b ⁷¹	1.71	6.19	1.58	8.10
F	Melilotus officinalis	ab ¹¹	b ⁷	b ²⁰	b ⁴	.48	.09	.93	.16
F	Microsteris gracilis (a)	a ⁻	a ¹	b ¹⁹	ab ⁵	-	.00	.06	.01
F	Onobrychis viciaefolia	-	-	-	-	-	.03	-	-
F	Phlox longifolia	2	9	-	-	.00	.01	-	-
F	Polygonum douglasii (a)	b ⁵⁰	a ³	a ³⁰	a ⁷	.19	.01	.05	.01
F	Ranunculus testiculatus (a)	-	-	4	4	-	-	.00	.03
F	Sanguisorba minor	b ³²	a ¹⁶	a ⁶	a ⁵	.60	.17	.24	.01
F	Sisymbrium altissimum (a)	16	35	15	22	.25	.61	.10	.44
F	Taraxacum officinale	a ⁻	ab ⁹	a ¹	b ²²	-	.19	.06	.67
F	Tragopogon dubius (a)	b ¹⁹⁰	b ¹⁹¹	a ⁷⁶	a ⁷⁸	3.86	8.22	.90	1.93
F	Vicia americana	a ¹¹	c ¹²⁴	b ⁵³	c ¹⁰⁸	.07	2.45	.46	3.72
Total for Annual Forbs		569	652	882	1638	7.38	12.59	4.25	34.91
Total for Perennial Forbs		312	523	433	593	5.57	12.24	6.42	21.77
Total for Forbs		881	1175	1315	2231	12.95	24.83	10.67	56.69

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

BROWSE TRENDS--

Management unit 05, Study no: 15

T y P e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	10	9	12	10	.10	.15	.44	1.61
B	Chrysothamnus nauseosus albicaulis	1	3	3	2	-	-	-	.18
B	Chrysothamnus viscidiflorus viscidiflorus	51	44	41	32	7.43	4.78	5.36	5.48
B	Gutierrezia sarothrae	22	11	0	9	1.45	.65	-	.03
B	Symphoricarpos oreophilus	3	4	3	4	.38	.15	.15	.00
Total for Browse		87	71	59	57	9.37	5.74	5.96	7.31

CANOPY COVER, LINE INTERCEPT--

Management unit 05, Study no: 15

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	1.98	1.45
Chrysothamnus nauseosus albicaulis	.43	.66
Chrysothamnus viscidiflorus viscidiflorus	9.19	7.18
Gutierrezia sarothrae	-	.45
Symphoricarpos oreophilus	.20	.21

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 05, Study no: 15

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	-	3.1	3.7

BASIC COVER--

Management unit 05, Study no: 15

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	63.68	64.11	53.64	81.79
Rock	.35	.51	.64	.04
Pavement	.20	2.60	2.07	.91
Litter	79.98	49.67	38.51	31.28
Cryptogams	.04	.08	.06	.08
Bare Ground	3.74	4.70	17.82	3.56

SOIL ANALYSIS DATA --

Management unit 05, Study no: 15, Study Name: Red Rock Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.5	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	6	1	-	-	-
Elk	1	-	5	-	-	27 (68)	-
Deer	5	11	42	11	50 (124)	40 (98)	-
Cattle	-	-	30	2	-	42 (104)	3 (7)

BROWSE CHARACTERISTICS--

Management unit 05, Study no: 15

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	25/31	
11	0	0	0	-	-	0	0	0	30/37	
<i>Artemisia tridentata vaseyana</i>										
96	220	100	0	0	80	0	0	0	17/9	
01	220	64	36	0	-	0	0	0	18/25	
06	280	0	100	0	-	21	36	0	22/22	
11	220	0	91	9	20	9	0	9	24/28	
<i>Chrysothamnus nauseosus albicaulis</i>										
96	20	0	100	-	-	0	0	0	25/25	
01	60	100	0	-	-	0	0	0	9/31	
06	60	0	100	-	-	0	0	0	27/39	
11	40	0	100	-	-	100	0	0	25/41	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
96	2200	7	92	1	-	0	0	0	17/28	
01	1360	1	87	12	-	0	0	0	15/25	
06	1220	0	98	2	-	0	0	0	19/30	
11	860	0	100	0	-	0	0	0	17/28	
<i>Gutierrezia sarothrae</i>										
96	1580	35	65	0	-	0	0	0	11/10	
01	580	0	93	7	-	0	0	0	8/10	
06	0	0	0	0	-	0	0	0	9/7	
11	180	33	67	0	-	0	0	0	9/11	
<i>Purshia tridentata</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	17/28	
11	0	0	0	-	-	0	0	0	25/36	
<i>Symphoricarpos oreophilus</i>										
96	80	50	50	-	-	0	0	0	23/32	
01	80	50	50	-	-	25	0	0	13/21	
06	60	33	67	-	-	0	0	0	19/31	
11	80	75	25	-	-	0	0	0	18/33	

SUMMARY WILDLIFE MANAGEMENT UNIT 5 - EAST CANYON

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Five interagency range trend studies were sampled in Unit 5 during the summer of 2011. All five of the studies [Tucson Hollow (5-2, East Canyon reservoir (5-3), Wanship (5-4), Barnard Creek (5-8), and Red Rock Canyon (5-15)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush, basin big sagebrush, or bitterbrush (*Purshia tridentata*) communities. The Wanship study is also considered to be elk winter range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains (Division 5). The Northern Mountains had a historic annual mean precipitation of 19.16 inches from 1895 to 2011. The mean annual PDSI of the Northern Mountains displays a cycle of several wet years followed by several drought years, over the course of study years in the unit. Over the course of the study wetter than normal years in the Northern Mountains included 1982-1986, 1993, 1995-1999, 2005, and 2011. Drought years included 1987-1992, 2000-2003 and 2007 (Figure 1 and Figure 2) (Time Series Data 2012). The 1961-1990 mean annual precipitation was 16-18 in. on the Wanship study; 20-24 in. on the East Canyon Reservoir, and Barnard Creek studies; and 24-28 in. on the Tucson Hollow, Red Rock Canyon, and Anshutz Ranch studies (PRISM Climate Group 2011).

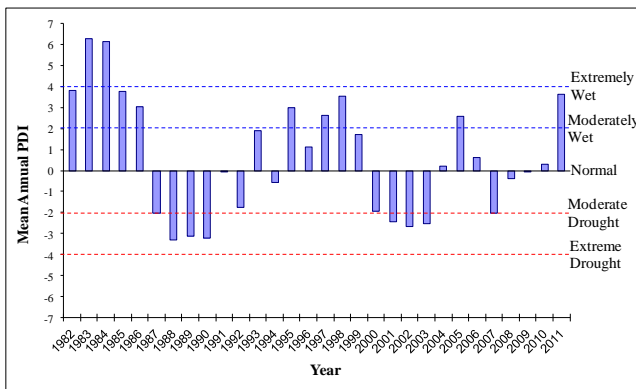


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

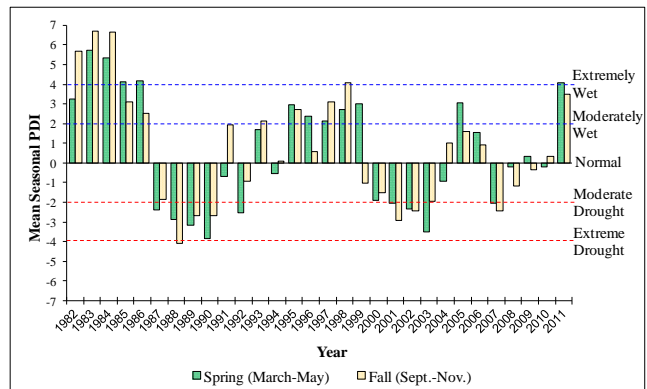


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

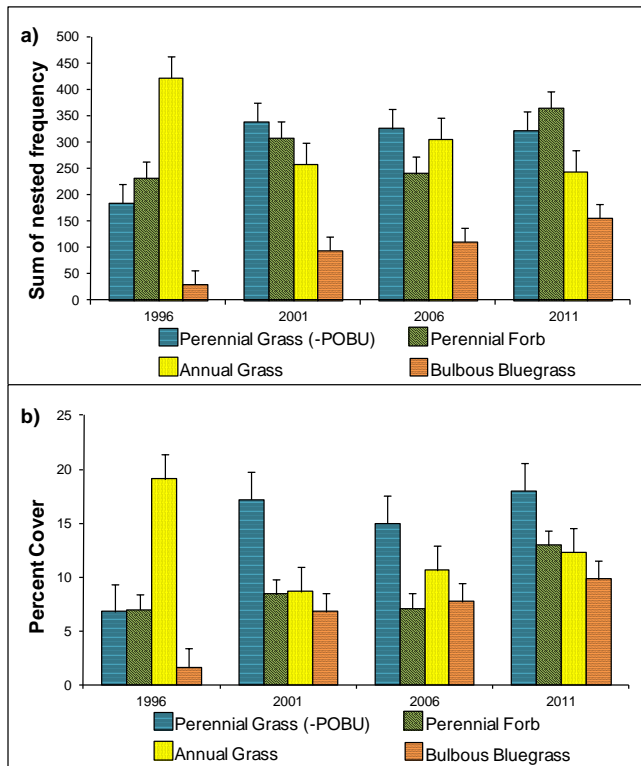


Figure 3. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass (*Poa bulbosa*) sum of nested frequency by year for WMU 5, East Canyon. b) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 5.

Mountain Big Sagebrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse trend for the unit has decreased since the outset of the study. Trend decreased slightly in 1990, and was down in 2006 (Figure 6). The dominant browse species on the East Canyon Reservoir, Wanship, and Red Rock Canyon studies is mountain big sagebrush. Basin big sagebrush is the dominant browse species on the Tucson Hollow study, but is a hybrid of basin big sagebrush and mountain big sagebrush. The two species were categorized as big sagebrush and summarized together in this report. The mean density of big sagebrush steadily decreased from 1996 to 2006, then remained similar in 2011 (Figure 4a). Despite the decrease in density, the mean cover of big sagebrush increased each year from 1996 to 2001, then remained similar in 2011 (Figure 4b). The mean decadence of big sagebrush has been fairly low on the studies since 1996, but with a significant increase in 2006 due to a large increase in decadence on the East Canyon Reservoir study in that year (Figure 4c).

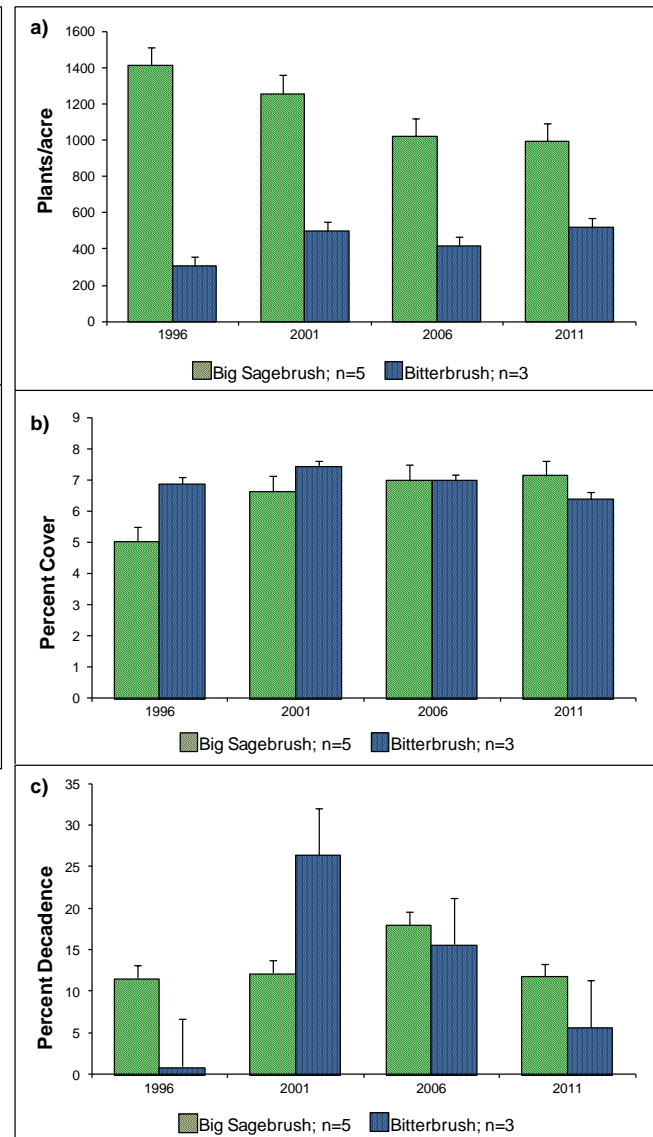


Figure 4. a) Mid-level potential sites mean density of big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Pushia tridentata*) by year for WMU 5, East Canyon. b) Mid-level potential sites mean cover of big sagebrush and antelope bitterbrush by year for WMU 5. c) Mid-level potential sites mean decadence of big sagebrush and antelope bitterbrush by year for WMU 5.

Antelope bitterbrush is the dominant browse species on the Barnard Creek study, and is also common on the Tucson Hollow and East Canyon Reservoir studies. The mean density of bitterbrush increased significantly in 2001, decreased slightly in 2006, then increased significantly in 2011 (Figure 4a). Mean cover of bitterbrush increased significantly in 2001, but has steadily decreased since that time (Figure 4b). Most of the decrease in cover is due to decreases on the Tucson Hollow and East Canyon Reservoir studies. Mean decadence of

bitterbrush has fluctuated from low to high rates. Much of the large increase in 2001 is due to a large increase in decadence on the Tucson Hollow study in that year (Figure 4c).

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit has increased over the course of the study years. Trend increased slightly in 1990, but had a more noticeable increase in 2001 (Figure 6). Desirable perennial grass species are generally diverse and abundant on these studies, but less desirable species are also abundant. Annual grass species such as cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are prevalent and often dominate the herbaceous component. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) is also common on many of the studies, and appears to be increasing throughout the unit. The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased significantly in 2001 and has remained similar since that time (Figure 3a). Mean cover of perennial grasses followed a similar trend, increasing significantly in 2001 and remaining similar through 2011 (Figure 3b). The mean sum of nested frequency of annual grasses decreased significantly in 2001 and has remained similar through 2011 (Figure 3a). Mean cover of annual grasses also decreased significantly in 2001, but has steadily increased through 2011. Mean cover of annual grasses remained significantly lower in 2011 than in 1996 (Figure 3b). The mean nested frequency and cover of bulbous bluegrass has steadily increased since 1996 (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend for the unit has increased over the course of the study years. Trend of forbs steadily increased from 1984 to 2001, decreased in 2006, but increased again in 2011 (Figure 6). Perennial forbs have been diverse and abundant, but generally provide less cover than perennial grasses within the sampled communities. The mean sum of nested frequency of perennial forbs was significantly higher in 2001 and 2011 than in 1996 and 2006 (Figure 3a). The mean cover of perennial forbs was relatively stable from 1996 to 2006, but increased significantly in 2011 (Figure 3b).

Browse Utilization & Animal Presence: Big sagebrush plants on most of the mid-level potential studies have displayed light to moderate use throughout the study years. Utilization was heavy on the East Canyon Reservoir study at the outset of the study in 1984, but has been light to moderate in subsequent sample years. Utilization has been moderate to heavy on the Wanship study throughout the course of the sample years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group transect data indicates that deer predominantly use these studies. The mean abundance of deer pellet groups on the unit decreased from high abundance in 2001 and 2006 to more moderate abundance in 2011. Deer pellet groups have been sampled in high abundance on all of the studies in at least one sample year. Deer use was much lower on the Tucson Hollow, Wanship, and Barnard Creek studies in 2011, but was much higher on the Red Rock Canyon study in that year. The mean abundance of elk pellet groups sampled was low in 2001, increasing to moderate abundance in 2006, and decreasing to low abundance again in 2011. The change in presence of both wildlife species was most likely due to the severe winter of 2010-2011, which likely limited access to some of the sites. Livestock use occurred only on the Wanship and Barnard Creek studies. The increase in the abundance of cattle pellets in 2006 was due to an increase on the Barnard Creek study in that year. Cattle sign has been low in other years (Figure 7a).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has increased slightly since 1996. Rankings have ranged from poor to fair since 1996. Most of the increase in scores is due to an increase in perennial grass cover, excluding bulbous bluegrass (Table 1 and Figure 5).

Discussion: The decline of sagebrush populations on these important winter ranges gives reason for concern. While there have been several periods of drought over the course of the study years (Figure 1 and Figure 2), lack of precipitation does not appear to be the primary cause of the decline. The cause of decline in the sagebrush populations in more recent years on this unit may be due to a sagebrush defoliator moth (*Aroga*

websteri) outbreak that occurred between the 2001 and 2006 sample years. The sagebrush defoliator moth is an obligate parasite of sagebrush (*Artemisia spp.*) that can have periodic outbreaks that cause substantial damage. This pest reduces the production and flowering of plants or, in high enough concentrations, can kill host plants. The defoliator moth was only detected on the East Canyon Reservoir study in 2006, but may have affected other sites in the area near this time as well.

The abundance of weedy annual species and the increase of the exotic weedy perennial grass bulbous bluegrass are also likely causes of sagebrush decline. These weedy species can form dense mats of cover that compete with seedling and young sagebrush plants which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event. Bulbous bluegrass is most prevalent on the East Canyon Reservoir and Red Rock Canyon studies, but has also shown marked increases on the other three studies as well. Annual grass species are particularly abundant on the Barnard Creek study, but are also prevalent on the other four studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	14.9	9.9	4.8	13.8	-12.8	9.0	-0.8	38.7	Poor
01	16.0	8.5	1.8	22.0	-5.8	7.9	-0.8	49.6	Poor-Fair
06	14.1	6.9	2.3	21.9	-6.7	7.2	-0.8	44.9	Poor
11	13.7	9.5	3.7	24.7	-6.5	8.7	-0.8	53.0	Fair

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=5) by year for WMU 5, East Canyon. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

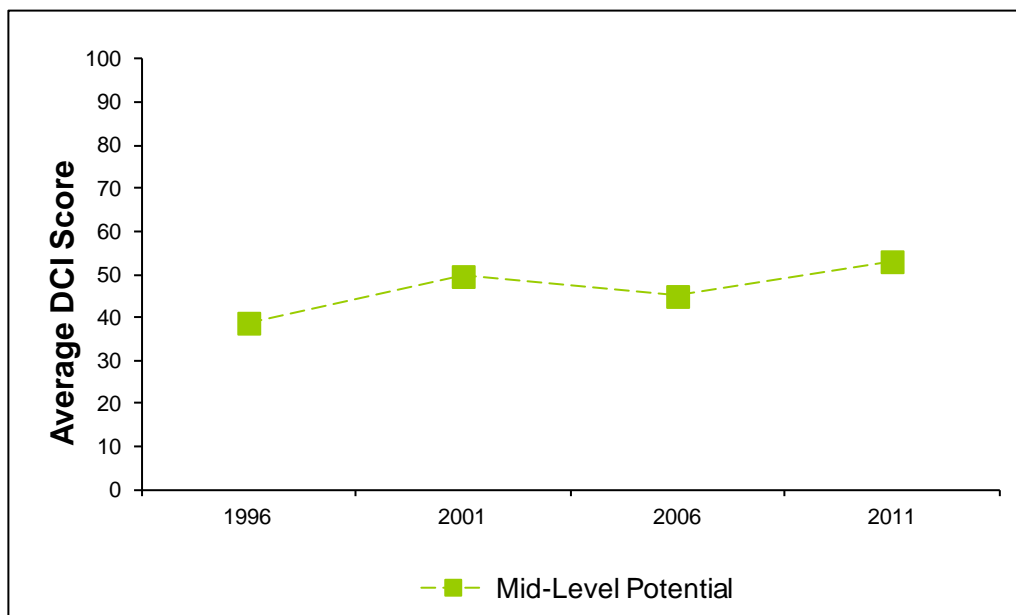


Figure 5. Mean mid-level (n=5) potential scale deer DCI scores by year for WMU 5, East Canyon. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

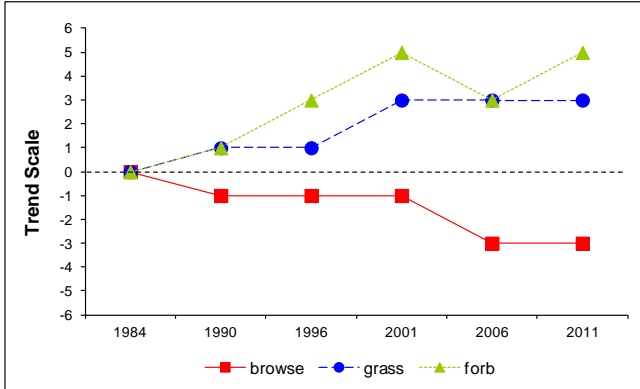


Figure 6. Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 5, East Canyon.

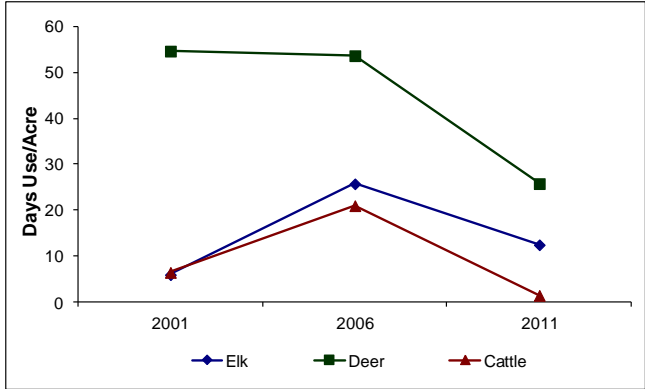
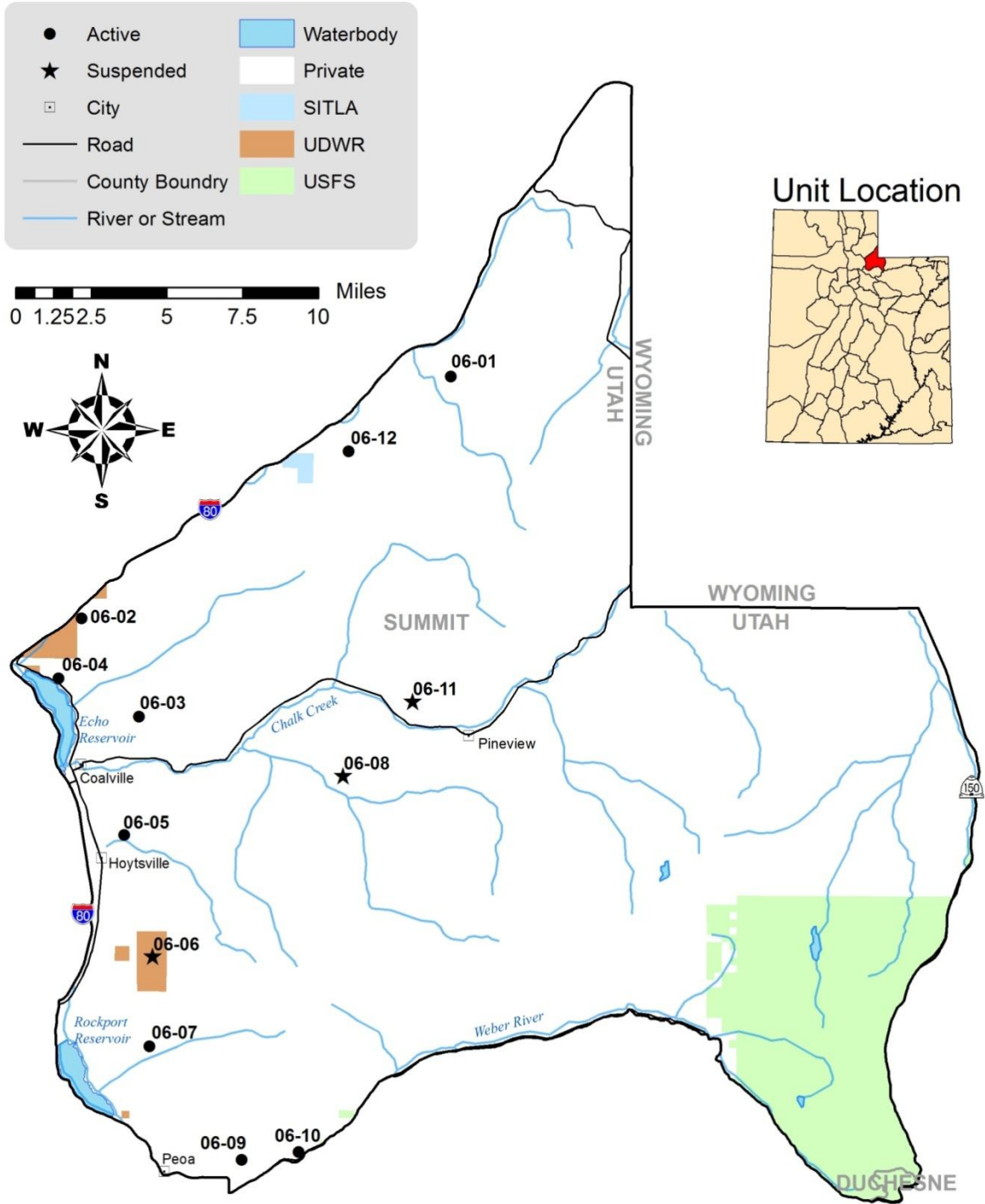


Figure 7. Mid-level potential sites mean animals days use/acre (n=5) by year for WMU 5, East Canyon.

Management Unit 6



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

According to the most current Big Game Management Plan (2006), the Chalk Creek Management Unit has an estimated 74,461 acres of winter range and 306,147 acres of summer range for mule deer range. The majority of the range is private with 96% of the winter range, and 89% of the summer range occurring on private property. 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 crucial 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.

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.

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.

Range Trend Studies

Nine interagency range trend studies were sampled in Unit 6 during the summer of 2011. A total of twelve studies have been established within Unit 6 since 1984. Six of the nineteen 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 1984. Ten studies (including the six studies which replaced the old line-intercept transects) were established in 1984, and of these studies one study [Anshutz Ranch (6-1)] samples a low sagebrush community; four studies [Echo Canyon Rest Area (6-2), Crandall Canyon (6-7), North Oakley Bench (6-9), and Mahogany Hills (6-10)] sample mountain brush communities; two studies [Spring Hollow Burn (6-3) and Upper Chalk Creek (6-11)] sample mountain big sagebrush communities; two studies [Echo Reservoir (6-4) and Spring Canyon (6-5)] sample juniper communities; and one study [Hixon Canyon (6-6)] samples a true mountain mahogany community. One study [South Fork Chalk Creek (6-8)] was established in 1990, and samples a mountain brush community. One study [Stag Canyon (6-12)] was established in 1996, and samples a mountain big sagebrush community.

In 1984, one study (Upper Chalk Creek) was suspended. In 1996, one study (South Fork Chalk Creek) was suspended. In 2006, one study (Hixon Canyon) was suspended. These sites were suspended for various reasons and if the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

ANSHUTZ RANCH - TREND STUDY NO. 6-1-11

Vegetation Type: Low Sagebrush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Summer (Calving habitat)

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA308UT](#)

Land Ownership: Private

Elevation: 6,580 ft (2,006 m)

Aspect: Northeast

Slope: 6%

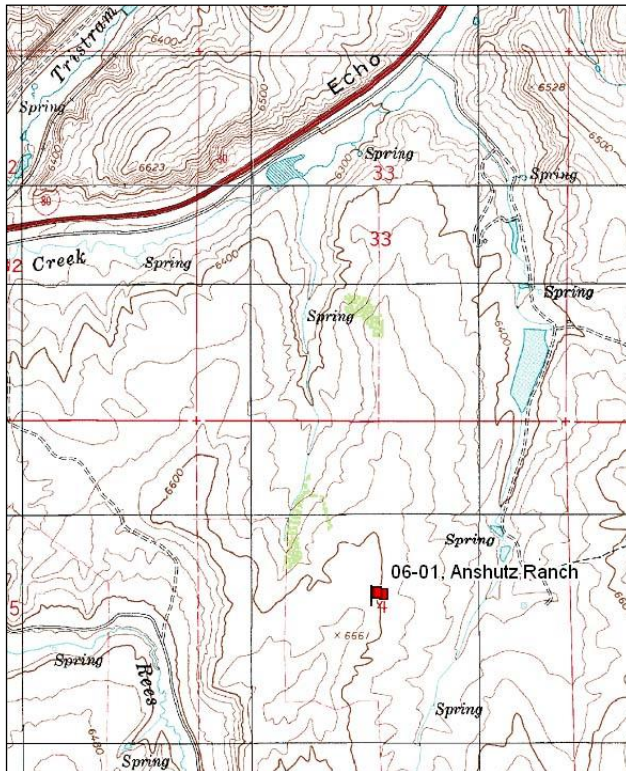
Transect bearing: 163° magnetic

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

Directions:

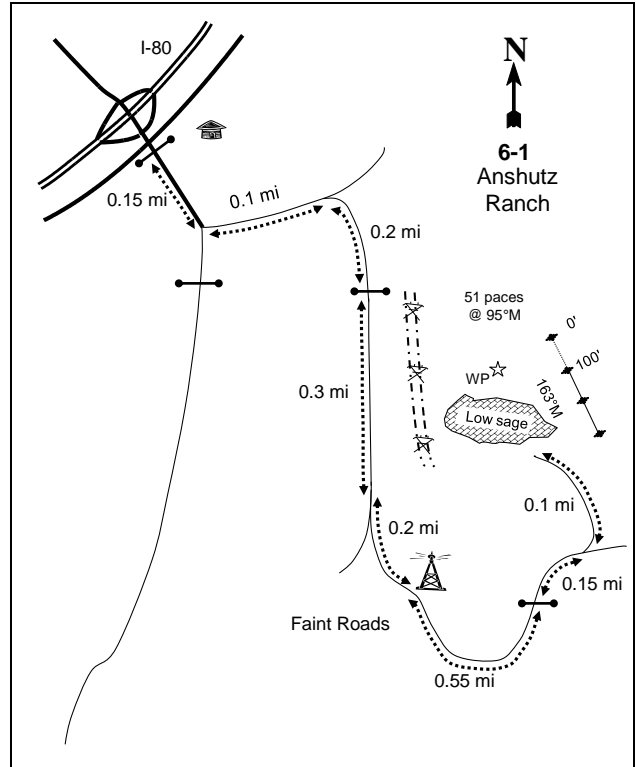
Proceeding east on I-80 from Echo, leave I-80 at exit number 185 and proceed east to Anshutz Ranch headquarters. From the main gate proceed 0.15 miles and turn left. Proceed 0.1 miles and turn right up the hill. Proceed 0.5 miles to an intersection near the radio tower. Turn left, proceed 0.8 miles (passing through the 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



Township: 4N Range: 7E Section: 4

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 486468 E 4550800 N

Site Information

Site Description: The study is located on private land south of Interstate 80, on the hills east of Rees Creek. The land is part of the Ensign Ranch and is utilized by sheep, cattle, and horses. The entire area is very open with little protective cover and gently rolling topography. A number of range types are closely intermixed in the general area. In swales, grass and/or basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) are often dominant. Gentle slopes and flat areas are typically mixed communities of basin big sagebrush and low sagebrush (*A. arbuscula*), with occasional Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). On the well-drained ridge tops, low sagebrush is dominant. Scattered around the whole area is an abundance of stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*), which are dominant in a few patches. The study area's vegetation consists of a mixture of basin big sagebrush and low sagebrush. Big game occupy the area is light to moderate numbers, but is chiefly of elk. The area is also important for sage grouse. Elk pellet groups were sampled in high abundance in 2001 and 2006, but in low abundance in 2011. Deer, cattle, and horse sign has been minimal since 2001. Grouse sign has also been sampled on the site, with the highest abundance in 2006, but no grouse pellets were sampled in 2011. Sign of sheep has been sampled infrequently, but a sheep carcass was identified in 2006 (Table - Pellet Group Data).

Browse: Browse composition is dominated by low sagebrush, which has provided over 60% of the browse cover since 1996 (Table - Browse Trends). The low sagebrush on the site is comprised of a dense population of low growing plants that has displayed mostly light to moderate use over the course of the study. Decadence in the low sagebrush population was high at the outset of the study, but has decreased through the sample years and was low in 2011. Recruitment of young low sagebrush plants has been fairly poor throughout the study years. Basin big sagebrush is also common on the site, but occurs mostly in the swales where soils are deeper. The basin big sagebrush population is moderately dense, and has had light to moderate use throughout the study years. Decadence in the big sagebrush population has been moderately high, with 20% or more of the plants classified as decadent in each sample year. Recruitment of young big sagebrush plants was excellent in the early years of the study, but has been poor since 1996. Broom snakeweed and stickyleaf low rabbitbrush are the only other common browse species. They appeared to be increasing in earlier readings, but population density estimates have decreased in later readings. Gray horsebrush (*Tetradymia canescens*) and winterfat (*Ceratoides lanata*) have also been sampled on the site, but in low densities (Table - Browse Characteristics).

Herbaceous Understory: Grasses on the site are fairly diverse, but are not overly abundant. Native perennial grass species are common and include species such as thickspike wheatgrass (*Agropyron dasystachyum*), bluebunch wheatgrass (*A. spicatum*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and Letterman needlegrass (*Stipa lettermani*). Cheatgrass is also on the site, but in low frequency and cover. The forbs species on the site are diverse, but are not overly abundant. Desert phlox (*Phlox austromontana*), longleaf phlox (*P. longifolia*), and silky milkvetch (*Astragalus cibarius*) have been the most abundant perennial forb species (Table - Herbaceous Trends).

Soil: The soil is in the Richsum-Heiners complex, likely part of the Richsum component. These soils occur on mountain slopes, with parent material derived from sandstone, conglomerate, and shale (Soil Survey Staff 2011). The soil texture is a clay loam with a slightly alkaline soil reaction (pH 7.6). Phosphorus may have limited availability for plant growth and development at 5.9 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Protective ground cover provided by vegetation and litter is abundant, with a low to moderate amount of bare ground cover (Table - Basic Cover). Some localized soil movement is apparent, but the soil erosion condition has been classified as stable since 2006.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was little change in the density of low sagebrush. Decadence and poor vigor each increased slightly from 50% to 55% and 5% to 13%, respectively. However, recruitment of young low sagebrush plants also increased slightly from 3% to 10%. Basin big sagebrush density decreased 25% from 8,598 plants/acre to 6,464 plants/acre, with a slight increase in decadence from 20% to 28%. Recruitment of young basin big sagebrush plants remained excellent.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of low sagebrush decreased to 13%, and poor vigor decreased to 4%. Decadence of basin big sagebrush decreased slightly to 21%, but poor vigor increased from 5% to 20%. Recruitment of young basin big sagebrush plants decreased from 51% to 8% of the population.
- **1996 to 2001 - slightly up (+1):** Density of low sagebrush increased by 19% from 8,040 plants/acre to 9,580 plants/acre, though cover decreased slightly from 22% to 21%. Decadence of low sagebrush increased to 22%, and poor vigor increased to 10%. Recruitment of young low sagebrush plants decreased from 5% to 2% of the population. Density of basin big sagebrush increased 42% from 2,200 plants/acre to 3,120 plants/acre, though cover remained similar at 7%. Decadence of big sagebrush increased to 35%, but poor vigor decreased to 4%. Recruitment of young big sagebrush plants decreased to just 4% of the population.
- **2001 to 2006 - slightly down (-1):** Low sagebrush density decreased 14% to 8,280 plants/acre, but cover increased slightly to 22%. Decadence of low sagebrush decreased slightly to 10%. Poor vigor remained similar in the low sagebrush population at 9%, but 200 plants/acre were classified as being infested with insects. It was not recorded that the sagebrush defoliator moth (*Aroga websteri*) 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. Basin big sagebrush density decreased by 29% to 2,200 plants/acre, but cover remained similar at 7%. Decadence of big sagebrush decreased slightly to 32%, but poor vigor increased to 19%. Recruitment of young plants in both sagebrush species remained poor.
- **2006 to 2011 - stable (0):** There was little change in the low sagebrush density, though cover increased to 28%. Decadence of low sagebrush decreased to 4%, and poor vigor decreased to 2% of the population. Basin big sagebrush density decreased 22% to 1,720 plants/acre, but cover remained similar at 7%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased 73%. There was a significant increase in the nested frequencies of bottlebrush squirreltail and Sandberg bluegrass.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though composition changed slightly. Bluebunch wheatgrass increased significantly in nested frequency, while bottlebrush squirreltail and Sandberg bluegrass decreased significantly.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 20%, but there was also a significant decrease in the nested frequency of the annual species cheatgrass. Cover of perennial species decreased from 11% to 6%, and cover of cheatgrass decreased from 2% to near 0%. There was a significant decrease in the nested frequencies of bluebunch wheatgrass and bottlebrush squirreltail.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased to 11%.
- **2006 to 2011 - stable (0):** The perennial grass sum of nested frequency remained similar, though cover decreased to 9%. The nested frequency of cheatgrass changed little, but cover increased to over 1%.

Forb:

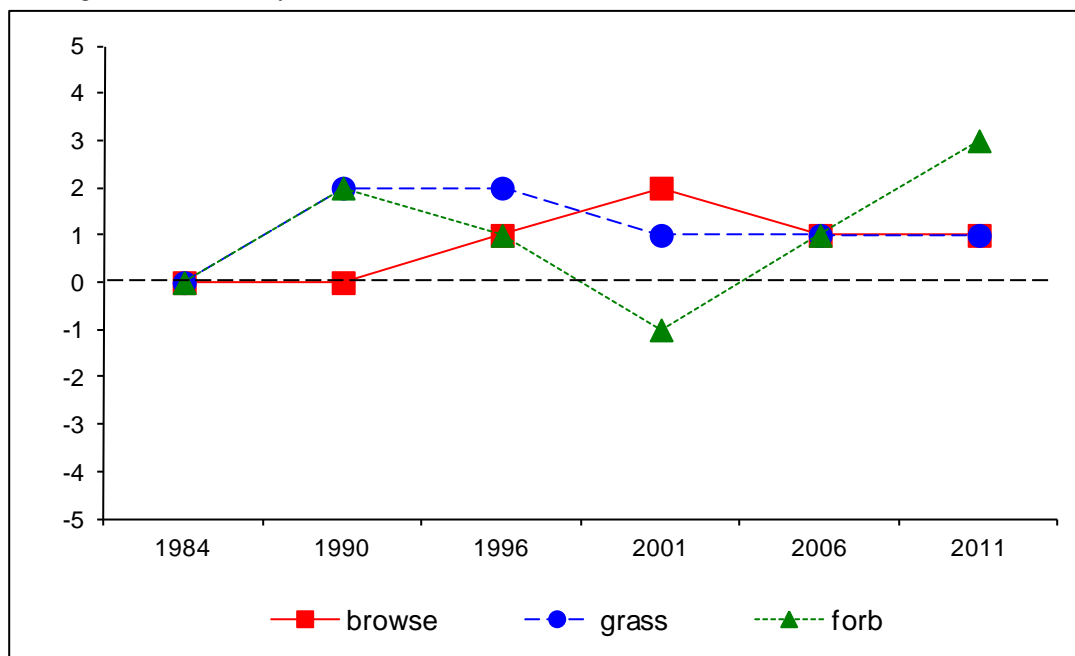
- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased two-fold.
- **1990 to 1996 - slightly down (-1):** There was a 28% decrease in the sum of nested frequency of perennial forbs, but much of this decrease may be due to the change in placement of quadrats with the change in sampling procedures.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 43%, and cover decreased from 4% to 2%. There was a significant decrease in the nested frequency of longleaf phlox.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased more than two-fold, and cover increased to 5%. Much of the increase was due to a significant increase in silky milkvetch, which was sampled for the first time in 2006.
- **2006 to 2011 - up (+2):** There was a 63% increase in the sum of nested frequency of perennial forbs, and cover increased to 10%. Lambstongue groundsel (*Senecio integerrimus*) was sampled for the first time in 2011, with good frequency and cover.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 6, study no: 1

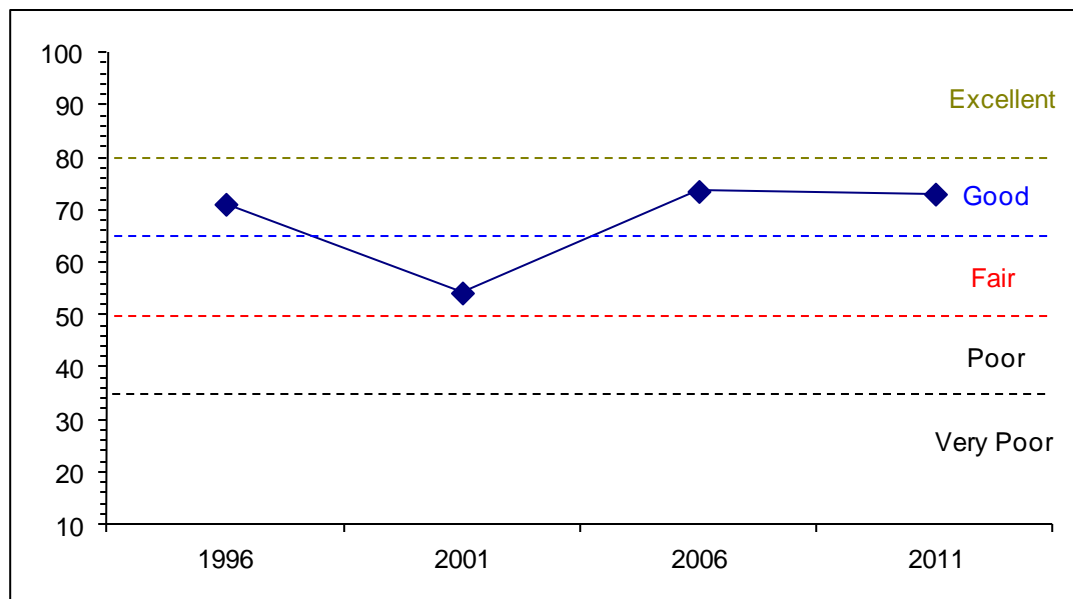
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	10.5	2.9	22.2	-1.5	7.0	0.0	71.1	Good
01	30.0	7.4	1.2	11.3	-0.1	4.3	0.0	54.2	Fair
06	30.0	10.4	1.5	21.8	-0.1	10.0	0.0	73.6	Good
11	30.0	12.8	3.7	17.6	-1.0	10.0	0.0	73.0	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 6 Study no: 1



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 6, Study no: 1



HERBACEOUS TRENDS--
Management unit 06, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a72	a71	a72	ab111	b157	c206	1.80	.76	4.19	3.72
G	Agropyron spicatum	a4	a12	c98	ab27	b43	a15	2.77	.38	1.10	.51
G	Bromus inermis	-	-	-	-	-	1	-	-	-	.00
G	Bromus japonicus (a)	-	-	2	3	-	-	.03	.03	-	-
G	Bromus tectorum (a)	-	-	b78	a25	a17	a43	2.00	.09	.08	1.34
G	Carex sp.	-	-	-	2	-	-	-	.03	-	-
G	Oryzopsis hymenoides	3	-	8	-	5	7	.09	-	.06	.15
G	Poa fendleriana	a-	a-	bc26	c33	b6	c39	.42	.53	.04	.42
G	Poa pratensis	a3	ab8	b27	ab11	ab11	ab11	.75	.10	.24	.08
G	Poa secunda	a76	d230	bc154	c182	ab108	ab114	2.01	2.61	2.14	3.09
G	Sitanion hystrix	c118	d162	c127	b32	b50	a-	2.63	.46	.92	-
G	Stipa comata	17	9	14	14	19	6	.25	.59	.63	.04
G	Stipa lettermani	a5	abc23	ab10	abc19	c39	bc33	.35	.16	1.53	.73
Total for Annual Grasses		0	0	80	28	17	43	2.03	0.12	0.08	1.34
Total for Perennial Grasses		298	515	536	431	438	432	11.11	5.64	10.88	8.78
Total for Grasses		298	515	616	459	455	475	13.15	5.76	10.97	10.12
F	Achillea millefolium	4	13	7	8	7	8	.07	.21	.33	.30
F	Agoseris glauca	a4	a3	a-	a6	a3	b50	-	.03	.01	.79
F	Allium acuminatum	b44	a-	a-	a-	a7	c100	-	-	.01	.47
F	Alyssum alyssoides (a)	-	-	a-	a7	a13	b128	-	.02	.06	1.69
F	Antennaria rosea	ab35	c82	a10	ab16	b37	ab30	.27	.10	.61	.53
F	Arabis sp.	-	22	9	-	17	14	.02	-	.08	.03
F	Astragalus cibarius	a-	a-	a-	a-	b104	b102	-	-	1.13	1.62

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Astragalus convallarius</i>	11	5	7	18	9	18	.12	.19	.05	.19
F	<i>Astragalus utahensis</i>	-	-	-	3	1	8	-	.03	.00	.04
F	<i>Calochortus nuttallii</i>	a8	a2	a-	a-	a5	b34	-	-	.01	.13
F	<i>Castilleja linariaefolia</i>	-	-	-	-	-	1	-	-	.00	.03
F	<i>Cirsium undulatum</i>	a15	b40	a12	a6	a4	a4	.13	.12	.07	.03
F	<i>Collinsia parviflora</i> (a)	-	-	b43	a13	a3	b62	.14	.03	.00	.31
F	<i>Collomia linearis</i> (a)	-	-	a-	a24	a4	b115	-	.05	.01	.74
F	<i>Comandra pallida</i>	-	-	-	-	2	-	-	-	.15	-
F	<i>Cordylanthus ramosus</i> (a)	-	-	a-	b43	a-	a4	-	1.39	-	.01
F	<i>Cymopterus</i> sp.	a-	a-	a-	a-	a-	b9	-	-	-	.07
F	<i>Delphinium nuttallianum</i>	a-	a-	a-	a-	a-	b11	-	-	-	.10
F	<i>Epilobium brachycarpum</i> (a)	-	-	-	3	-	-	-	.01	-	-
F	<i>Erigeron pumilus</i>	bc47	c74	ab31	ab16	ab15	a17	.22	.12	.18	.42
F	<i>Eriogonum umbellatum</i>	a-	a1	a3	a5	a3	b34	.06	.21	.18	.47
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	4	-	-	-	.01	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	b18	a-	a-	a-	.03	-	-	-
F	<i>Linum lewisii</i>	a-	a-	a3	ab7	b16	ab11	.03	.04	.13	.24
F	<i>Lomatium</i> sp.	a-	a-	a-	a-	a3	b9	-	-	.01	.19
F	<i>Machaeranthera canescens</i>	a-	b9	a-	a-	a-	a-	-	.00	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	-	11	15	-	-	.04	.02
F	<i>Phlox austromontana</i>	a-	a2	bc60	bc46	c63	b37	1.36	.85	1.50	.55
F	<i>Phlox longifolia</i>	a40	c164	c158	a39	bc134	b111	1.16	.20	.58	.63
F	<i>Polygonum douglasii</i> (a)	-	-	b85	a27	a-	a3	1.08	.08	-	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	a14	a5	b51	c118	.03	.01	.17	1.23
F	<i>Senecio integerrimus</i>	a-	a-	a-	a-	a-	b57	-	-	-	2.00
F	<i>Senecio multilobatus</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Sphaeralcea coccinea</i>	1	2	-	-	-	-	-	-	-	-
F	<i>Taraxacum officinale</i>	-	9	8	5	2	3	.05	.01	.00	.06
F	<i>Tragopogon dubius</i> (a)	-	-	11	3	-	1	.02	.00	-	.00
F	Unknown forb-perennial	3	-	-	-	-	-	-	-	-	-
F	<i>Viola</i> sp.	a-	a-	a-	a-	a-	b38	-	-	-	.52
Total for Annual Forbs		0	0	171	129	82	446	1.31	1.61	0.30	4.03
Total for Perennial Forbs		212	428	308	177	432	706	3.52	2.16	5.10	9.49
Total for Forbs		212	428	479	306	514	1152	4.84	3.77	5.40	13.52

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	'11	'96	'01	'06	'11
B	Artemisia arbuscula	90	86	86	87	22.02	20.63	21.67	27.67
B	Artemisia tridentata tridentata	53	61	51	54	7.44	6.64	7.19	6.86
B	Ceratoides lanata	3	4	3	0	-	.01	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	94	89	83	83	5.53	4.28	4.36	5.15
B	Gutierrezia sarothrae	18	28	31	5	.28	1.20	1.05	.36
B	Tetradymia canescens	9	8	10	10	.03	.03	.21	-
Total for Browse		267	276	264	239	35.31	32.81	34.50	40.05

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 1

Species	Percent Cover	
	'06	'11
Artemisia arbuscula	27.14	30.31
Artemisia tridentata tridentata	11.60	13.58
Chrysothamnus viscidiflorus viscidiflorus	6.23	7.23
Gutierrezia sarothrae	1.04	.16
Tetradymia canescens	-	.13

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 1

Species	Average leader growth (in)	
	'06	'11
Artemisia arbuscula	0.7	1.1
Artemisia tridentata tridentata	0.9	1.9

BASIC COVER--

Management unit 06, Study no: 1

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	12.25	49.98	45.91	45.28	57.31
Rock	2.25	1.25	1.98	1.67	1.35	.83
Pavement	0	2.00	1.36	1.81	2.29	1.16
Litter	71.25	60.25	55.00	46.81	40.79	31.58
Cryptogams	.50	.50	.77	6.75	2.26	.66
Bare Ground	23.75	23.75	16.36	20.99	28.38	21.76

SOIL ANALYSIS DATA --

Management unit 06, Study no: 1, Study Name: Anshutz Ranch

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
13.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	-	-	1	-	-	1 (3)	-
Rabbit	11	7	18	2	-	-	-
Horse	-	2	1	1	6 (16)	1 (1)	-
Grouse	-	1	1	-	9 (21)	35 (86)	-
Elk	8	7	9	2	48 (117)	38 (93)	9 (22)
Deer	6	2	1	5	3 (8)	13 (31)	11 (28)
Cattle	1	-	2	1	4 (9)	4 (9)	2 (5)

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 1

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Artemisia arbuscula</i>									
84	7865	3	47	50	-	84	3	5	12/17
90	8531	10	35	55	533	.78	0	13	9/15
96	8040	5	82	13	40	18	1	4	9/20
01	9580	2	76	22	80	22	0	10	10/20
06	8280	3	87	10	500	1	0	9	11/21
11	8320	9	87	4	-	18	0	2	10/19
<i>Artemisia tridentata tridentata</i>									
84	8598	54	26	20	2466	38	3	2	27/35
90	6464	51	22	28	399	21	2	5	28/29
96	2200	8	71	21	-	49	5	20	29/34
01	3120	4	60	35	-	6	0	4	29/38
06	2200	3	65	32	20	9	0	19	31/35
11	1720	1	78	21	-	26	0	17	29/33
<i>Ceratoides lanata</i>									
84	66	0	100	0	-	0	0	0	7/3
90	0	0	0	0	-	0	0	0	-/-
96	60	33	67	0	-	33	0	0	7/8
01	140	0	86	14	-	43	0	14	6/9
06	60	33	67	0	-	33	67	0	5/5
11	0	0	0	0	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	16132	0	48	52	-	0	0	2	9/11
90	15064	12	35	53	-	2	0	28	9/13
96	8100	24	76	0	180	.98	0	.24	8/12
01	7340	1	92	7	40	0	0	1	7/11
06	6620	6	91	3	40	0	0	.90	8/13
11	5000	22	78	0	20	0	0	.40	6/11

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>										
84	8998	0	91	9	-	0	0	0	7/6	
90	8464	12	79	9	66	0	0	2	5/7	
96	900	9	91	0	-	0	0	0	5/6	
01	1620	1	99	0	-	4	0	0	6/11	
06	1200	10	90	0	-	0	0	0	6/9	
11	100	0	100	0	-	0	0	0	5/8	
<i>Tetradymia canescens</i>										
84	132	50	50	0	-	0	0	0	8/3	
90	66	0	100	0	-	100	0	0	4/5	
96	240	25	67	8	-	8	33	0	7/13	
01	180	0	67	33	-	0	0	11	6/12	
06	280	7	86	7	-	0	0	7	8/12	
11	220	9	91	0	-	0	0	0	8/15	

ECHO CANYON REST AREA - TREND STUDY NO. 6-2-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,000 ft (1,829 m)

Aspect: Northwest

Slope: 32%

Transect bearing: 80° magnetic

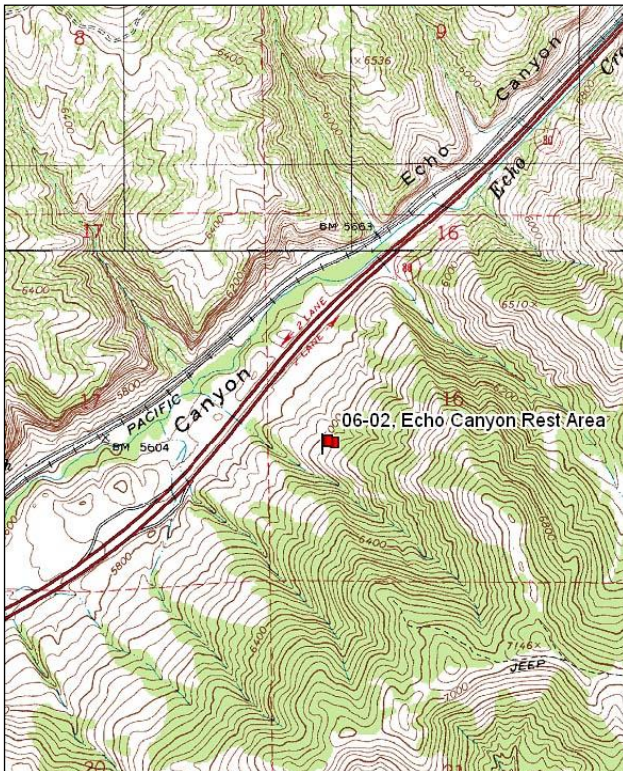
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:

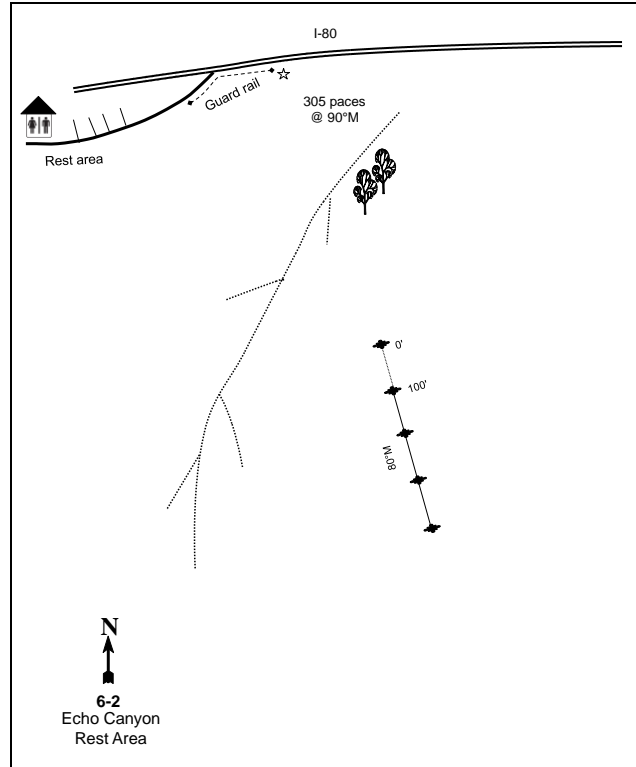
Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately 2 miles). From the rest area, follow the guard-rail on the right side of the freeway until it ends (approximately 100 yards).

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

GPS: NAD 83, UTM 12S 466801 E 4537935 N

ECHO CANYON REST AREA - TREND STUDY NO. 6-2

Site Information

Site Description: The study is located on the hillside east of the Echo Canyon Rest Area on the south side of Interstate 80. This study replaced a line-intercept transect established in 1977 which sampled a similar true mountain mahogany (*Cercocarpus montanus*) community. In 1984, a new study was established slightly up slope from the line-intercept transect, 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, on a ridge that is up slope and to the north of the 1984 study. A wild fire burned the study area in 1999, removing much of the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and true mountain mahogany that was found on the site. Deer pellet groups were sampled in moderate abundance in 2001 and 2006, but low abundance in 2011. Elk pellet groups were sampled in low abundance in 2001 and 2011, but moderate abundance in 2006. Sign of moose has also been sampled infrequently (Table - Pellet Group Data).

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, antelope bitterbrush (*Purshia tridentata*), and Saskatoon serviceberry (*Amelanchier alnifolia*). Two other species that are usually not considered key browse, mountain snowberry (*Symphoricarpos oreophilus*) and Gambel oak (*Quercus gambelii*), are also present and display some use. Mountain big sagebrush was the most abundant browse in 1996, providing the majority of the browse cover (Table - Browse Trends). However, the wildfire removed nearly all of the mountain big sagebrush from the site. The small population densities of serviceberry, mahogany, and bitterbrush plants have remained fairly similar prior to, and following the fire. Following the fire in 2001, it was noted that these key browse species were resprouting, primarily mountain mahogany and serviceberry. All three of these preferred browse species have had moderate to heavy utilization since 1996. Much 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. Gambel oak density increased following the fire (Table - Browse Characteristics), though cover has remained similar (Table - Browse Trends). Density of snowberry decreased initially following the fire, but has steadily increased since 2001 (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is an important component to this winter range. The grass component is diverse and abundant. The perennial species bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) dominate the grass component in cover. The annual grass species cheatgrass (*Bromus tectorum*) is also prevalent, and was particularly abundant in 2001 following the fire. There was a substantial increase in the nested frequency and cover of forb species following the fire. The increase in forbs was primarily due to an increase in the perennial species yarrow (*Achillea millefolium*) and American vetch (*Vicia americana*), as well as several annual species: pale alyssum (*Alyssum alyssoides*), littleflower collinsia (*Collinsia parviflora*), holosteum (*Holosteum umbellatum*), and bur buttercup (*Ranunculus testiculatus*).

Soil: The soil is in the Horrocks-Cutoff complex, which occurs on mountain slopes. Parent material consists of colluvium derived from andesite, quartzite, sandstone, and conglomerate (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a neutral reaction (pH 6.7) (Table - Soil Analysis Data). There is abundant vegetation and litter cover providing good protective ground cover, and keeping bare ground cover low (Table - Basic Cover). The soil erosion condition was classified as slight in 2001, following the fire, but has been stable since 2006.

Trend Assessments

Browse:

- **1996 to 2001 - down (-2):** Following the fire, the density of mountain big sagebrush decreased 97% from 2,440 plants/acre to 80 plants/acre, and cover decreased from 13% to 0%. Density of true mountain mahogany decreased by 29% from 420 plants/acre to 300 plants/acre, and cover decreased from 4% to 1%. Serviceberry and bitterbrush were infrequent prior to the fire, and have remained so. The density of Gambel oak increased over two-fold, but cover has remained similar.
- **2001 to 2006 - stable (0):** The density of serviceberry increased two-fold from 200 plants/acre to 440 plants/acre, but cover remained similar at 1%. Density of mountain big sagebrush increased to 160 plants/acre, but cover remained low. Mahogany density decreased from 300 plants/acre to 180 plants/acre.
- **2006 to 2011 - stable (0):** There was little change in any of the preferred browse species.

Grass:

- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial grasses decreased by 35%, and cover decreased from 21% to 16%. The nested frequency of cheatgrass remained similar, but cover increased from 3% to 8%.
- **2001 to 2006 - up (+2):** The perennial grass sum of nested frequency increased by 38% and cover increased to 22%. The nested frequency of cheatgrass increased significantly, but cover decreased slightly to 5%.
- **2006 to 2011 - up (+2):** There was a 31% increase in the sum of nested frequency of perennial grasses, and cover increased to 26%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

Forb:

- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased more than two-fold, and cover increased from 3% to 17%. Yarrow and American vetch increased significantly in nested frequency. Annual forb sum of nested frequency increased ten-fold, but annual species often increase dramatically following disturbance.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial forbs decreased 34%, and cover decreased to 5%. The sum of nested frequency of annual forbs remained high.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased 54%, and cover increased to 14%.

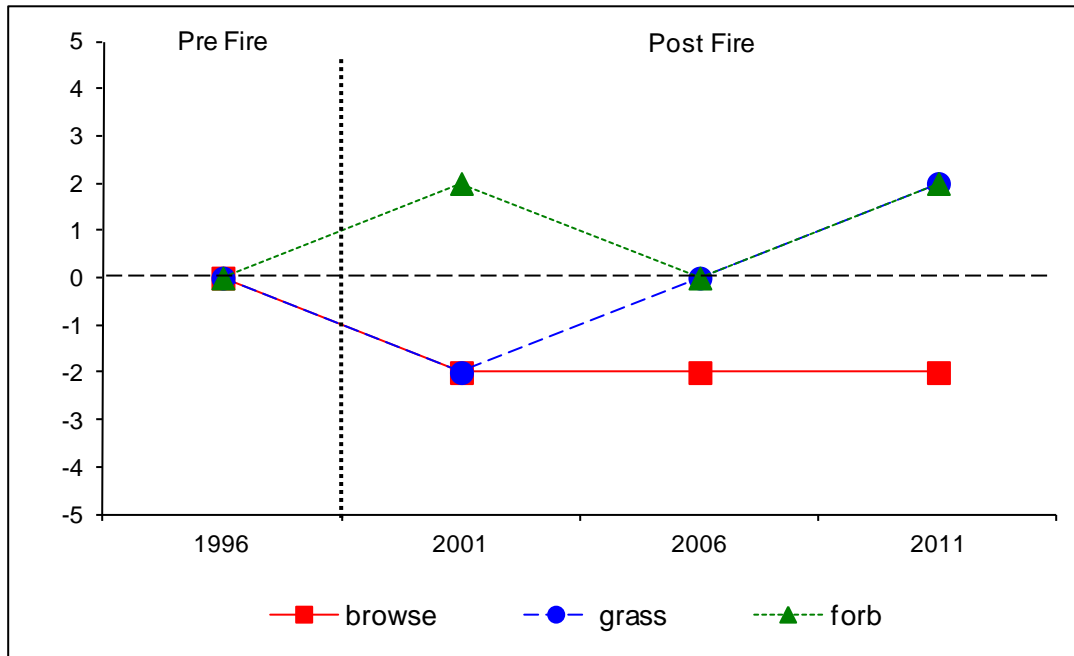
DEER DESIRABLE COMPONENTS INDEX - HIGH POTENTIAL SCALE --

Management unit 6, study no: 2

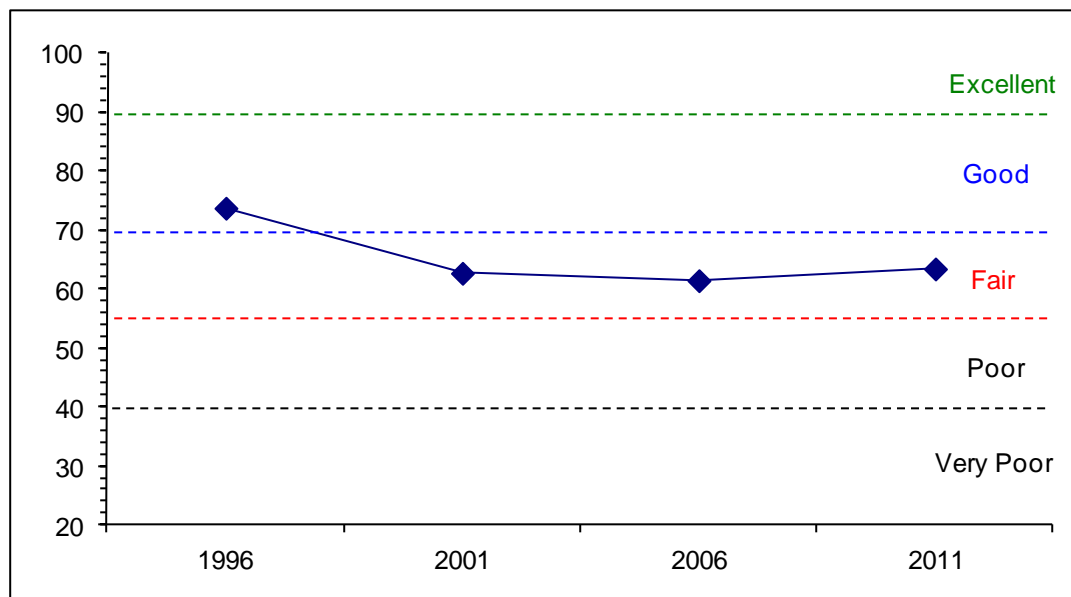
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	25.7	7.4	6.9	30.0	-2.5	6.2	0.0	73.7	Good
01	6.5	7.1	15.0	30.0	-6.0	10.0	0.0	62.7	Fair
06	7.8	12.9	4.6	30.0	-3.7	9.9	0.0	61.4	Fair
11	6.7	13.1	5.9	30.0	-2.3	10.0	0.0	63.4	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6, Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, HIGH POTENTIAL--
 Management unit 6, Study no: 2



HERBACEOUS TRENDS--
Management unit 06, Study no: 2

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	b155	a96	b160	c211	6.88	6.83	11.74	14.04
G	Bromus brizaeformis (a)	-	-	1	-	-	-	.00	-
G	Bromus carinatus	-	2	2	-	-	.15	.03	-
G	Bromus japonicus (a)	-	-	1	6	-	-	.00	.01
G	Bromus tectorum (a)	a142	a189	b268	a192	3.30	7.93	4.98	3.07
G	Carex sp.	-	-	1	-	-	.00	.03	-
G	Festuca myuros (a)	-	2	-	2	-	.00	-	.01
G	Festuca ovina	4	-	-	4	.03	-	-	.03
G	Koeleria cristata	3	1	2	-	.03	.00	.03	-
G	Oryzopsis hymenoides	-	-	1	2	.00	-	.15	.00
G	Poa bulbosa	a-	a-	a4	b16	-	-	.01	.25
G	Poa fendleriana	a6	ab14	b27	b26	.18	.57	1.11	.67
G	Poa secunda	b270	a171	a193	b256	13.49	8.03	8.32	10.74
G	Sitanion hystrix	-	-	3	-	-	-	.03	-
Total for Annual Grasses		142	191	270	200	3.30	7.94	4.99	3.09
Total for Perennial Grasses		438	284	393	515	20.62	15.60	21.48	25.75
Total for Grasses		580	475	663	715	23.93	23.54	26.47	28.85
F	Achillea millefolium	b105	c150	a43	a66	1.82	10.21	1.58	3.18
F	Agoseris glauca	a-	a2	b18	ab12	-	.00	.04	.12
F	Allium sp.	a4	b85	b61	c121	.03	.51	.49	.60
F	Alyssum alyssoides (a)	a23	b90	c174	d253	.11	3.04	.83	5.53
F	Ambrosia psilostachya	-	1	1	-	-	.15	.15	-
F	Antennaria rosea	1	1	3	5	.03	.03	.15	.30
F	Arabis sp.	1	7	2	-	.00	.04	.01	-
F	Aster sp.	3	-	4	1	.03	.03	.06	.00
F	Astragalus cibarius	a-	b12	ab6	ab8	-	.37	.18	.18
F	Astragalus convallarius	3	6	1	-	.03	.16	.00	-
F	Calochortus nuttallii	a-	ab3	b17	b13	-	.01	.06	.05
F	Castilleja linariaefolia	3	1	-	-	.03	.03	-	-
F	Cirsium undulatum	13	33	12	21	.11	.79	.23	.34
F	Collinsia parviflora (a)	a12	c168	b100	b91	.03	3.34	.40	.74
F	Collomia linearis (a)	1	7	10	3	.00	.02	.02	.01
F	Comandra pallida	3	-	-	-	.00	-	-	-
F	Crepis acuminata	3	8	14	16	.00	.10	.10	.16
F	Cryptantha sp.	-	-	-	6	-	-	-	.01
F	Descurainia pinnata (a)	a-	b37	a1	a3	-	.21	.00	.03
F	Draba verna (a)	a-	b57	b39	b44	-	.20	.15	.16
F	Epilobium brachycarpum (a)	a-	c89	d104	b13	-	.46	.89	.17
F	Erigeron pumilus	b26	b24	a6	ab10	.65	.32	.04	.12
F	Erodium cicutarium (a)	-	-	4	3	-	-	.03	.01
F	Gayophytum ramosissimum(a)	a3	a3	a2	b15	.00	.00	.01	.03
F	Hackelia patens	3	-	-	6	.03	.15	.03	.15
F	Hedysarum boreale	-	-	2	-	-	-	.00	-

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Helianthella uniflora</i>	-	-	-	6	-	.00	-	.16
F	<i>Holosteum umbellatum</i> (a)	_a 6	_b 81	_b 74	_c 170	.01	1.18	.27	2.65
F	<i>Hydrophyllum</i> sp.	-	-	-	6	-	-	-	.07
F	<i>Lactuca serriola</i> (a)	-	1	-	6	-	.00	-	.01
F	<i>Lappula occidentalis</i> (a)	_a -	_a -	_a -	_b 43	-	-	-	2.59
F	<i>Lithophragma</i> sp.	-	-	-	12	-	-	-	.07
F	<i>Lomatium triternatum</i>	_a -	_a 4	_a 12	_b 35	-	.01	.10	.19
F	<i>Microsteris gracilis</i> (a)	_a -	_b 14	_c 55	_c 45	-	.08	.78	.12
F	<i>Orogenia linearifolia</i>	-	-	-	2	-	-	-	.01
F	<i>Penstemon</i> sp.	1	-	3	-	.00	-	.00	-
F	<i>Phlox longifolia</i>	6	3	-	-	.02	.03	-	-
F	<i>Polygonum douglasii</i> (a)	_a 6	_a 2	_b 38	_a -	.01	.00	.11	-
F	<i>Ranunculus testiculatus</i> (a)	_a 9	_b 71	_c 120	_b 78	.02	1.31	1.19	.71
F	<i>Schoenocrambe linifolia</i>	_a -	_b 20	_a 4	_a 4	-	.53	.04	.01
F	<i>Senecio integerrimus</i>	-	2	-	2	-	.00	-	.01
F	<i>Sisymbrium altissimum</i> (a)	_a -	_b 13	_a -	_a -	-	.22	-	-
F	<i>Smilacina</i> sp.	-	-	-	2	-	-	-	.18
F	<i>Sphaeralcea coccinea</i>	-	-	1	-	-	-	.15	-
F	<i>Tragopogon dubius</i> (a)	_a -	_a -	_a 3	_b 18	-	-	.03	.06
F	<i>Verbascum thapsus</i>	_a -	_b 16	_a 1	_a -	-	.11	.03	-
F	<i>Vicia americana</i>	_a 35	_{bc} 120	_b 116	_c 149	.28	2.97	1.40	7.97
F	<i>Zigadenus paniculatus</i>	-	1	2	3	-	.03	.03	.01
Total for Annual Forbs		60	633	724	785	0.21	10.13	4.75	12.85
Total for Perennial Forbs		210	499	329	506	3.11	16.63	4.92	13.93
Total for Forbs		270	1132	1053	1291	3.33	26.77	9.68	26.79

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	6	10	10	11	.07	.63	.93	.76
B	<i>Artemisia tridentata vaseyana</i>	75	3	7	7	12.75	-	.38	.21
B	<i>Cercocarpus montanus</i>	18	11	8	9	3.73	.97	.71	.39
B	<i>Chrysothamnus nauseosus albicaulis</i>	0	2	1	1	-	-	.15	.15
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	55	52	56	54	3.87	5.69	6.55	6.53
B	<i>Gutierrezia sarothrae</i>	4	3	7	5	.06	.18	-	.06
B	<i>Opuntia</i> sp.	1	1	1	0	-	-	-	-
B	<i>Purshia tridentata</i>	2	2	2	2	1.00	1.25	1.70	1.70
B	<i>Quercus gambelii</i>	6	9	9	8	2.57	2.22	2.13	2.00
B	<i>Symphoricarpos oreophilus</i>	32	32	33	38	4.96	4.35	5.69	6.66
Total for Browse		199	125	134	135	29.04	15.31	18.27	18.47

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 2

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.36	1.13
Artemisia tridentata vaseyana	.33	.75
Cercocarpus montanus	1.13	.93
Chrysothamnus nauseosus albicaulis	.23	.16
Chrysothamnus viscidiflorus viscidiflorus	11.14	6.83
Gutierrezia sarothrae	.10	.10
Purshia tridentata	1.14	1.89
Quercus gambelii	4.23	2.38
Symphoricarpos oreophilus	9.61	10.25

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	1.8	3.5	0.4
Artemisia tridentata vaseyana	-	3.6	0.8
Cercocarpus montanus	2.4	3.3	0.7

BASIC COVER--

Management unit 06, Study no: 2

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	51.15	61.48	50.06	62.47
Rock	1.75	2.42	3.21	1.78
Pavement	2.69	3.64	5.06	3.42
Litter	55.56	36.42	38.07	34.81
Cryptogams	6.57	1.93	2.82	5.84
Bare Ground	7.26	14.42	16.09	10.08

SOIL ANALYSIS DATA --

Management unit 06, Study no: 2, Study Name: Echo Canyon Rest Area

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
14.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	3	4	28	-	-	-	-
Moose	1	-	-	-	-	1 (1)	-
Elk	6	-	18	26	7 (18)	36 (89)	15 (36)
Deer	38	12	28	19	26 (64)	27 (68)	7 (17)

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 2

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier alnifolia</i>									
96	120	50	50	0	20	0	67	17	34/36
01	200	40	30	30	-	10	0	0	24/31
06	440	36	59	5	120	9	36	0	24/33
11	360	44	50	6	-	72	17	0	24/36
<i>Artemisia tridentata vaseyana</i>									
96	2440	5	56	39	-	61	26	37	22/37
01	80	100	0	0	-	0	0	0	21/35
06	160	13	88	0	-	25	13	0	21/23
11	160	0	75	25	-	75	0	0	20/26
<i>Cercocarpus montanus</i>									
96	420	14	86	0	-	52	33	0	49/47
01	300	13	33	53	-	0	0	0	25/31
06	180	0	56	44	-	11	89	33	23/27
11	260	0	100	0	-	38	38	0	23/35
<i>Chrysothamnus nauseosus albicaulis</i>									
96	0	0	0	0	-	0	0	0	-/-
01	40	100	0	0	-	0	0	0	-/-
06	20	0	100	0	-	0	0	0	21/34
11	20	0	0	100	-	100	0	0	19/33
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	2400	3	94	3	-	0	0	4	15/21
01	2320	8	92	0	-	0	0	0	14/22
06	2460	9	80	11	60	0	0	2	17/27
11	2720	8	85	7	-	0	0	0	15/26
<i>Gutierrezia sarothrae</i>									
96	120	0	100	0	-	0	0	0	7/8
01	80	25	75	0	-	0	0	0	8/16
06	160	13	75	13	-	0	0	0	8/12
11	120	0	100	0	-	0	0	0	6/10
<i>Opuntia sp.</i>									
96	40	0	100	-	-	0	0	0	6/26
01	20	0	100	-	-	0	0	0	4/9
06	20	0	100	-	-	0	0	0	6/12
11	0	0	0	-	-	0	0	0	4/12
<i>Purshia tridentata</i>									
96	60	0	100	0	-	0	33	0	34/64
01	40	0	50	50	-	0	0	0	12/37
06	40	0	100	0	-	0	100	0	16/51
11	40	0	100	0	-	0	100	0	18/73

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Quercus gambelii</i>										
96	760	61	34	5	80	8	0	0	16/29	
01	2040	100	0	0	-	0	0	0	33/18	
06	2880	8	89	3	-	0	0	0	36/27	
11	1620	14	83	4	-	0	0	4	21/12	
<i>Symphoricarpos oreophilus</i>										
96	1280	27	72	2	-	34	13	5	22/43	
01	680	9	88	3	-	0	0	0	20/47	
06	1240	11	89	0	-	3	0	0	22/46	
11	1520	17	83	0	-	11	1	0	25/48	
<i>Tetradymia canescens</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	12/21	

SPRING HOLLOW BURN - TREND STUDY NO. 6-3-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Summer (Calving habitat)

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: Private

Elevation: 6,500 ft (1,829 m)

Aspect: Southeast

Slope: 7%

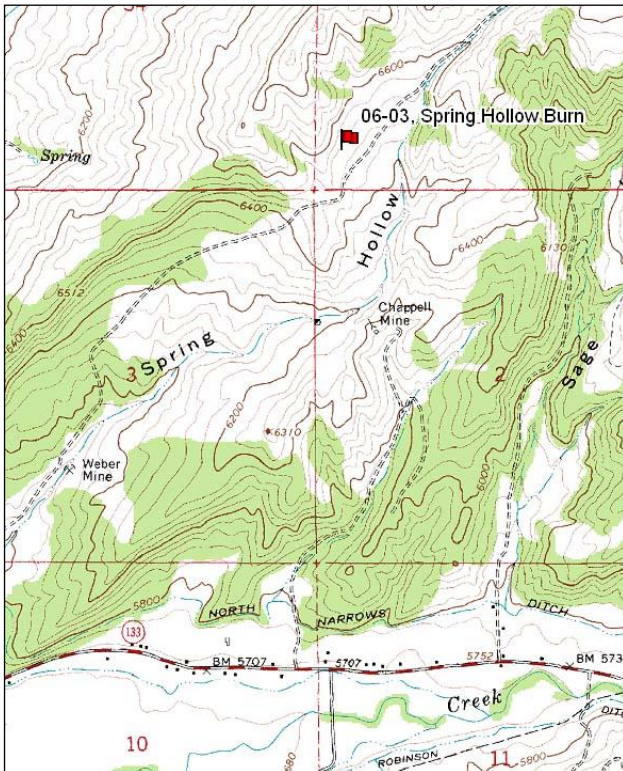
Transect bearing: 165° magnetic

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

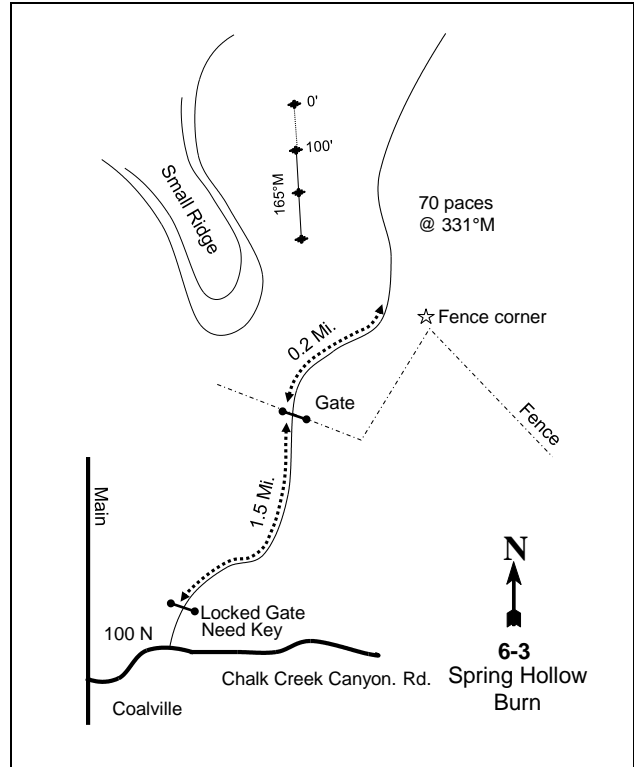
Directions:

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

GPS: NAD 83, UTM 12S 469866 E 4532699 N

SPRING HOLLOW BURN - TREND STUDY NO. 6-3

Site Information

Site Description: The study is located on an old burn in the upper part of Spring Hollow, near an old line-intercept study. Prior to the fire the area was dominated by sagebrush (*Artemisia spp.*), grass, Utah juniper (*Juniperus osteosperma*), and pinyon pine (*Pinus edulis*) communities. After the burn, the area was seeded with perennial grasses, mostly crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*). The area 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 crucial for wildlife due to the lack of browse. Deer, elk, and cattle pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data). In 1984, deer pellet groups occurred frequently, and three deer and one elk antler sheds were found. The study was not read in 1996 because access to the private property was not obtained.

Browse: Browse is very limited on the site. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Saskatoon serviceberry (*Amelanchier alnifolia*) are the most abundant preferred species, but both occur in low density. Serviceberry has had moderate to heavy use, and sagebrush has had mostly moderate use. The sagebrush defoliator moth (*Aroga websteri*) was identified on a few sagebrush plants in 2006, but was not sampled in the density measurements. Broom snakeweed (*Gutierrezia sarothrae*) is the most abundant species (Table - Browse Characteristics), and provides the majority of the limited browse cover on the site (Table - Browse Trends).

Herbaceous Understory: The herbaceous understory is dominated by crested wheatgrass and Sandberg bluegrass (*Poa secunda*). Other perennial species are rare. Forbs are diverse and abundant on the site. Both perennial and annual forbs have steadily increased since 2001 (Table - Herbaceous Trends).

Soil: The soil is in the Ant Flat series, which occur on fan remnants. Parent material consists of slope alluvium derived from sandstone, shale, and conglomerate (Soil Survey Staff 2011). The soil texture is a clay loam with a slightly acidic soil reaction (pH 6.5) (Table - Soil Analysis Data). There is an abundance of herbaceous vegetation cover and litter cover, with a low amount of bare ground cover (Table - Basic Cover). Relative bare ground cover was 11% in 2001 and 10% in 2006. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of mountain big sagebrush decreased 27% from 964 plants/acre to 699 plants/acre. Decadence increased from 21% to 48%. In addition to increased decadence, the site had an infestation of ants and aphids on the sagebrush.
- **1990 to 2001 - stable (0):** Differences in density may be related to the larger sample area used in 2001; therefore, trend was determined using other parameters. The sagebrush and serviceberry populations are very small, and distribution is patchy throughout the area. The high competition from crested wheatgrass will likely hinder future recruitment of young plants.
- **2001 to 2006 - stable (0):** There was little change in browse on the study site.
- **2006 to 2011 - stable (0):** There was little change in browse on the study site.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 40%, with a significant increase in the nested frequency of crested wheatgrass and Sandberg bluegrass.
- **1990 to 2001 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 11%.
- **2001 to 2006 - down (-2):** There was a 28% decrease in the sum of nested frequency of perennial grasses, and cover decreased from 36% to 28%.

- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grasses increased 20%, and cover increased 35%.

Forb:

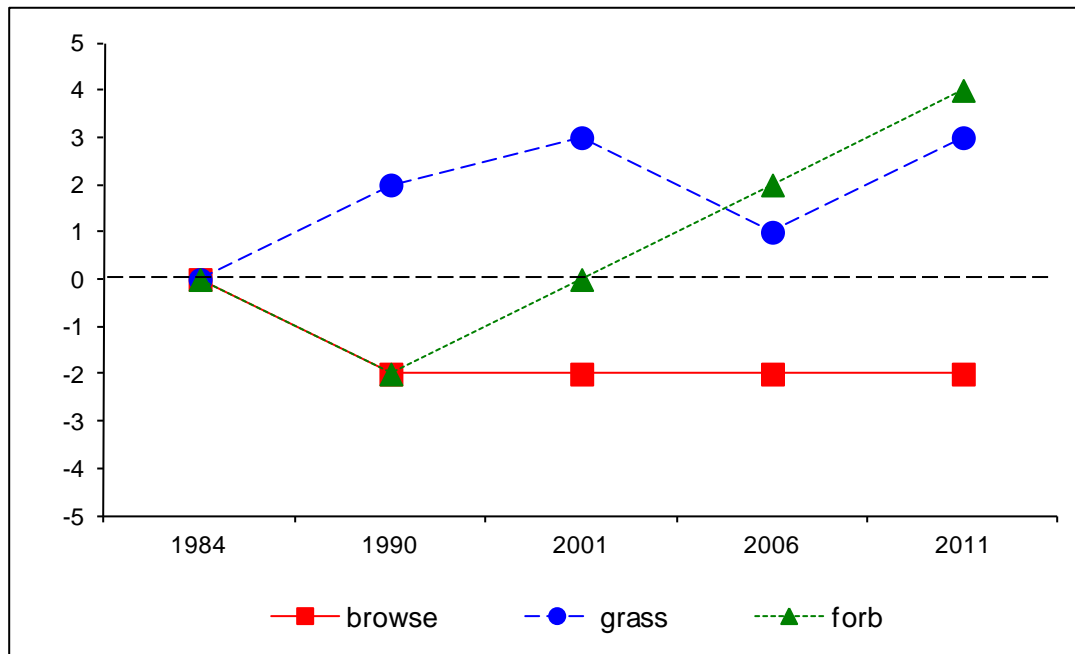
- **1984 to 1990 - down (-2):** There was a 29% decrease in the sum of nested frequency of perennial forbs.
- **1990 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased two-fold, and many new species were sampled for the first time.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased 23%, and cover increased from 4% to 8%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased 63%, and cover increased to 16%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 6, study no: 3

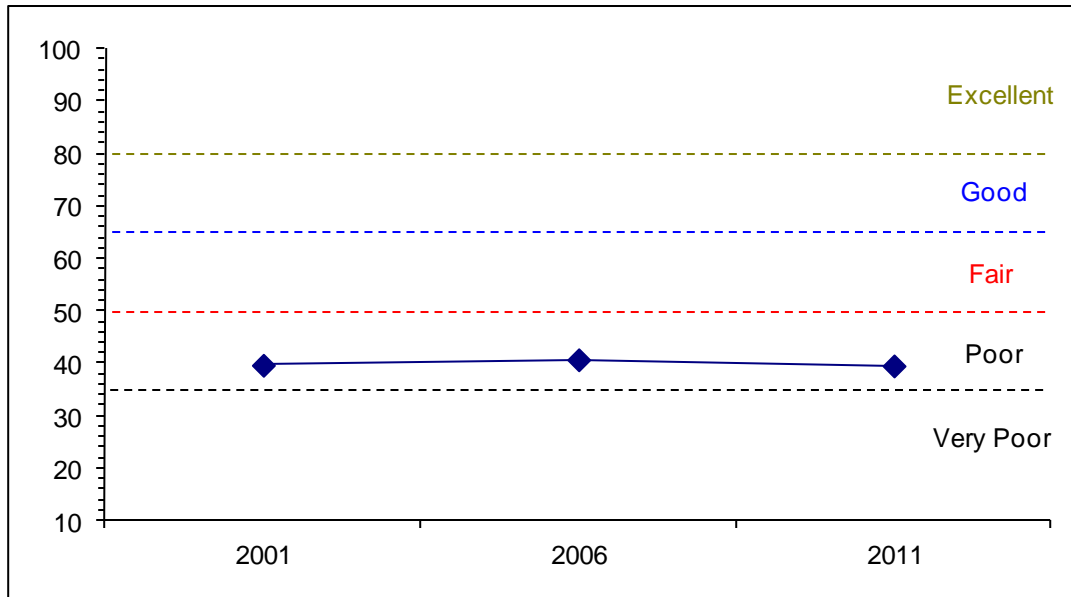
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
01	0.8	0.0	0.0	30.0	0.0	8.8	0.0	39.7	Poor
06	0.7	0.0	0.0	30.0	0.0	10.0	0.0	40.7	Poor
11	0.0	0.0	0.0	30.0	-0.5	10.0	0.0	39.5	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 6 Study no: 3



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 6, Study no: 3



HERBACEOUS TRENDS--
Management unit 06, Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'01	'06	'11	'01	'06	'11
G	Agropyron cristatum	a312	b348	ab323	ab317	ab304	27.98	24.37	25.01
G	Agropyron dasystachyum	10	-	11	-	-	.67	-	-
G	Agropyron intermedium	-	9	5	13	18	.04	.42	.30
G	Agropyron spicatum	a5	a7	b46	a24	a10	2.08	1.18	.18
G	Bromus tectorum (a)	-	-	-	3	16	-	.00	.70
G	Elymus cinereus	-	-	3	-	-	.03	-	-
G	Koeleria cristata	ab14	a2	c44	ab12	bc30	.59	.10	1.55
G	Poa bulbosa	-	-	9	4	21	.12	.03	1.26
G	Poa fendleriana	-	5	-	-	-	-	-	-
G	Poa pratensis	a1	a-	ab8	ab10	b15	.07	.09	.57
G	Poa secunda	a77	c214	bc205	a92	b166	4.55	1.52	6.52
G	Stipa sp.	-	3	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	3	16	0	0.00	0.69
Total for Perennial Grasses		419	588	654	472	564	36.16	27.73	35.43
Total for Grasses		419	588	654	475	580	36.16	27.73	36.13
F	Achillea millefolium	a3	a4	b20	ab7	a1	.11	.21	.03
F	Agoseris glauca	-	a-	b12	c96	d144	.04	.36	3.47
F	Allium sp.	a-	a-	c54	b12	d231	.18	.03	4.02
F	Alyssum alyssoides (a)	-	-	42	58	136	.25	.16	1.43
F	Antennaria rosea	-	-	2	3	4	.03	.03	.15
F	Arabis sp.	-	4	-	-	-	-	-	-
F	Artemisia ludoviciana	4	8	8	5	6	.06	.21	.30
F	Aster chilensis	a7	a8	b60	b61	c82	1.82	2.24	3.38

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'01	'06	'11	'01	'06	'11
F	<i>Astragalus cibarius</i>	a ⁻	a ⁻	b ⁵⁹	c ¹³⁸	b ⁷⁴	.39	3.90	2.43
F	<i>Astragalus convallarius</i>	-	-	2	-	-	.03	-	-
F	<i>Calochortus nuttallii</i>	-	-	3	9	5	.01	.05	.01
F	<i>Cirsium undulatum</i>	5	3	4	3	-	.06	.06	-
F	<i>Collinsia parviflora</i> (a)	-	a ⁻	b ⁹⁸	b ⁸⁰	b ⁷³	.33	.21	.84
F	<i>Collomia linearis</i> (a)	-	a ⁻	b ³⁴	c ⁶⁸	b ⁴⁵	.08	.22	.60
F	<i>Crepis acuminata</i>	-	-	-	1	3	-	.00	.03
F	<i>Cryptantha</i> sp.	a ⁻	a ⁻	a ⁻	a ⁴	b ²¹	-	.01	.46
F	<i>Descurainia pinnata</i> (a)	-	-	6	-	-	.01	-	-
F	<i>Descurainia</i> sp. (a)	a ⁻	a ⁻	a ⁻	a ⁻	b ¹⁵³	-	-	1.30
F	<i>Draba</i> sp. (a)	-	a ⁻	c ⁸⁵	b ³³	c ¹²¹	.18	.10	.62
F	<i>Epilobium brachycarpum</i> (a)	-	a ⁻	b ⁸⁵	d ²²¹	c ¹⁷³	.46	2.70	5.74
F	<i>Erigeron divergens</i>	c ¹²⁴	b ⁵⁶	b ⁴⁶	a ⁶	ab ³⁰	.65	.09	.84
F	<i>Eriogonum umbellatum</i>	-	-	-	-	2	-	-	.00
F	<i>Erodium cicutarium</i> (a)	-	a ⁻	a ³	a ⁷	b ³⁰	.01	.01	.18
F	<i>Holosteum umbellatum</i> (a)	-	a ⁻	b ³¹	b ³⁸	b ²²	.09	.10	.09
F	<i>Lactuca serriola</i> (a)	-	a ⁻	a ⁸	a ²³	b ¹¹⁸	.04	.09	1.61
F	<i>Lappula occidentalis</i> (a)	-	a ⁻	a ⁹	a ⁸	b ²⁰¹	.04	.04	2.86
F	<i>Lithospermum ruderales</i>	b ⁴⁵	b ⁴²	a ⁸	a ¹	a ⁹	.49	.33	.27
F	<i>Lupinus argenteus</i>	a ⁻	a ⁻	a ²	b ¹⁴	ab ¹³	.06	.36	.22
F	<i>Microsteris gracilis</i> (a)	-	a ⁻	bc ²⁷	c ⁴⁴	b ¹⁵	.11	.10	.04
F	<i>Oenothera pallida</i>	c ⁴⁰	c ³²	b ¹⁴	bc ²¹	a ⁻	.23	.29	-
F	<i>Phlox longifolia</i>	-	-	7	-	-	.01	-	-
F	<i>Polygonum douglasii</i> (a)	-	a ⁻	b ³⁴	b ⁴⁶	a ⁻	.07	.11	-
F	<i>Ranunculus testiculatus</i> (a)	-	a ⁻	b ⁴⁶	c ⁸²	c ¹¹⁵	.15	.30	.92
F	<i>Senecio integerrimus</i>	-	-	2	-	3	.01	-	.03
F	<i>Sphaeralcea coccinea</i>	-	4	4	8	-	.02	.07	-
F	<i>Tragopogon dubius</i> (a)	a ⁸	a ¹²	b ⁵⁶	a ¹¹	a ¹⁵	.42	.19	.21
F	<i>Viguiera multiflora</i>	-	1	-	-	-	-	-	-
F	<i>Zigadenus paniculatus</i>	-	-	13	4	11	.19	.06	.16
Total for Annual Forbs		8	12	564	719	1217	2.26	4.38	16.50
Total for Perennial Forbs		228	162	320	393	639	4.43	8.34	15.86
Total for Forbs		236	174	884	1112	1856	6.70	12.72	32.36

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	'11	'01	'06	'11
B	Amelanchier alnifolia	2	2	2	.03	.15	.03
B	Artemisia tridentata vaseyana	1	1	1	.63	.38	-
B	Chrysothamnus viscidiflorus viscidiflorus	8	7	8	.18	.03	.76
B	Gutierrezia sarothrae	63	37	26	1.19	2.45	1.17
B	Leptodactylon pungens	1	0	0	-	-	-
B	Opuntia sp.	3	4	3	-	-	-
B	Symphoricarpos oreophilus	1	2	1	-	-	-
Total for Browse		79	53	41	2.03	3.01	1.96

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 3

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.20	.11
Chrysothamnus viscidiflorus viscidiflorus	.71	.58
Gutierrezia sarothrae	3.11	.23
Opuntia sp.	.03	.08
Symphoricarpos oreophilus	.13	.28

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 3

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.3	1.9	2.3

BASIC COVER--

Management unit 06, Study no: 3

Cover Type	Average Cover %				
	'84	'90	'01	'06	'11
Vegetation	3.50	15.50	49.49	45.59	62.85
Rock	7.00	3.25	3.73	5.75	4.47
Pavement	11.50	15.75	6.90	10.15	11.37
Litter	49.50	43.25	43.11	43.63	10.62
Cryptogams	11.25	2.00	.07	0	.06
Bare Ground	17.25	20.25	13.19	11.42	22.12

SOIL ANALYSIS DATA --

Management unit 06, Study no: 3, Study Name: Spring Hollow Burn

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.6	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	'11	'01	'06	'11
Rabbit	10	10	-	-	-	-
Horse	1	-	-	-	-	-
Elk	5	4	1	9 (22)	17 (41)	5 (13)
Deer	2	11	5	6 (15)	13 (33)	8 (20)
Cattle	16	6	4	21 (52)	14 (34)	8 (20)

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 3

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Amelanchier alnifolia</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
01	40	0	0	100	-	50	50	0	21/23
06	40	0	50	50	-	50	0	0	25/25
11	40	0	100	0	-	50	50	0	20/26
<i>Artemisia tridentata vaseyana</i>									
84	964	7	73	21	66	59	34	0	17/23
90	699	0	52	48	-	62	38	5	23/36
01	20	0	100	0	-	100	0	0	22/34
06	20	0	0	100	-	100	0	100	22/38
11	20	0	0	100	-	100	0	100	20/43
<i>Chrysothamnus nauseosus albicaulis</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	24/28
11	0	0	0	-	-	0	0	0	14/46
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	66	0	50	50	-	0	0	50	11/17
90	331	30	10	60	-	10	0	20	12/11
01	320	0	100	0	-	0	0	0	9/13
06	180	22	78	0	-	11	11	0	12/24
11	260	8	92	0	-	0	0	0	12/24
<i>Gutierrezia sarothrae</i>									
84	20332	20	80	0	1433	0	0	0	7/6
90	16998	47	48	5	966	.78	0	3	7/7
01	4100	5	94	0	-	0	0	.48	7/8
06	3480	3	93	4	-	10	5	3	8/10
11	1580	37	61	3	-	0	0	0	6/8

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Leptodactylon pungens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
01	60	0	100	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Opuntia sp.										
84	399	8	92	0	-	0	0	0	3/3	
90	298	67	22	11	66	0	0	11	5/10	
01	60	0	100	0	-	0	0	0	4/9	
06	80	25	75	0	-	0	0	0	6/21	
11	60	0	100	0	-	33	0	0	6/19	
Symphoricarpos oreophilus										
84	0	0	0	0	-	0	0	0	-/-	
90	33	0	0	100	-	0	0	0	-/-	
01	20	0	100	0	-	0	0	0	15/23	
06	40	0	100	0	-	0	0	0	23/53	
11	40	0	100	0	-	100	0	0	25/40	

ECHO RESERVOIR - TREND STUDY NO. 6-4-11

Vegetation Type: Juniper

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Upland Loam \(Basin Big Sagebrush\), R047XA305UT](#)

Land Ownership: Private

Elevation: 5,700 ft (1,737 m)

Aspect: South

Slope: 20%

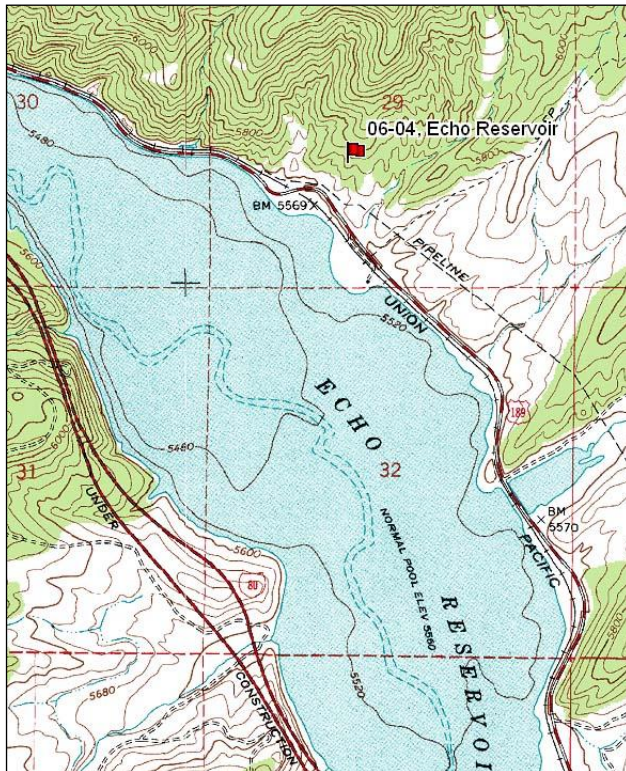
Transect bearing: 163° magnetic

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

Directions:

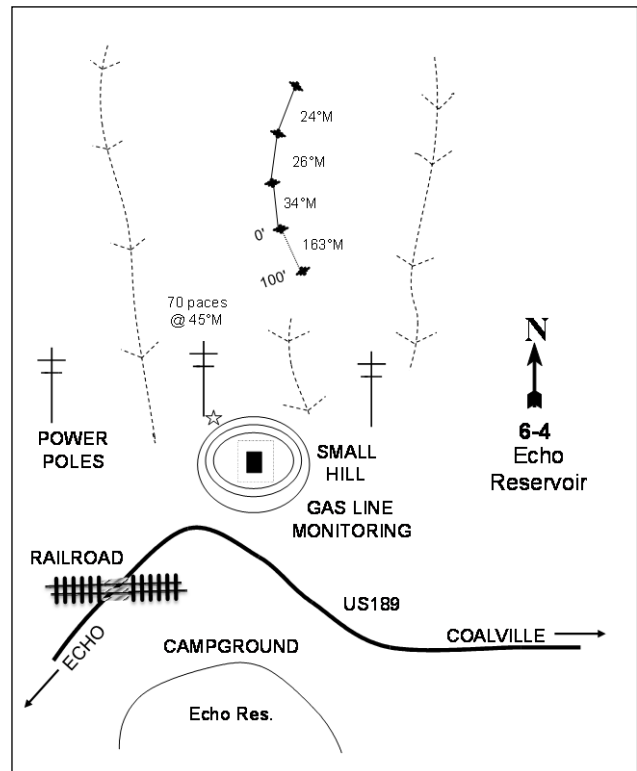
From the east end of Echo Dam, proceed toward Coalville on Highway 189 to a point where the road passes over railroad tracks. Continue for approximately 150 yards to a spur road on the left that leads to a gas monitoring station on a small hill. From the power pole, approximately 25 yards north of the 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



Township: 3N Range: 5E Section: 29

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 465582 E 4534723 N

ECHO RESERVOIR - TREND STUDY NO. 6-4

Site Information

Site Description: The study samples a Utah juniper (*Juniperus osteosperma*) community located immediately east of Echo Reservoir, near an old line-intercept transect study. This area is important to wintering deer, and elk to a lesser extent. 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 an unburned juniper stand. Big game use has been moderate to heavy. Although deer were fed at two nearby locations during the winter of 1983-84, signs of long-term winter use were intense. This heavy utilization likely contributed in the elimination of the already low abundance of browse forage. Evidence of heavy deer presence includes the more than 50 winter-killed carcasses observed near the old line-intercept transect following the hard winter of 1983-84. Deer pellet groups have been sampled in high abundance since 2001. There were three deer carcasses observed on the site in 2001 and one deer carcass in 2011. Elk pellet groups were sampled in low abundance in 2001, but have steadily increased and were sampled in moderate abundance in 2011. Sampled cattle sign has been minimal (Table - Pellet Group Data).

Browse: Browse composition consists of a variety of scattered shrubs, of which only mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Saskatoon serviceberry (*Amelanchier alnifolia*) are palatable. The remaining species are less preferred and are generally classified as increasers or invaders. The most abundant are stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*). Big sagebrush and serviceberry have not been sampled since 1996 in either density or height/crown measurements. The only substantial browse species is Utah juniper, but provides only limited quality forage. It was noted that Utah juniper trees had been high-lined in the past, but utilization has been lower in more recent sample years (Table - Browse Characteristics). The juniper population is comprised of mostly mature trees, and density has remained similar since 2001 (Table - Point-Quarter Tree Data).

Herbaceous Understory: Grasses are moderately diverse and abundant. The annual species cheatgrass (*Bromus tectorum*) was the dominant grass in 1996, but decreased significantly in nested frequency and cover in 2001. Cheatgrass remains common on the site, but perennial grass species are also prevalent and provide good cover. Common perennial grass species include bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and needle-and-thread (*Stipa comata*). The forb component is not particularly abundant, and is dominated by annual species (Table - Herbaceous Trends).

Soil: The soil is in the Jana-Richsum-Rock outcrop series complex, likely as part of the Jana component. This component occurs on mountain slopes, and parent material consists of colluviums derived from sandstone, conglomerate, and shale (Soil Survey Staff 2011). The soil is a clay loam in texture with a moderately alkaline soil reaction (pH 7.9) (Table - Soil Analysis Data). 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. Bare ground cover is moderately high with most of the bare soil occurring in the interspaces between juniper trees; however, there is a moderate amount of vegetation and litter providing protective ground cover on the site. Pavement cover is also high (Table - Basic Cover). The soil erosion condition was classified as moderate in 2001, slight in 2006, but stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of serviceberry decreased from 865 plants/acre to no plants sampled on the site. Other browse species occur in low densities.
- **1990 to 1996 - stable (0):** Palatable browse species remain rare on the site.

- **1996 to 2001 - stable (0):** Palatable browse species remain rare on the site.
- **2001 to 2006 - stable (0):** Palatable browse species remain rare on the site.
- **2006 to 2011 - stable (0):** Palatable browse species remain rare on the site.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased two-fold. The sum of nested frequency of Sandberg bluegrass increased significantly.
- **1990 to 1996 - slightly down (-1):** There was a 16% decrease in the sum of nested frequency of perennial grasses.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased by 23%, and cover increased from 9% to 16%. There was a significant decrease in the nested frequency of cheatgrass, and cover decreased from 15% to 1%.
- **2001 to 2006 - down (-2):** There was a 21% decrease in the sum of nested frequency of perennial grasses, and cover decreased to 13%. Much of the decline was due to a significant decrease in the nested frequency of needle-and-thread.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses increased slightly by 10%, and cover increased to 14%. There was a significant increase in the nested frequency of needle-and-thread, but a significant decrease in the nested frequency of bluebunch wheatgrass. The nested frequency of cheatgrass remained similar, but cover increased from 2% to 5%.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency of perennial forbs decreased 42%.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 32%, but perennial forbs remained moderately rare on the site.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, but cover decreased slightly from 2% to 1%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 33%, but cover increased slightly to 2%. Annual forb sum of nested frequency increased substantially, and cover increased from 1% to 4%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 70%, but cover remained similar at 2%. Perennial forbs remained rare on the site. Annual forb sum of nested frequency remained similar, but cover increased to 10%.

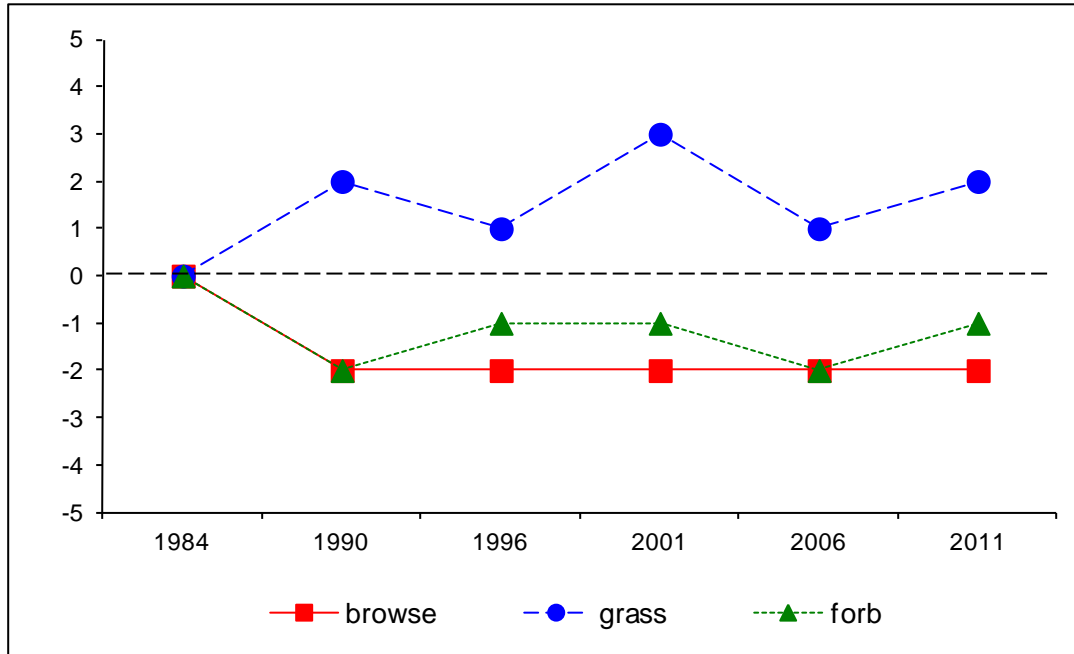
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 6, study no: 4

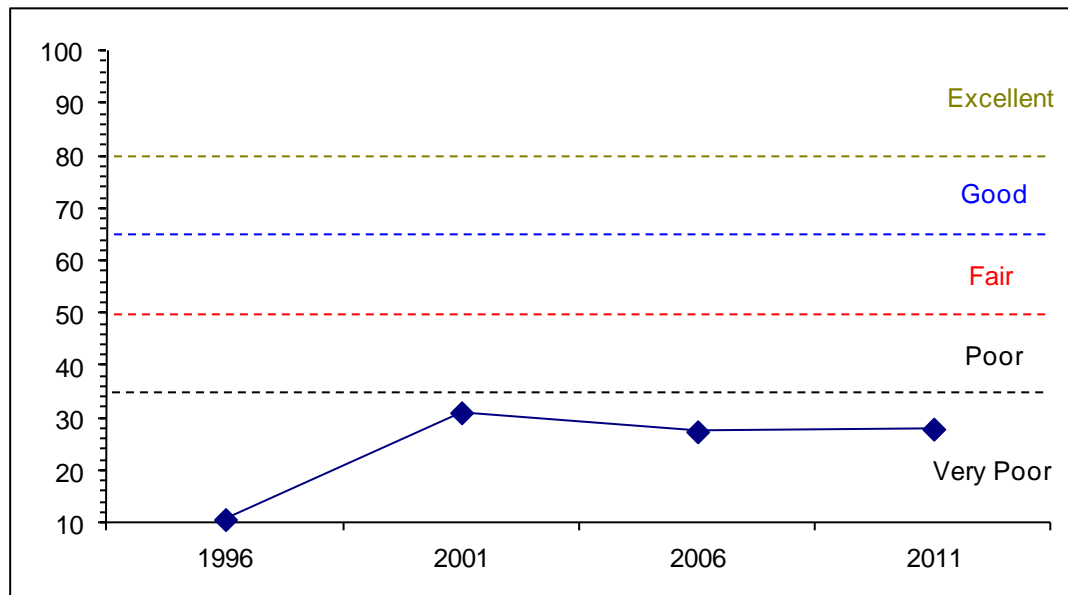
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	0.0	0.0	0.0	17.6	-11.5	4.6	0.0	10.7	Very Poor
01	0.0	0.0	0.0	30.0	-1.0	2.0	0.0	31.0	Very Poor
06	0.0	0.0	0.0	25.7	-1.4	3.1	0.0	27.4	Very Poor
11	0.0	0.0	0.0	27.0	-3.6	4.5	0.0	27.9	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6 Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 6, Study no: 4



HERBACEOUS TRENDS--
Management unit 06, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	ab13	ab21	a7	a6	b27	ab26	.18	.15	.56	.70
G	Agropyron spicatum	a81	bc130	d177	ab109	cd166	ab110	5.22	4.59	8.24	4.65
G	Bromus brizaeformis (a)	-	-	7	-	-	-	.02	-	-	-
G	Bromus japonicus (a)	-	-	-	2	-	-	-	.00	-	-
G	Bromus tectorum (a)	-	-	b323	a152	a138	a152	15.37	1.27	1.90	4.85
G	Oryzopsis hymenoides	b71	b79	a26	b70	b60	a22	.43	3.11	2.12	.67
G	Poa bulbosa	-	-	-	-	-	6	-	-	-	.06
G	Poa fendleriana	a-	a-	b18	a-	a1	a-	.13	-	.03	-
G	Poa pratensis	-	-	2	5	3	3	.00	.30	.03	.03
G	Poa secunda	a10	c143	b63	c150	b71	b98	.93	2.65	1.13	2.47
G	Sitanion hystrix	-	-	1	3	-	-	.03	.00	.00	.00
G	Sporobolus cryptandrus	2	1	-	-	-	-	-	-	-	-
G	Stipa comata	ab32	b47	bc61	cd92	a15	d111	1.87	5.07	.73	4.98
Total for Annual Grasses		0	0	330	154	138	152	15.39	1.28	1.90	4.85
Total for Perennial Grasses		209	421	355	435	343	376	8.81	15.89	12.86	13.58
Total for Grasses		209	421	685	589	481	528	24.20	17.17	14.77	18.44
F	Agoseris glauca	-	1	-	-	-	4	-	-	-	.01
F	Allium sp.	a-	a-	a-	a4	a4	b18	-	.01	.01	.06
F	Alyssum alyssoides (a)	-	-	b291	a264	b307	b293	2.98	1.28	3.78	8.72
F	Antennaria rosea	b24	ab20	a-	a3	ab7	ab22	-	.00	.09	.69
F	Artemisia ludoviciana	-	-	-	-	3	-	-	-	.15	-
F	Astragalus cibarius	-	-	-	3	1	3	-	.00	.03	.03
F	Astragalus utahensis	b79	a17	b68	a38	a23	a30	1.45	.29	.23	.50
F	Calochortus nuttallii	-	-	-	10	1	11	-	.01	.00	.03
F	Camelina microcarpa (a)	-	-	-	1	4	5	-	.00	.02	.03
F	Chenopodium album (a)	-	-	-	-	-	3	-	-	-	.00
F	Cirsium undulatum	8	2	3	-	-	1	.03	-	-	.00
F	Collinsia parviflora (a)	-	-	-	8	19	-	-	.04	.06	-
F	Collomia linearis (a)	-	-	-	3	-	-	-	.00	-	-
F	Cordylanthus ramosus (a)	-	-	-	1	-	-	-	.00	-	-
F	Crepis acuminata	-	-	1	-	-	6	.00	-	-	.07
F	Cryptantha sp.	-	-	10	-	5	7	.06	-	.06	.01
F	Cymopterus sp.	-	-	2	9	5	6	.01	.02	.06	.05
F	Descurainia pinnata (a)	-	-	a-	a1	ab17	b25	-	.00	.03	.76
F	Draba sp. (a)	-	-	a-	a2	b33	a5	-	.00	.08	.06
F	Epilobium brachycarpum (a)	-	-	-	4	-	-	-	.03	-	-
F	Erigeron pumilus	-	5	-	12	9	3	-	.08	.33	.00
F	Eriogonum brevicaulis	6	2	5	-	-	-	.09	-	-	-
F	Galium aparine (a)	-	-	-	2	-	-	-	.00	-	-
F	Hackelia patens	-	-	4	-	-	2	.01	-	-	.03
F	Holosteum umbellatum (a)	-	-	a1	ab6	ab14	b17	.00	.02	.17	.23
F	Lactuca serriola (a)	-	-	-	-	2	3	-	-	.00	.01
F	Lesquerella sp.	-	-	-	3	-	-	-	.00	-	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Machaeranthera grindelioides</i>	-	-	-	5	-	-	-	.03	-	.03
F	<i>Penstemon humilis</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Phlox austromontana</i>	22	21	12	8	7	10	.12	.19	.24	.19
F	<i>Phlox hoodii</i>	-	-	-	-	1	-	-	-	.03	-
F	<i>Phlox longifolia</i>	-	1	-	-	-	-	-	-	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	a-	a5	b17	b33	-	.01	.07	.26
F	<i>Sphaeralcea coccinea</i>	30	29	24	19	16	11	.49	.31	.30	.49
F	<i>Taraxacum officinale</i>	-	-	-	-	-	5	-	-	-	.04
F	<i>Townsendia</i> sp.	-	-	-	5	-	-	-	.01	-	-
F	<i>Tragopogon dubius</i> (a)	b15	a1	a1	a-	a-	b20	.00	-	-	.06
F	<i>Vicia americana</i>	-	-	-	3	-	-	-	.01	-	-
Total for Annual Forbs		15	1	293	297	413	404	2.99	1.43	4.22	10.16
Total for Perennial Forbs		170	98	129	122	82	139	2.30	1.00	1.56	2.25
Total for Forbs		185	99	422	419	495	543	5.29	2.43	5.79	12.42

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	'11	'96	'01	'06	'11
B	<i>Chrysothamnus nauseosus albicaulis</i>	2	1	1	1	-	-	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	36	27	18	17	1.18	.72	.18	.01
B	<i>Gutierrezia sarothrae</i>	36	33	7	3	1.12	.90	.49	.03
B	<i>Juniperus osteosperma</i>	3	2	1	3	7.92	5.48	1.89	1.85
B	<i>Opuntia</i> sp.	36	41	39	32	1.15	.90	1.62	.77
B	<i>Pinus edulis</i>	0	0	1	0	-	-	-	-
B	<i>Tetradymia canescens</i>	1	3	2	3	-	.03	-	.00
Total for Browse		114	107	69	59	11.39	8.03	4.19	2.67

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 4

Species	Percent Cover		
	'01	'06	'11
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.01	.86
<i>Gutierrezia sarothrae</i>	-	.30	-
<i>Juniperus osteosperma</i>	17.60	15.28	19.53
<i>Opuntia</i> sp.	-	1.35	.95
<i>Tetradymia canescens</i>	-	-	.01

POINT-QUARTER TREE DATA--

Management unit 06, Study no: 4

Species	Trees per Acre			Average diameter (in)		
	'01	'06	'11	'01	'06	'11
Juniperus osteosperma	80	79	69	12.6	8.7	9.3

BASIC COVER--

Management unit 06, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	6.50	7.25	37.54	31.35	25.73	32.56
Rock	1.25	1.50	2.04	1.21	2.53	1.38
Pavement	2.25	4.50	6.47	6.97	10.48	10.46
Litter	61.00	46.50	37.07	31.57	22.95	20.62
Cryptogams	.75	7.75	6.51	16.85	11.54	9.90
Bare Ground	28.25	32.50	23.30	27.64	40.34	43.84

SOIL ANALYSIS DATA --

Management unit 06, Study no: 4, Study Name: Echo Reservoir

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.3	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	2	19	35	4	-	-	-
Elk	5	2	16	14	8 (20)	19 (48)	31 (76)
Deer	31	36	43	48	63 (155)	46 (112)	59 (146)
Cattle	1	3	-	-	4 (9)	-	-

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 4

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
84	864	8	46	46	-	8	92	0	42/14
90	0	0	0	0	-	0	0	0	-/-
96	0	0	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	0	0	0	0	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
84	66	0	0	100	-	50	50	50	-/-	
90	33	0	0	100	-	100	0	100	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
<i>Chrysothamnus nauseosus albicaulis</i>										
84	33	0	100	0	-	0	100	0	19/18	
90	33	0	0	100	-	0	100	100	-/-	
96	40	0	0	100	-	0	50	50	27/40	
01	20	0	0	100	-	0	0	0	21/20	
06	20	0	0	100	-	0	0	100	26/27	
11	20	0	100	0	-	100	0	0	17/31	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	5131	1	40	58	-	14	0	0	12/18	
90	2332	3	74	23	-	9	11	69	10/14	
96	1940	29	69	2	20	1	0	0	8/14	
01	1200	8	70	22	-	2	0	3	6/10	
06	580	31	62	7	-	14	0	3	7/9	
11	440	27	73	0	-	0	0	0	8/12	
<i>Gutierrezia sarothrae</i>										
84	1432	5	93	2	-	0	0	0	13/14	
90	2365	51	44	6	566	0	0	10	8/7	
96	1900	31	67	2	700	0	0	2	8/9	
01	2380	2	90	8	-	0	0	4	6/8	
06	280	36	50	14	-	0	0	14	6/7	
11	60	67	33	0	-	0	0	0	9/10	
<i>Juniperus osteosperma</i>										
84	66	50	50	0	-	0	50	50	69/47	
90	33	100	0	0	33	100	0	0	-/-	
96	60	0	100	0	-	0	0	0	-/-	
01	40	0	100	0	-	50	0	0	-/-	
06	20	0	100	0	20	0	0	0	-/-	
11	60	0	67	33	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
84	999	37	63	0	-	0	0	0	6/16	
90	1199	28	69	3	-	0	0	22	4/16	
96	1300	20	75	5	40	0	0	6	5/18	
01	1680	7	90	2	40	1	0	2	5/10	
06	1800	7	70	23	40	0	1	7	5/13	
11	1040	6	90	4	100	0	0	4	4/12	

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Pinus edulis									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	20	0	100	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
Symphoricarpos oreophilus									
84	1265	26	63	11	-	32	0	0	27/25
90	0	0	0	0	-	0	0	0	-/-
96	0	0	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	0	0	0	0	-	0	0	0	-/-
Tetradymia canescens									
84	66	0	0	100	-	100	0	0	-/-
90	66	0	0	100	-	100	0	50	-/-
96	40	0	100	0	-	0	0	0	8/16
01	100	0	20	80	-	20	0	0	12/24
06	40	0	100	0	-	50	0	0	8/14
11	60	33	33	33	-	33	0	33	7/14

SPRING CANYON - TREND STUDY NO. 6-5-11

Vegetation Type: Juniper

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Upland Loam \(Basin Big Sagebrush\), R047XA305UT](#)

Land Ownership: Private

Elevation: 6,120 ft (1,865 m)

Aspect: South

Slope: 5-8%

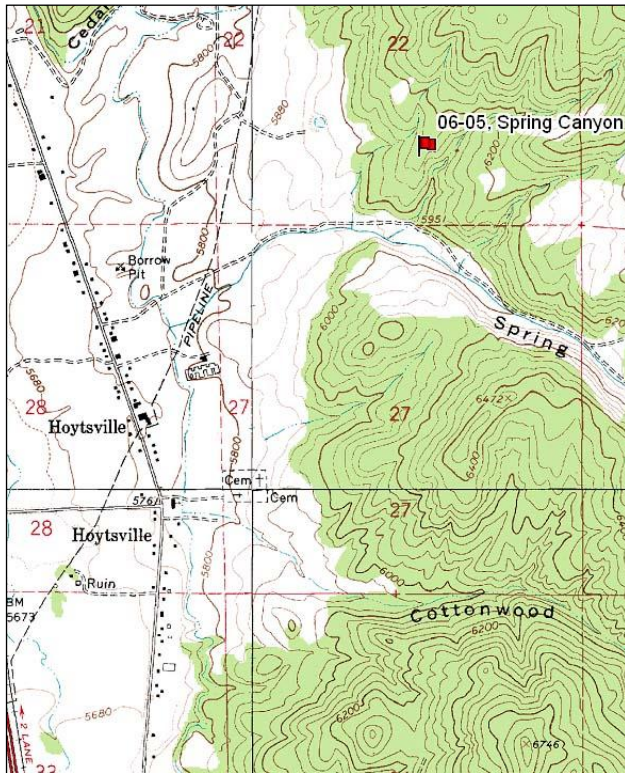
Transect bearing: 165° magnetic

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

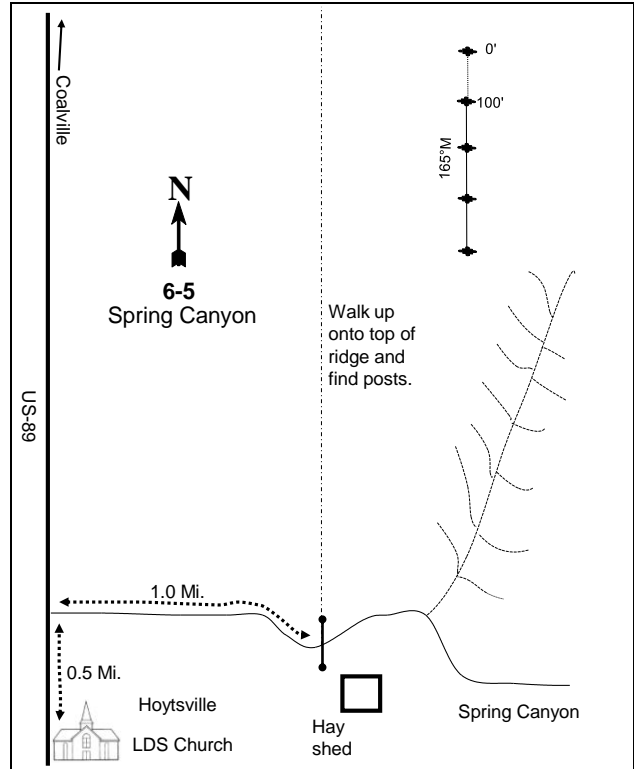
Directions:

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

GPS: NAD 83, UTM 12S 469074 E 4526392 N

SPRING CANYON - TREND STUDY NO. 6-5

Site Information

Site Description: This study is located on a Utah juniper (*Juniperus osteosperma*) covered ridge immediately east of Hoytsville, and north of the mouth of Spring Canyon. The area is crucial deer winter range, primarily used by deer for thermal cover. The study is on private land, and is grazed by cattle and sheep. Domestic sheep were present in late August of 1984, when the study was established. The preferred browse species have been browsed heavily by wildlife and domestic livestock to the point of browsing on woody stems and branches. Deer pellet groups have been sampled in high abundance since 2001. Nine winter-killed deer were observed in the immediate vicinity in 1984, and a fawn was spotted approaching the study area in 2006. Elk pellet groups been sampled in minimal abundance in 2001 and 2006, but moderate abundance in 2011. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data). Numerous game trails traverse the study and head toward the alfalfa fields below.

Browse: Other than juniper, shrubs and trees are rare. The juniper type is very uniform and characterized by a moderately dense stand of even-aged trees. Juniper density and cover have remained similar since 2001 (Table - Point-Quarter Tree Data and Table - Canopy Cover). The 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. The only other browse species sampled since 2006 was prickly pear cactus (*Opuntia sp.*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is sparse and provides little ground cover or forage. Native perennial grasses are somewhat abundant in the more open areas, but are infrequent where the juniper overstory is dense. Bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread (*Stipa comata*) have all been sampled. Cheatgrass (*Bromus tectorum*) was fairly prevalent when annual species were first sampled in 1996, but has significantly decreased in nested frequency and is not common on the site. 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, and was the dominant herbaceous species in cover in 2011 (Table - Herbaceous Trends). Due to the vegetation characteristics, this site is really only useful as thermal cover and as a travel corridor for wildlife.

Soil: The soil is in the Jana-Richsum-Rock outcrop complex, likely as part of the Jana component. These soils occur on mountain slopes, with parent material consisting of colluviums derived from sandstone, conglomerate, and shale (Soil Survey Staff 2011). The soils texture is a clay loam with a neutral soil reaction (pH 7.3) (Table - Soil Analysis Data). Understory cover is low on the site, with a moderately high amount of bare ground cover. Cryptogam cover is high, particularly in the interspaces between juniper trees (Table - Basic Cover). The soil erosion condition was classified as slight to moderate in 2001, moderate in 2006, but was stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** Preferred browse species remained rare on the site. All of the juniper trees were highlined.
- **1990 to 1996 - stable (0):** Preferred browse species remained rare on the site.
- **1996 to 2001 - stable (0):** Preferred browse species remained rare on the site.
- **2001 to 2006 - stable (0):** Preferred browse species remained rare on the site.
- **2006 to 2011 - stable (0):** Preferred browse species remained rare on the site.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 37%. However, there was a change in composition. There was a significant decrease in the nested frequency of bluebunch wheatgrass, and a significant increase in the nested frequencies of Sandberg bluegrass and bottlebrush squirreltail.
- **1990 to 1996 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover increased from 3% to 5%. Cheatgrass decreased in nested frequency, and cover decreased from 3% to less than 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover decreased slightly to 4%. The nested frequency of cheatgrass decreased significantly, but cover remained similar.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses changed little, though there was a slight increase in cover to 5%.

Forb:

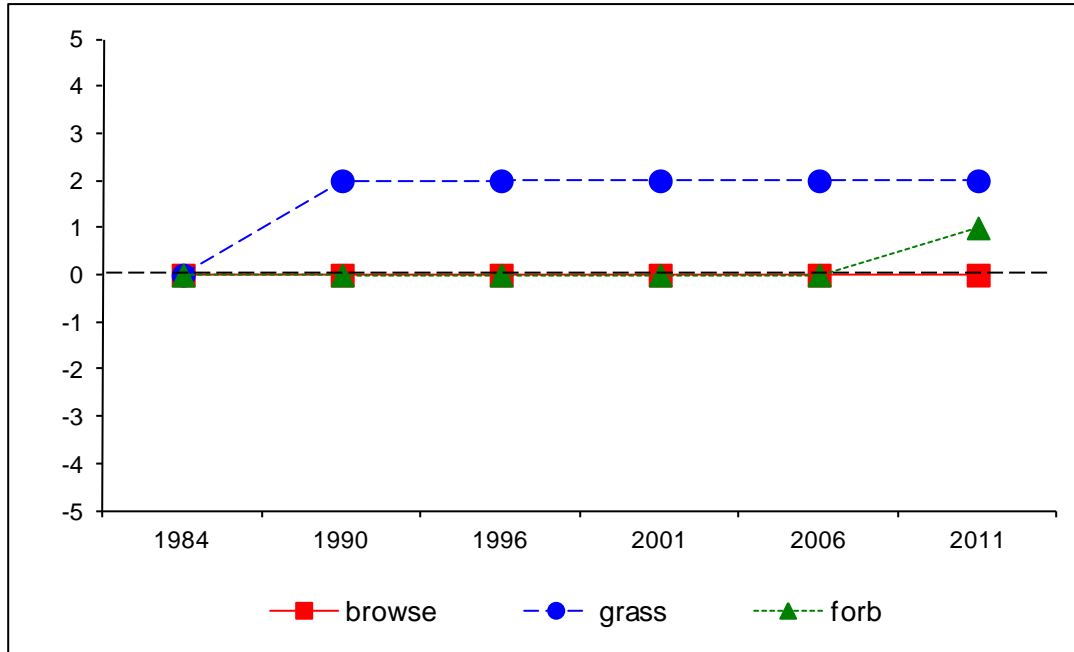
- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial forbs decreased, but perennial forbs were already rare on the site.
- **1990 to 1996 - stable (0):** The sum of nested frequency of perennial forbs returned to 1984 levels.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs.
- **2001 to 2006 - stable (0):** The sum of nested frequency and cover of perennial forbs remained similar.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased 88%, and cover increased from 2% to 4%. However, annual forb sum of nested frequency also increased, and cover increased from 3% to 13%. Most of the increase in annual forbs was due to a significant increase in the nested frequency of burr buttercup, with a subsequent increase in cover.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 6, study no: 5

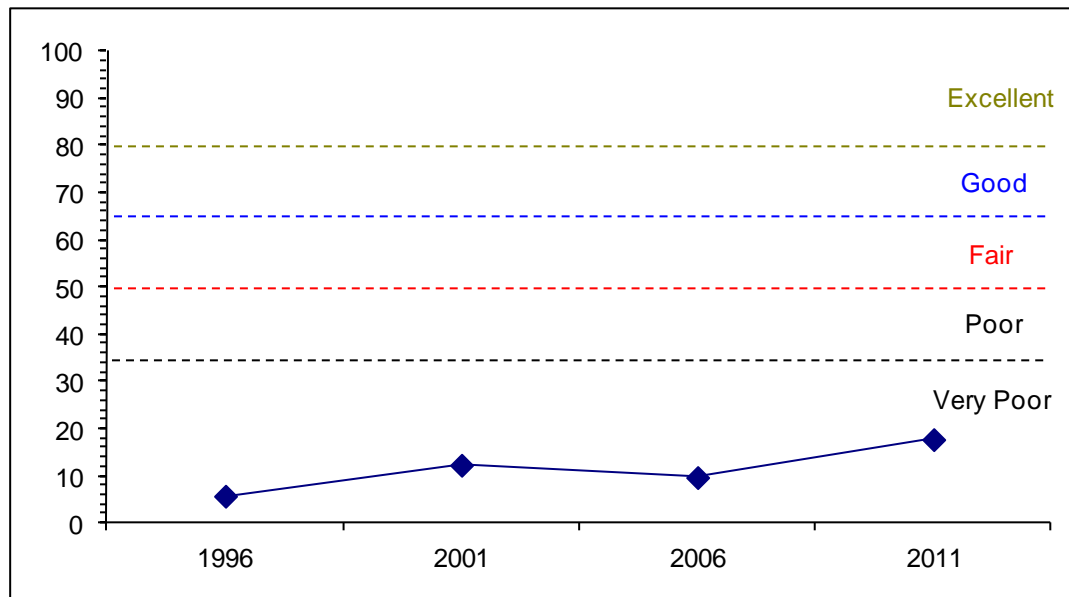
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	0.0	0.0	0.0	5.5	-2.1	2.3	0.0	5.7	Very Poor
01	0.0	0.0	0.0	9.7	-0.3	2.9	0.0	12.3	Very Poor
06	0.0	0.0	0.0	6.6	-0.5	3.6	0.0	9.7	Very Poor
11	0.0	0.0	0.0	10.0	-0.2	7.9	0.0	17.7	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6 Study no: 5



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 6, Study no: 5



HERBACEOUS TRENDS--
Management unit 06, Study no: 5

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	b ⁵⁹	a ³²	ab ⁴⁴	ab ⁵³	b ⁶⁰	b ⁵⁶	.59	1.43	.96	2.12
G	Bromus tectorum (a)	-	-	c ¹²⁹	bc ¹⁰³	a ⁷⁵	ab ⁷⁷	2.82	.42	.63	.25
G	Oryzopsis hymenoides	ab ⁶⁸	ab ⁶⁶	ab ⁷⁸	b ⁸⁵	b ⁹¹	a ⁴⁴	1.08	1.62	1.40	.58
G	Poa bulbosa	a ⁻	a ⁻	a ⁻	a ⁻	a ³	b ⁸	-	-	.00	.07
G	Poa pratensis	3	-	-	-	-	-	-	-	-	-
G	Poa secunda	a ¹³	bc ⁵⁶	ab ⁴⁷	b ⁵⁴	ab ³⁸	c ⁹³	.48	.96	.51	2.13
G	Sitanion hystrix	a ¹	c ³⁴	bc ²²	abc ²³	ab ¹⁸	a ³	.28	.51	.40	.15
G	Stipa comata	bc ¹³	c ²⁷	bc ²⁹	b ⁹	a ⁻	a ⁻	.30	.34	-	-
Total for Annual Grasses		0	0	129	103	75	77	2.82	0.42	0.62	0.25
Total for Perennial Grasses		157	215	220	224	210	204	2.75	4.86	3.28	5.08
Total for Grasses		157	215	349	327	285	281	5.58	5.28	3.92	5.33
F	Agoseris glauca	a ⁻	a ⁻	a ⁻	a ⁻	a ²	b ⁵	-	-	.00	.18
F	Allium sp.	-	-	-	-	-	8	-	-	-	.02
F	Alyssum alyssoides (a)	-	-	b ²³⁹	b ²⁶²	b ²⁵³	a ¹⁸³	1.10	1.05	.74	2.26
F	Antennaria rosea	-	6	1	7	10	2	.00	.04	.02	.01
F	Arabis sp.	-	3	5	-	-	2	.01	-	-	.03
F	Astragalus convallarius	4	-	-	-	2	1	-	-	.00	.00
F	Astragalus utahensis	1	-	2	1	-	4	.03	.03	-	.03
F	Calochortus nuttallii	-	-	-	-	-	5	-	-	-	.03
F	Camelina microcarpa (a)	-	-	5	2	4	6	.01	.00	.03	.06
F	Chaenactis douglasii	2	-	-	-	-	1	-	-	-	.00
F	Cirsium undulatum	2	-	1	-	-	-	.03	-	-	-
F	Collinsia parviflora (a)	-	-	2	3	-	4	.01	.00	-	.01
F	Cryptantha sp.	30	13	21	16	20	28	.25	.45	.39	.49
F	Cymopterus longipes	a ⁻	a ²	a ⁵	a ³	a ²	b ²⁵	.02	.01	.03	.71
F	Delphinium sp.	-	-	-	-	-	3	-	-	-	.01
F	Descurainia pinnata (a)	-	-	a ⁻	a ²	a ⁻	b ²³	-	.00	-	.53
F	Eriogonum umbellatum	7	2	-	-	-	5	-	-	-	.01
F	Erodium cicutarium (a)	-	-	-	-	-	1	-	-	-	.00
F	Gilia sp. (a)	-	-	-	-	-	9	-	-	-	.01
F	Hackelia patens	-	11	7	6	4	18	.04	.04	.21	.75
F	Hedysarum boreale	8	-	-	-	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	-	-	3	-	-	-	.00	-
F	Lactuca serriola (a)	-	-	-	-	-	3	-	-	-	.00
F	Machaeranthera grindelioides	-	-	2	1	1	1	.01	.00	.00	.00
F	Microsteris gracilis (a)	-	-	-	12	8	17	-	.05	.01	.09
F	Penstemon humilis	1	5	3	5	1	-	.03	.01	.00	-
F	Penstemon sp.	b ¹⁷	a ⁻	a ³	a ¹	a ⁻	a ⁻	.03	.00	-	-
F	Phlox austromontana	27	20	39	37	27	21	.66	.82	1.08	.54
F	Phlox longifolia	-	-	5	11	6	11	.01	.02	.01	1.06
F	Ranunculus testiculatus (a)	-	-	a ⁸⁶	b ¹⁶⁶	c ²²⁸	d ²⁸⁹	.27	.97	1.77	9.69
F	Senecio multilobatus	-	-	2	-	-	1	.00	-	-	.00
F	Sisymbrium altissimum (a)	-	-	1	-	-	5	.00	-	-	.01

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Veronica biloba (a)	-	-	-	-	-	3	-	-	-	.01
Total for Annual Forbs		0	0	333	447	496	543	1.39	2.09	2.56	12.72
Total for Perennial Forbs		99	62	96	88	75	141	1.16	1.43	1.78	3.93
Total for Forbs		99	62	429	535	571	684	2.56	3.53	4.35	16.65

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	0	1	0	0	-	-	-	-
B	Gutierrezia sarothrae	6	7	0	0	.20	.03	-	-
B	Juniperus osteosperma	12	12	13	11	16.73	8.39	7.87	7.01
B	Opuntia sp.	8	11	14	9	.22	.05	.45	.36
B	Symphoricarpos oreophilus	1	0	0	0	-	-	-	-
Total for Browse		27	31	27	20	17.15	8.47	8.32	7.38

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 5

Species	Percent Cover		
	'01	'06	'11
Juniperus osteosperma	36.79	44.86	43.33
Opuntia sp.	-	.23	.40

POINT-QUARTER TREE DATA--

Management unit 06, Study no: 5

Species	Trees per Acre			Average diameter (in)		
	'01	'06	'11	'01	'06	'11
Juniperus osteosperma	189	155	173	20.2	9.9	7.6

BASIC COVER--

Management unit 06, Study no: 5

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	.50	1.00	25.55	18.48	16.60	23.67
Rock	1.75	6.25	2.94	2.79	2.20	2.83
Pavement	9.25	12.50	3.84	5.47	7.21	3.93
Litter	56.25	48.50	40.31	40.42	45.65	36.09
Cryptogams	2.75	5.25	3.52	14.18	9.54	12.90
Bare Ground	29.50	26.50	28.08	31.93	36.15	32.50

SOIL ANALYSIS DATA --

Management unit 06, Study no: 5, Study Name: Spring Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.1	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	2	-	-	-	-	-	-
Rabbit	12	37	51	26	-	-	-
Elk	1	1	2	3	-	3 (8)	25 (63)
Deer	44	22	23	19	58 (144)	88 (218)	68 (167)
Cattle	-	1	-	-	1 (2)	2 (4)	-

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 5

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	0	0	0	-	-	0	0	0	-/-
90	33	100	0	-	-	100	0	100	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	62/56
11	0	0	0	-	-	0	0	0	-/-
Artemisia tridentata vaseyana									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	20	100	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
Cercocarpus montanus									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	20/27

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	66	50	0	50	-	50	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	0	0	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	6/11
11	0	0	0	0	-	0	0	0	4/19
<i>Gutierrezia sarothrae</i>									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	240	17	83	0	20	0	0	0	7/8
01	400	75	20	5	-	0	0	5	5/4
06	0	0	0	0	-	0	0	0	6/6
11	0	0	0	0	-	0	0	0	7/9
<i>Juniperus osteosperma</i>									
84	365	18	82	0	-	36	36	0	67/157
90	299	11	89	0	-	0	33	0	186/153
96	260	15	85	0	-	0	0	0	-/-
01	280	7	79	14	20	0	0	14	-/-
06	520	4	92	4	20	0	31	0	-/-
11	220	9	64	27	-	0	0	0	-/-
<i>Opuntia sp.</i>									
84	66	50	50	0	-	0	0	0	7/14
90	165	40	40	20	-	0	0	20	5/10
96	280	7	57	36	-	0	0	29	5/12
01	260	23	69	8	20	0	0	0	4/10
06	380	21	68	11	-	0	0	11	5/17
11	180	0	78	22	-	0	0	22	5/16
<i>Symphoricarpos oreophilus</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	20	0	100	-	-	0	0	0	7/12
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	5/11

CRANDALL CANYON - TREND STUDY NO. 6-7-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: Private

Elevation: 6,600 ft (2,012 m)

Aspect: South

Slope: 31%

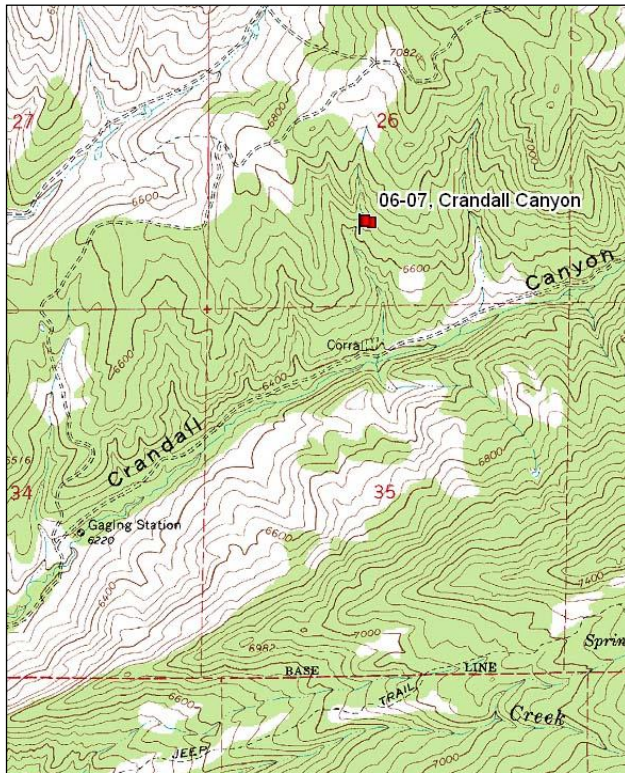
Transect bearing: 165° magnetic

Belt placement: line 1 (11, 31, & 71ft), line 2 (59 & 95ft)

Directions:

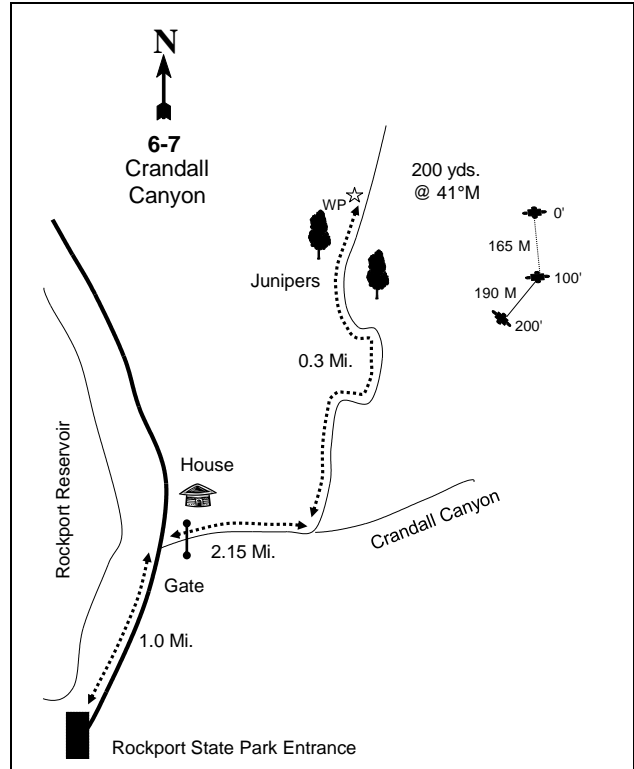
From the guard house at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed up through the gate and up Crandall Canyon (dirt road) for 2.15 miles, and turn left at the fork. Travel 0.3 miles north on this road to a pair of junipers on either side of the road. 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



Township: 1N Range: 5E Section: 26

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 470437. E 4515135 N

CRANDALL CANYON - TREND STUDY NO. 6-7

Site Information

Site Description: The study is located on crucial deer and elk winter range east of Rockport Reservoir. The plant community is comprised of mixed mountain brush with patches of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*). 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 presence is heavy and animals are usually seen here at all times of the year. Deer pellet groups were sampled in high abundance in 2001, but abundance has been low since 2006. Two deer carcasses were on the site in 2011. Elk pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The majority of the vegetation is composed of a diverse mixture of mountain brush species. Over the duration of the study, twelve species have been sampled. The abundant species are true mountain mahogany (*Cercocarpus montanus*), mountain snowberry (*Symphoricarpos oreophilus*), Gambel oak, Saskatoon serviceberry (*Amelanchier alnifolia*), and mountain big sagebrush. Many of the browse species form tight associations with one another, with three or four species commonly growing within one "bush". This growth pattern provides some protection from heavy browsing. The dominant preferred browse species is true mountain mahogany. The mahogany is a moderately dense population of heavily used plants. Consistent heavy browsing on mahogany has resulted in a population of short statured plants. The serviceberry and sagebrush populations have lower densities, but show moderate to heavy use. Other common browse species including Gambel oak and snowberry display lighter use (Table - Browse Characteristics). Pocket gopher and badger diggings around plants have been 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 affect vigor. Utah juniper (*Juniperus osteosperma*) has been invading the study area. Juniper canopy cover has increased since 2001 (Table - Canopy Cover), and density has increased slightly since 2006 (Table - Point-Quarter Tree Data).

Herbaceous Understory: Grasses provide the majority of the herbaceous cover on the site. Thickspike wheatgrass (*Agropyron dasystachyum*), bluebunch wheatgrass (*A. spicatum*), and Indian ricegrass (*Oryzopsis hymenoides*) are the most abundant perennial grasses. Two annuals, cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*), are present, but are not overly abundant. Forbs are not very abundant on the site, but are quite diverse (Table - Herbaceous Trends).

Soil: The soil is in the Yeates Hollow-Henefer complex, which occurs on mountain slopes. Parent material consists of colluviums derived from conglomerate, sandstone, quartzite, and shale (Soil Survey Staff 2011). The soil texture is classified as a sandy clay loam, and the soil reaction is moderately alkaline (pH 8.0). Phosphorus may have limited availability for plant growth and development at 5.1 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is moderately high. Vegetation cover has increased since 1996, but litter cover has decreased. Rock and pavement cover is moderate (Table - Basic Cover). Gullies are evident, but many of them show signs of healing. Sheet and gully erosion have been high in the past, but appear to have been stabilizing in recent years. Some erosion is apparent with pedestalling around some of the plants. The soil erosion condition was classified as slight in 2001, moderate in 2006, but stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** True mountain mahogany decreased 20% in density from 1,331 plants/acre to 1,065 plants/acre, but the densities of both sagebrush and serviceberry increased. Decadence and poor vigor increased, and is considered high, in all three species.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of true mountain

mahogany decreased from 88% to 4%, and poor vigor decreased from 31% to 2%. Decadence and poor vigor of sagebrush and serviceberry also decreased at similar rates.

- **1996 to 2001 - stable (0):** The density and cover of serviceberry, sagebrush, and mahogany plants remained similar. Decadence increased to moderate levels in the sagebrush and mahogany populations. Recruitment of young sagebrush and mahogany plants decreased, and was considered to be poor.
- **2001 to 2006 - slightly down (-1):** True mountain mahogany density decreased 12% from 1,200 plants/acre to 1,060 plants/acre, and cover decreased from 5% to 3%. Serviceberry density decreased 50% from 640 plants/acre to 320 plants/acre, but cover increased slightly from 1% to 3%. Sagebrush density decreased 29% from 280 plants/acre to 200 plants/acre, but cover remained similar. Decadence remained moderate in all three species.
- **2006 to 2011 - stable (0):** There was a slight decrease in the density of mahogany, serviceberry, and sagebrush plants, but decadence of all three species decreased substantially.

Grass:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1990 to 1996 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 16%, though cover remained similar.
- **2001 to 2006 - stable (0):** The sum of nested frequency remained similar, but cover increased from 11% to 17%.
- **2006 to 2011 - slightly down (-1):** Despite an increase in perennial grass cover to 19%, the sum of nested frequency of perennial grasses decreased 11%. The annual species Japanese chess increased significantly in nested frequency, and cover increased from near 0% to 3%.

Forb:

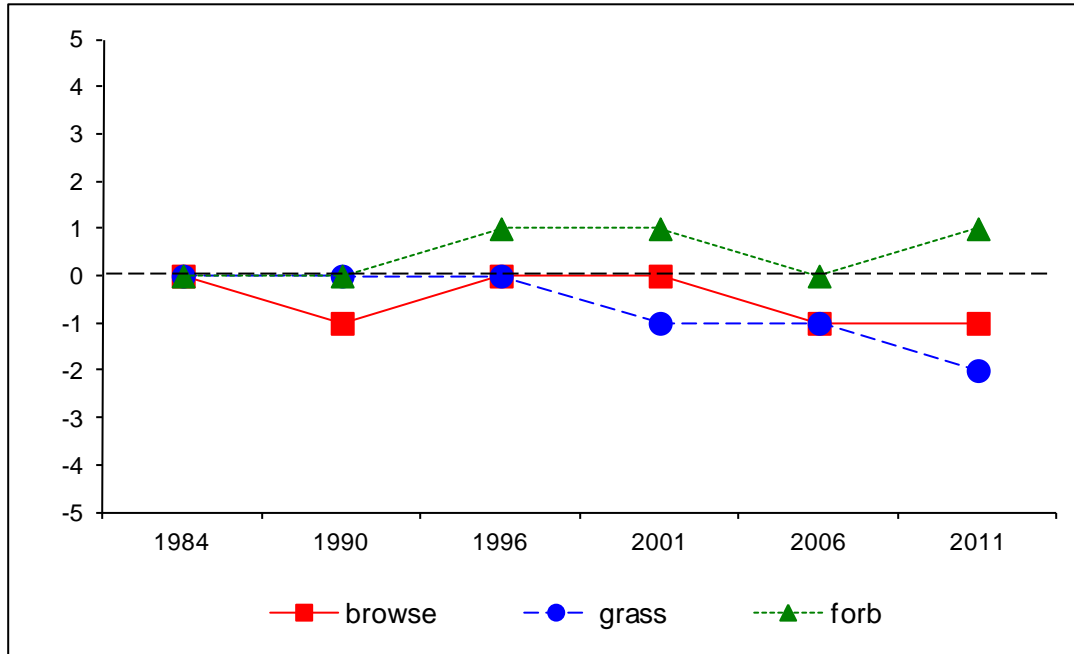
- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial forbs decreased; however, perennial forbs are rare on the site.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial forbs increased nearly two-fold. Some of this increase may be related to the larger sample area used in 1996.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs.
- **2001 to 2006 - slightly down (-1):** The perennial forb sum of nested frequency decreased 44%, returning to 1990 levels.
- **2006 to 2011 - slightly up (+1):** There was a 56% increase in the sum of nested frequency of perennial forbs, and cover increased from 2% to 4%. However, there was also a substantial increase in the cover of annual forbs due to a significant increase in the nested frequency of pale alyssum (*Alyssum alyssoides*).

DEER DESIRABLE COMPONENTS INDEX - HIGH POTENTIAL SCALE --
Management unit 6, study no: 7

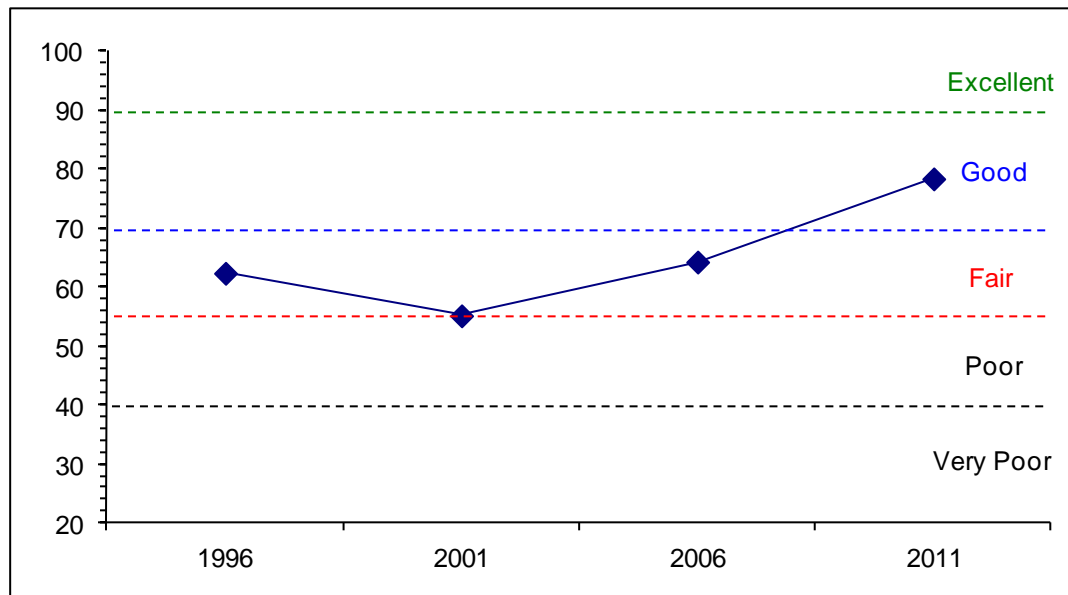
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	15.0	13.0	9.2	21.0	-0.2	4.4	0.0	62.3	Fair
01	11.7	10.9	5.4	21.9	-0.2	5.4	0.0	55.1	Poor-Fair
06	11.7	11.3	8.1	30.0	-0.1	3.2	0.0	64.2	Fair
11	17.4	14.8	9.8	30.0	-2.1	8.4	0.0	78.3	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6 Study no: 7



DEER DESIRABLE COMPONENTS INDEX TREND, HIGH POTENTIAL--
 Management unit 6, Study no: 7



HERBACEOUS TRENDS--
Management unit 06, Study no: 7

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a26	c268	b126	b100	c219	b114	3.48	2.92	9.85	5.42
G	Agropyron spicatum	c244	a21	bc147	bc133	a44	b110	4.57	5.35	2.71	9.70
G	Bromus japonicus (a)	-	-	a-	a10	a19	b87	-	.04	.09	2.62
G	Bromus tectorum (a)	-	-	b57	b40	a20	a16	.22	.15	.05	.14
G	Carex sp.	19	12	8	6	1	3	.16	.08	.03	.03
G	Elymus cinereus	-	-	-	1	-	-	-	.03	-	-
G	Oryzopsis hymenoides	53	53	72	49	55	51	1.62	1.81	3.05	1.84
G	Poa pratensis	-	-	1	5	3	7	.00	.06	.03	.09
G	Poa secunda	4	6	20	13	17	13	.18	.03	.09	.54
G	Sitanion hystrix	-	3	4	3	-	-	.00	.03	-	-
G	Stipa comata	a1	ab10	ab8	b15	ab12	b16	.45	.64	1.08	.92
Total for Annual Grasses		0	0	57	50	39	103	0.21	0.20	0.14	2.76
Total for Perennial Grasses		347	373	386	325	351	314	10.48	10.97	16.87	18.56
Total for Grasses		347	373	443	375	390	417	10.70	11.17	17.01	21.33
F	Achillea millefolium	-	-	4	1	-	4	.03	.03	-	.15
F	Agoseris glauca	-	-	-	-	3	-	-	-	.00	-
F	Alyssum alyssoides (a)	-	-	bc215	ab182	a177	c231	1.00	.84	.43	7.03
F	Arabis sp.	-	-	-	1	-	-	-	.00	-	-
F	Aster chilensis	a-	a-	b32	b36	b14	b22	.52	.48	.11	.80
F	Astragalus convallarius	-	-	-	-	1	-	-	-	.03	-
F	Astragalus sp.	-	3	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	3	3	5	2	-	2	.06	.03	.03	.15
F	Calochortus nuttallii	-	-	-	5	-	5	-	.18	-	.04
F	Camelina microcarpa (a)	-	-	a-	a1	b29	ab13	-	.00	.06	.25
F	Chaenactis douglasii	4	11	13	5	1	5	.08	.04	.00	.04
F	Cirsium sp.	-	-	-	-	1	-	-	-	.03	-
F	Cirsium undulatum	ab9	a5	abc22	c27	abc16	bc31	.63	.90	.61	1.57
F	Collomia linearis (a)	-	-	-	3	-	-	-	.00	-	-
F	Comandra pallida	28	12	28	25	23	34	.19	.22	.14	.30
F	Cryptantha sp.	a19	b34	a22	ab30	a12	a4	.27	.50	.37	.22
F	Descurainia pinnata (a)	-	-	1	-	1	1	.00	-	.00	.03
F	Epilobium brachycarpum (a)	-	-	1	-	1	-	.00	-	.00	-
F	Eriogonum umbellatum	-	3	-	-	3	3	-	-	.03	.01
F	Euphorbia brachycera	-	-	-	-	-	3	-	-	-	.03
F	Hackelia patens	c32	ab10	bc21	ab8	a4	a-	.20	.04	.18	-
F	Lactuca serriola (a)	-	-	1	-	-	-	.00	-	-	-
F	Oenothera caespitosa	-	-	-	1	-	-	-	.03	-	-
F	Penstemon humilis	11	6	9	15	10	20	.09	.18	.07	.82
F	Phlox longifolia	-	-	-	-	1	-	-	-	.00	-
F	Ranunculus testiculatus (a)	-	-	-	14	-	1	-	.02	-	.00
F	Senecio integerrimus	-	-	-	-	-	3	-	-	-	.03
F	Smilacina racemosa amplexicaulis	-	-	6	3	-	3	.07	.03	-	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Tragopogon dubius (a)	2	-	4	-	6	5	.06	-	.06	.07
F	Unknown forb-perennial	3	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		2	0	222	200	214	251	1.08	0.88	0.56	7.39
Total for Perennial Forbs		109	87	162	159	89	139	2.17	2.71	1.62	4.20
Total for Forbs		111	87	384	359	303	390	3.25	3.59	2.19	11.60

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	22	25	16	11	1.68	1.17	2.56	1.52
B	Artemisia tridentata vaseyana	13	11	8	8	.94	.56	.63	1.18
B	Cercocarpus montanus	38	38	40	39	5.02	4.66	2.92	5.41
B	Chrysothamnus viscidiflorus viscidiflorus	20	23	19	21	.74	1.50	1.55	1.33
B	Gutierrezia sarothrae	82	77	36	31	4.02	3.67	.44	1.24
B	Juniperus osteosperma	2	6	7	2	2.39	3.37	5.87	4.38
B	Opuntia sp.	10	7	11	2	.51	.45	.18	.03
B	Purshia tridentata	1	1	1	2	.63	.38	.38	.41
B	Quercus gambelii	6	8	9	8	2.65	1.66	2.16	4.88
B	Rosa woodsii	0	1	0	0	.15	-	-	.03
B	Symphoricarpos oreophilus	19	19	21	21	2.75	3.59	1.97	1.92
B	Tetradymia canescens	4	3	0	0	.18	.38	-	-
Total for Browse		217	219	168	145	21.69	21.43	18.69	22.37

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 7

Species	Percent Cover		
	'01	'06	'11
Amelanchier alnifolia	-	3.48	4.13
Artemisia tridentata vaseyana	-	.30	1.01
Cercocarpus montanus	-	2.59	5.84
Chrysothamnus viscidiflorus viscidiflorus	-	1.01	1.38
Gutierrezia sarothrae	-	.98	1.88
Juniperus osteosperma	6.80	13.14	9.16
Opuntia sp.	-	.08	-
Pinus edulis	-	-	4.43
Purshia tridentata	-	1.01	1.14
Quercus gambelii	3.40	4.31	5.18
Rosa woodsii	-	-	-
Symphoricarpos oreophilus	-	3.45	3.88

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 7

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	-	2.7	3.2
Artemisia tridentata vaseyana	-	2.2	2.6
Cercocarpus montanus	1.9	2.3	5.1

POINT-QUARTER TREE DATA--

Management unit 06, Study no: 7

Species	Trees per Acre			Average diameter (in)		
	'01	'06	'11	'01	'06	'11
Juniperus osteosperma	-	40	55	-	8.5	7.4

BASIC COVER--

Management unit 06, Study no: 7

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	4.50	9.50	34.75	37.41	38.00	52.36
Rock	2.75	4.75	3.69	3.95	4.17	3.68
Pavement	11.25	7.25	5.34	4.38	4.35	6.00
Litter	46.50	37.00	38.81	26.92	26.64	18.88
Cryptogams	.25	0	.03	0	0	.15
Bare Ground	34.75	41.50	31.27	41.62	45.29	30.20

SOIL ANALYSIS DATA --

Management unit 06, Study no: 7, Study Name: Crandall Canyon

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
15.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	11	3	1	-	-	-
Elk	5	2	2	1	2 (5)	1 (3)	5 (12)
Deer	15	22	7	6	50 (122)	15 (36)	9 (23)
Cattle	-	1	-	-	7 (16)	-	5 (13)

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 7

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	1132	47	0	53	-	24	18	29	-/-	
96	580	21	69	10	20	21	21	14	21/22	
01	640	25	63	13	-	28	34	9	22/27	
06	320	25	63	13	-	19	44	19	25/30	
11	220	9	91	0	-	18	18	0	22/26	
<i>Artemisia tridentata vaseyana</i>										
84	864	8	46	46	-	62	31	0	20/23	
90	1132	0	29	71	66	12	59	41	19/23	
96	340	24	71	6	-	24	41	0	14/25	
01	280	7	64	29	-	36	43	0	16/26	
06	200	0	80	20	60	50	20	20	23/31	
11	160	0	100	0	20	50	0	13	21/35	
<i>Cercocarpus montanus</i>										
84	1331	10	45	45	-	15	85	0	17/18	
90	1065	6	6	88	-	13	81	31	6/10	
96	1120	20	77	4	20	27	43	2	21/29	
01	1200	3	78	18	-	7	80	13	26/35	
06	1060	9	70	21	-	9	66	6	20/34	
11	1020	12	86	2	20	29	31	6	19/28	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	6265	22	50	28	-	16	0	43	9/7	
96	1020	2	94	4	-	2	2	0	10/12	
01	1640	4	96	0	-	0	0	0	8/11	
06	1120	9	89	2	-	5	0	0	9/16	
11	960	21	79	0	20	0	0	2	9/16	
<i>Gutierrezia sarothrae</i>										
84	4599	0	97	3	-	1	0	0	11/13	
90	7998	36	54	10	2333	0	0	3	8/7	
96	7640	11	89	0	620	0	0	0	9/11	
01	10680	2	91	7	20	0	0	4	6/8	
06	1360	16	82	1	40	0	0	0	7/10	
11	940	23	77	0	20	0	0	0	10/13	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Juniperus osteosperma										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	100	0	-	-	0	0	0	-/-	
01	120	0	100	-	-	0	0	0	-/-	
06	140	14	86	-	-	0	0	0	-/-	
11	60	33	67	-	-	0	0	0	-/-	
Opuntia sp.										
84	398	33	50	17	-	0	0	0	10/7	
90	199	33	67	0	-	0	0	0	6/6	
96	380	16	84	0	-	0	0	0	5/15	
01	300	0	60	40	20	0	0	27	4/9	
06	440	14	86	0	-	0	0	0	4/13	
11	40	0	100	0	20	0	0	0	4/12	
Purshia tridentata										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	40	0	50	50	-	50	0	0	-/-	
01	60	0	100	0	-	0	0	0	14/51	
06	20	0	100	0	-	100	0	0	12/54	
11	60	0	100	0	-	0	100	0	11/47	
Quercus gambelii										
84	1999	37	63	0	-	27	47	0	30/19	
90	4398	73	0	27	666	26	6	18	-/-	
96	720	17	83	0	60	0	0	0	28/18	
01	1320	26	74	0	-	0	0	0	47/24	
06	1460	23	77	0	-	0	0	0	40/19	
11	520	38	62	0	-	15	0	0	-/-	
Rosa woodsii										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	16/10	
01	40	0	100	-	-	0	0	0	9/6	
06	0	0	0	-	-	0	0	0	19/12	
11	0	0	0	-	-	0	0	0	12/12	
Symphoricarpos oreophilus										
84	0	0	0	0	-	0	0	0	-/-	
90	866	15	0	85	-	54	8	62	-/-	
96	940	36	55	9	20	32	2	2	16/26	
01	560	21	79	0	-	0	0	0	18/29	
06	1000	8	64	28	-	0	4	16	16/22	
11	900	16	84	0	20	4	0	0	16/24	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Tetradymia canescens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	200	10	90	-	-	90	0	0	15/18	
01	100	20	80	-	-	0	0	0	10/15	
06	0	0	0	-	-	0	0	0	6/15	
11	0	0	0	-	-	0	0	0	11/24	

NORTH OAKLEY BENCH - TREND STUDY NO. 6-9-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: Private

Elevation: 6,700 ft (2,042 m)

Aspect: South

Slope: 3%

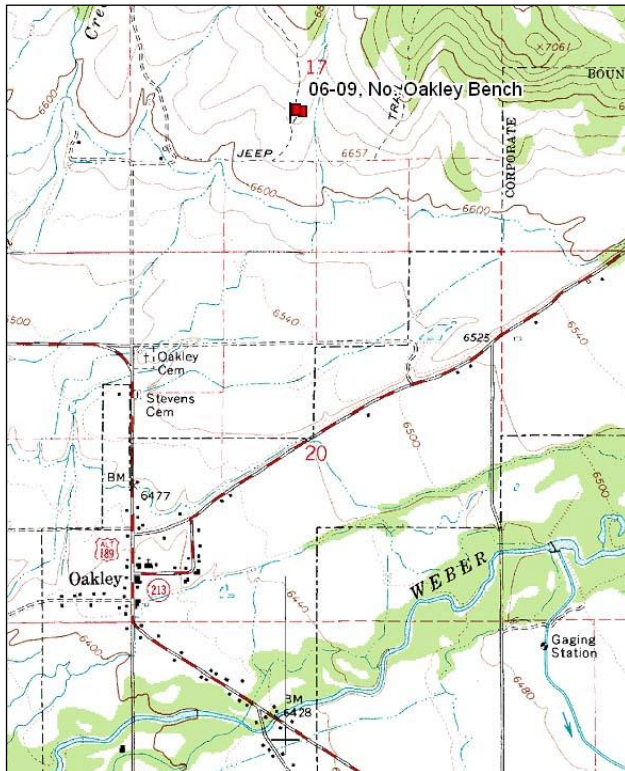
Transect bearing: 180° magnetic

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

Directions:

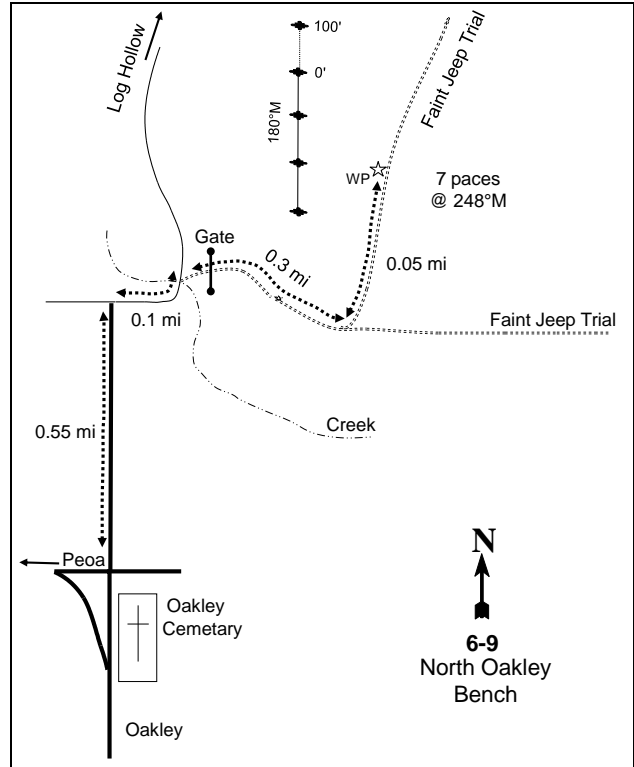
From the Oakley cemetery, just north of Oakley, proceed north 0.55 miles to an intersection and turn right. Proceed east 0.1 miles to a gate; pass through gate (private land; key needed) with creek on immediate right. Continue on a faint road for 0.3 miles to a fork. Turn left and proceed 0.05 miles 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



Township: 1S Range: 6E Section: 17

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 475331 E 4509101 N

NORTH OAKLEY BENCH - TREND STUDY NO. 6-9

Site Information

Site Description: The study lies on a relatively uniform mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), grass, and mountain brush community north of Oakley. 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. The study 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. The study area is very representative of the south-facing slopes north of Oakley. Deer pellet groups were sampled in moderate abundance in 2001 and 2011, but high abundance in 2006. Elk pellet groups have been sampled in high abundance since 2001. Sampled cattle sign was moderate in 2001, but has been low in abundance since 2006. Cattle were on the study when it was monitored in 2001 and 2011. Sheep and horse pellets groups have also been sampled in limited numbers (Table - Pellet Group Data). A moose pellet group was identified in 2006, but was not sampled within the pellet group transect. Ants were extremely abundant in 2001 and 2006.

Browse: The preferred browse species are mountain big sagebrush, Saskatoon serviceberry (*Amelanchier alnifolia*), and antelope bitterbrush (*Purshia tridentata*). The key browse species is mountain big sagebrush, but density of sagebrush has steadily decreased since 1996. There was an infestation by the sagebrush defoliator moth (*Aroga websteri*) between the 2001 and 2006 study years similar to other studies in the region. There were 10% of the sagebrush plants that were classified as insect infested in 2006, and poor vigor and decadence increased substantially in that year. Utilization of sagebrush has been mostly light to moderate, though with heavy use in several years. Recruitment of young sagebrush plants has been good over the course of the study. Both serviceberry and bitterbrush occur in low density. Serviceberry and bitterbrush populations have shown moderate to heavy use, good vigor, and low decadence since 1996. Mountain snowberry (*Symphoricarpos oreophilus*) occurs in moderate density. Snowberry displayed moderate to heavy use in 1996, but use has been mostly light to moderate in other sample years. Other browse species sampled include stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), gray horsebrush (*Tetradymia canescens*), and prickly pear cactus (*Opuntia* sp.) (Table - Browse Characteristics). Stickyleaf low rabbitbrush is abundant on the site, and has steadily increased in cover since 1996 (Table - Browse Trends).

Herbaceous Understory: Grass and forb composition is diverse, but includes many biennial and perennial weeds or species of poor forage value. The dominant grass species is the weedy species bulbous bluegrass (*Poa bulbosa*). Bulbous bluegrass has steadily increased in frequency and cover since 1996. Other common perennial species include crested wheatgrass (*Agropyron cristatum*), thickspike wheatgrass (*A. dasystachyum*), Kentucky bluegrass (*Poa pratensis*), Sandberg bluegrass (*P. secunda*), and Letterman needlegrass (*Stipa lettermani*). Kentucky bluegrass has steadily decreased in frequency and cover since 1996. Forb composition include species such as thistle (*Cirsium undulatum*), aster (*Aster chilensis*), western yarrow (*Achillea millefolium*), common dandelion (*Taraxacum officinale*), yellow salsify (*Tragopogon dubius*), death camas (*Zigadenus paniculatus*), and tapertip onion (*Allium acuminatum*) (Table - Herbaceous Trends).

Soil: The soil is in the Ayoub series, which occur on mountain slopes. The parent material consists of slope alluvium derived from andesite over residuum weathered from andesite (Soil Survey Staff 2011). The soil is a clay loam soil texture with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is moderately low. Moreover, there is a large amount of vegetation cover providing protective ground cover (Table - Basic Cover). During the height of the 1987 to 1990 drought period, some trampling damage and soil compaction were evident from livestock, but have been less evident as vegetation recovered. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** Density of mountain big sagebrush decreased 58% from 3,664 plants/acre to 1,531 plants/acre. Decadence of sagebrush decreased from 35% to 13%, and recruitment of young sagebrush plants remained excellent at 35% of the population. The serviceberry density increased slightly, and bitterbrush density remained similar.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. There was little change in any of the preferred browse decadence or vigor. Recruitment of young sagebrush plants decreased to 17% of the population, but is still considered very good.
- **1996 to 2001 - slightly down (-1):** The density of mountain big sagebrush decreased 27% from 2,180 plants/acre to 1,600 plants/acre, but cover increased from 6% to 9%. Recruitment of young sagebrush decreased to 11%, but is still considered good. Serviceberry and bitterbrush populations remained similar.
- **2001 to 2006 - down (-2):** Sagebrush decreased 26% in density to 1,180 plants/acre, and cover decreased to 6%. Decadence increased to 47%, and poor vigor increased from 15% to 63%. This increase in decadence and poor vigor is likely due to an infestation of the sagebrush defoliator moth, which caused defoliation and drying of leaves on approximately 240 plants/acre.
- **2006 to 2011 - stable (0):** The density of sagebrush decreased by 19% to 960 plants/acre, though cover remained similar at 6%. Decadence of sagebrush decreased to 15%, and poor vigor decreased to 21% of the population. Density of bitterbrush has remained similar, but cover has steadily increased since 2001.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased 34%.
- **1990 to 1996 - stable (0):** Bulbous bluegrass and annual grass species were included in the sample for the first time in 1996. The perennial grass sum of nested frequency remained similar due to the large amount of bulbous bluegrass sampled.
- **1996 to 2001 - slightly down (-1):** Excluding bulbous bluegrass, there was little change in the sum of nested frequency of perennial grasses. However, bulbous bluegrass increased significantly in nested frequency, and cover increased from 7% to 12%.
- **2001 to 2006 - slightly down (-1):** Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased by 10%. Bulbous bluegrass increased in nested frequency, but cover decreased slightly to 10%.
- **2006 to 2011 - slightly down (-1):** Excluding bulbous bluegrass, there was little change in the sum of nested frequency of perennial grasses. However, bulbous bluegrass has increased significantly in nested frequency since 2001, and cover increased to 16%.

Forb:

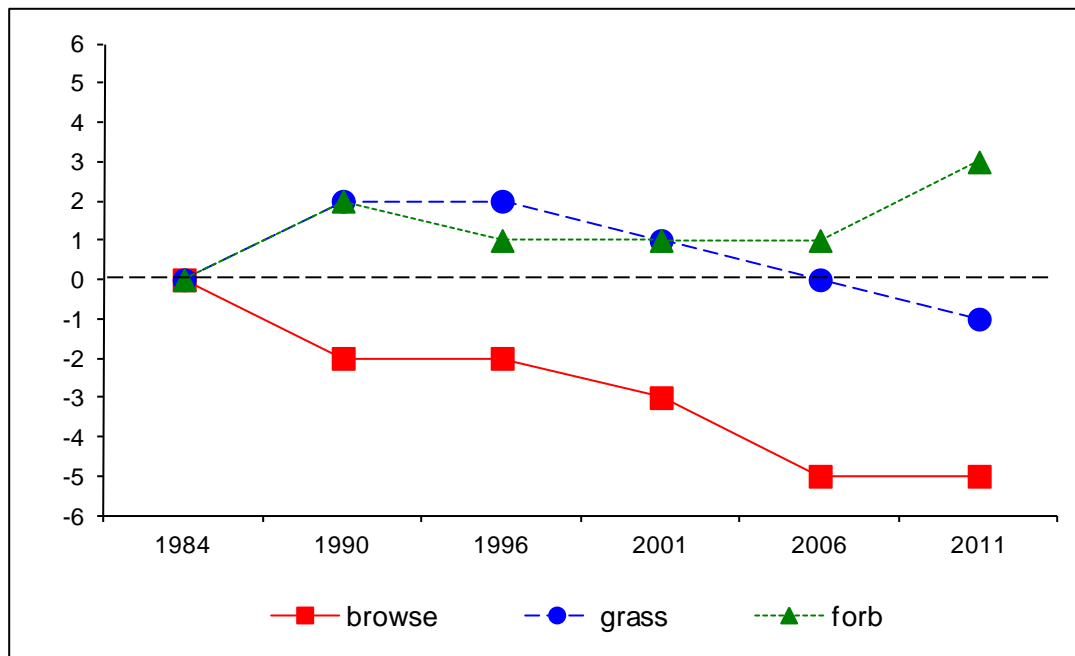
- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased by 37%.
- **1990 to 1996 - slightly down (-1):** The perennial forb sum of nested frequency decreased by 24%, but some of this decrease may be related to the larger sample area used in 1996.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial forbs remained similar, but cover increased slightly from 5% to 6%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased 58%, and cover increased to 16%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 6, study no: 9

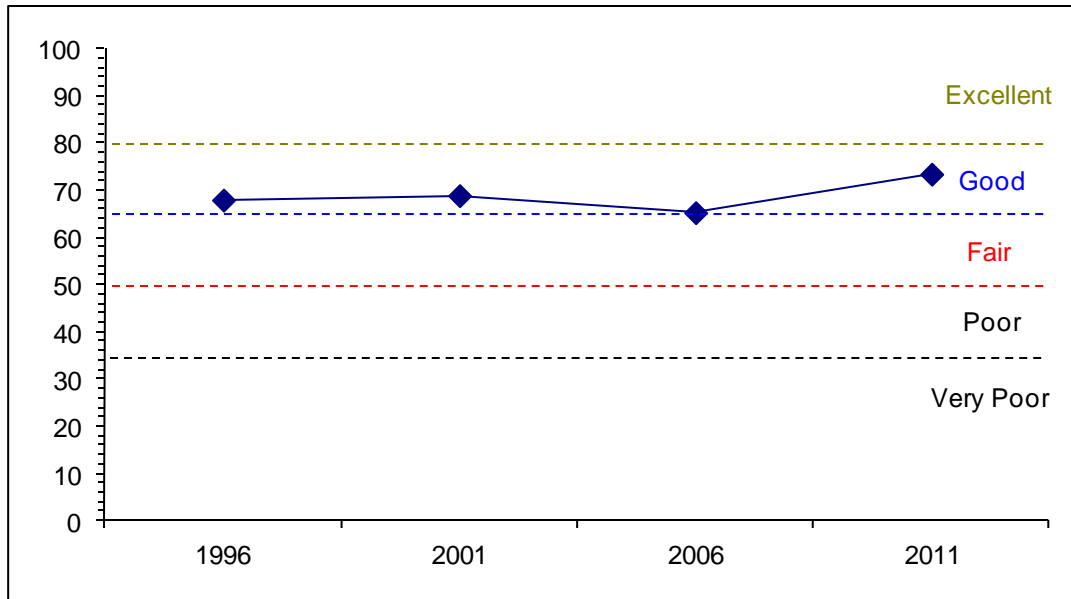
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	9.2	12.8	7.5	30.0	-0.2	8.6	0.0	67.9	Good
01	15.3	11.2	4.9	28.0	-0.1	9.6	0.0	68.9	Good
06	11.7	5.9	7.8	30.0	0.0	10.0	0.0	65.3	Fair-Good
11	16.5	12.3	4.9	30.0	-0.3	10.0	0.0	73.4	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6 Study no: 9



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 6, Study no: 9



HERBACEOUS TRENDS--
 Management unit 06, Study no: 9

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	b132	c216	a71	a82	a92	a84	2.39	4.20	4.93	2.58
G	Agropyron dasystachyum	b80	a17	b72	c124	bc94	d158	.74	2.00	1.24	3.99
G	Agropyron intermedium	-	-	2	-	-	1	.15	-	-	.00
G	Agropyron spicatum	b47	a14	b68	a15	a14	a11	1.48	.60	.29	.33
G	Bromus brizaeformis (a)	-	-	-	3	-	-	-	.03	-	-
G	Bromus inermis	-	13	7	6	6	6	.18	.18	.06	.06
G	Bromus tectorum (a)	-	-	18	18	8	8	.22	.06	.04	.41
G	Koeleria cristata	-	-	4	16	21	29	.03	.39	.19	.38
G	Poa bulbosa	a-	a-	b135	c230	cd233	d282	6.46	11.66	9.93	15.83
G	Poa fendleriana	-	4	8	10	9	20	.21	.18	.09	1.27
G	Poa pratensis	c116	d182	d182	bc81	ab59	a27	4.97	2.01	1.74	.15
G	Poa secunda	a10	ab25	a17	c58	abc36	bc48	.42	.89	1.54	5.56
G	Sitanion hystrix	-	-	-	5	6	4	-	.18	.07	.06
G	Stipa columbiana	b133	c221	a18	a6	a3	a24	.27	.06	.15	.87
G	Stipa comata	a-	a-	a-	b6	a-	a-	-	.06	-	.03
G	Stipa lettermani	a-	a-	b165	b176	b184	a86	5.61	3.22	6.03	3.43
Total for Annual Grasses		0	0	18	21	8	8	0.22	0.09	0.03	0.41
Total for Perennial Grasses		518	692	749	815	757	780	22.95	25.68	26.29	34.59
Total for Grasses		518	692	767	836	765	788	23.18	25.77	26.33	35.00
F	Achillea millefolium	ab52	ab46	a30	a30	ab47	b65	.29	.46	1.02	1.98
F	Agoseris glauca	-	-	7	-	2	2	.01	-	.00	.00
F	Allium acuminatum	ab29	a6	a14	b42	b55	c135	.08	.13	.15	1.15
F	Alyssum alyssoides (a)	-	-	a6	ab29	b62	c178	.01	.14	.32	4.07

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Arabis sp.	-	13	7	-	5	-	.01	-	.04	-
F	Aster chilensis	a9	b34	a9	a13	a6	a2	.18	.42	.04	.03
F	Astragalus beckwithii	-	-	2	1	-	7	.03	.00	-	.33
F	Astragalus convallarius	ab13	ab12	a5	bc34	c59	cd43	.04	.60	.83	1.47
F	Balsamorhiza sagittata	-	-	-	-	-	4	-	.00	-	.06
F	Calochortus nuttallii	a3	a11	a13	a17	a9	b40	.04	.20	.02	.15
F	Camelina microcarpa (a)	-	-	-	-	2	6	-	-	.03	.06
F	Chenopodium fremontii (a)	-	-	-	3	-	-	-	.00	-	-
F	Cirsium undulatum	c137	b73	a38	a24	a17	b92	.61	.55	.10	2.39
F	Collinsia parviflora (a)	-	-	a-	bc35	c52	b8	-	.06	.10	.05
F	Collomia linearis (a)	-	-	-	26	-	20	-	.06	-	.09
F	Comandra pallida	a15	a22	b50	ab30	ab28	ab27	.38	.15	.61	.33
F	Cordylanthus ramosus (a)	-	-	a5	bc30	c29	ab9	.06	.35	.32	.09
F	Crepis acuminata	6	-	-	-	5	-	-	-	.04	-
F	Cruciferae	-	2	-	-	-	-	-	-	-	-
F	Cryptantha sp.	4	-	-	-	-	-	-	-	-	-
F	Cynoglossum officinale	-	2	2	-	-	-	.03	-	-	-
F	Delphinium nuttallianum	-	-	3	-	-	1	.00	-	-	.03
F	Descurainia pinnata (a)	-	-	-	-	2	2	-	-	.00	.00
F	Draba sp. (a)	-	-	a-	a-	a-	b25	-	-	-	.37
F	Epilobium brachycarpum (a)	-	-	a-	b12	c36	bc24	-	.05	.37	.11
F	Erigeron pumilus	a2	c34	c41	bc29	ab10	ab10	.30	.09	.07	.25
F	Eriogonum racemosum	4	15	5	3	5	-	.01	.01	.01	-
F	Eriogonum umbellatum	-	-	3	-	-	-	.01	-	-	-
F	Gayophytum ramosissimum(a)	-	-	b15	a-	b18	b14	.05	-	.05	.05
F	Hackelia patens	-	-	6	1	-	13	.30	.00	-	.25
F	Holosteum umbellatum (a)	-	-	a6	b40	a3	a5	.01	.21	.00	.15
F	Ipomopsis aggregata	-	2	1	-	-	-	.03	-	-	-
F	Lactuca serriola (a)	-	3	-	-	-	5	-	-	-	.01
F	Lithospermum ruderale	a-	a2	a4	a3	a2	b10	.03	.03	.69	1.23
F	Lupinus argenteus	a2	a4	ab22	b40	b37	c79	.74	1.28	1.71	5.71
F	Machaeranthera canescens	bc70	d128	c74	ab20	a14	a4	.51	.13	.09	.04
F	Microsteris gracilis (a)	-	-	a-	b68	a17	a6	-	.28	.04	.01
F	Navarretia intertexta (a)	-	-	-	3	-	-	-	.00	-	-
F	Penstemon sp.	-	2	-	-	1	-	-	-	.00	-
F	Phlox longifolia	a-	b22	ab10	ab15	b30	a1	.05	.04	.16	.00
F	Polygonum douglasii (a)	-	-	b81	a28	b80	a32	.22	.08	.43	.13
F	Ranunculus testiculatus (a)	-	-	a3	b22	a-	a-	.00	.09	-	-
F	Senecio integerrimus	-	-	-	16	9	14	-	.15	.06	.29
F	Senecio multilobatus	3	-	-	4	7	-	-	.01	.02	-
F	Sphaeralcea coccinea	4	18	14	8	4	3	.31	.06	.18	.06
F	Taraxacum officinale	ab6	c34	bc26	c32	a2	abc26	.21	.26	.01	.36
F	Tragopogon dubius (a)	a7	b56	a25	a19	a4	a32	.27	.24	.06	.38
F	Unknown forb-annual (a)	-	-	b12	a-	a-	a-	.07	-	-	-
F	Verbascum thapsus	11	9	2	-	-	-	.03	-	-	-
F	Veronica biloba (a)	-	-	-	-	-	3	-	-	-	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Vicia americana</i>	a ⁻	b ¹⁵	a ⁻	a ⁻	a ⁻	a ⁻	-	-	-	-
F	<i>Viguiera multiflora</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Zigadenus paniculatus</i>	-	3	1	8	12	1	.03	.15	.18	.00
Total for Annual Forbs		7	59	153	315	305	369	0.70	1.61	1.76	5.65
Total for Perennial Forbs		371	509	389	370	366	579	4.32	4.78	6.09	16.16
Total for Forbs		378	568	542	685	671	948	5.02	6.40	7.85	21.81

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	13	13	11	18	.97	1.42	1.47	2.44
B	<i>Artemisia tridentata vaseyana</i>	55	43	45	39	5.86	9.43	5.65	6.30
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	85	86	94	92	3.79	6.31	8.35	8.97
B	<i>Kochia prostrata</i>	0	0	0	2	-	-	-	-
B	<i>Mahonia repens</i>	21	17	15	24	.93	.22	.32	1.00
B	<i>Opuntia sp.</i>	4	4	5	5	.91	.91	.60	.93
B	<i>Purshia tridentata</i>	11	16	11	12	.30	.89	1.59	3.28
B	<i>Symphoricarpos oreophilus</i>	28	25	24	22	3.65	5.55	4.56	5.85
B	<i>Tetradymia canescens</i>	3	2	5	3	-	.38	.15	-
Total for Browse		220	206	210	217	16.44	25.13	22.69	28.81

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 9

Species	Percent Cover	
	'06	'11
<i>Amelanchier alnifolia</i>	1.28	2.15
<i>Artemisia tridentata vaseyana</i>	6.43	6.09
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	12.25	12.33
<i>Mahonia repens</i>	.48	.85
<i>Opuntia sp.</i>	.41	.43
<i>Purshia tridentata</i>	2.21	4.41
<i>Symphoricarpos oreophilus</i>	7.53	8.06
<i>Tetradymia canescens</i>	-	.53

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 9

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.0	2.0	5.7
Artemisia tridentata vaseyana	1.6	2.1	2.9
Purshia tridentata	2.0	1.6	2.9

BASIC COVER--

Management unit 06, Study no: 9

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	7.75	12.00	46.85	55.62	55.27	75.12
Rock	2.00	1.50	1.37	1.79	2.08	1.31
Pavement	.25	1.50	.91	.32	1.07	1.37
Litter	60.50	47.00	39.72	38.70	35.50	27.04
Cryptogams	1.25	4.25	.97	2.75	.20	.74
Bare Ground	28.25	33.75	21.67	21.97	21.64	8.77

SOIL ANALYSIS DATA --

Management unit 06, Study no: 9, Study Name: North Oakley Bench

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
9.6	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	'11	'01	'06	'11
Sheep	1	-	-	-	-	-	-
Rabbit	3	3	10	4	-	-	-
Horse	-	3	2	-	-	3 (7)	-
Elk	5	21	43	17	30 (73)	59 (146)	48 (117)
Deer	15	11	15	10	19 (48)	46 (112)	21 (53)
Cattle	6	12	2	3	22 (54)	13 (32)	8 (20)

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 9

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
84	66	0	0	100	-	100	0	0	-/-
90	199	67	33	0	66	67	33	33	25/31
96	280	7	93	0	20	29	50	0	25/30
01	260	0	85	15	-	23	77	0	28/34
06	220	27	73	0	-	18	64	0	29/29
11	420	10	86	5	-	38	29	5	28/31

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
84	3664	27	38	35	66	56	18	5	13/7	
90	1531	35	52	13	2466	30	4	4	14/17	
96	2180	17	73	9	140	46	21	9	20/28	
01	1600	11	76	13	40	46	23	15	22/35	
06	1180	17	36	47	40	27	12	63	22/34	
11	960	15	71	15	20	27	2	21	21/31	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	6932	0	74	26	-	0	0	0	16/15	
90	9932	17	66	17	1133	27	5	21	9/10	
96	6660	11	87	2	100	.30	0	0	11/16	
01	7500	9	90	1	-	2	0	.26	9/16	
06	8640	11	87	2	-	7	0	.92	10/21	
11	6960	18	82	1	200	.57	0	.28	11/16	
<i>Kochia prostrata</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	60	0	100	-	-	0	0	0	-/-	
<i>Mahonia repens</i>										
84	66	100	0	-	-	0	0	0	-/-	
90	1932	69	31	-	-	14	0	0	3/4	
96	6340	79	21	-	320	0	0	0	3/5	
01	3960	11	89	-	-	0	0	0	2/3	
06	5120	13	87	-	20	0	0	0	2/3	
11	5220	0	100	-	20	0	0	0	3/4	
<i>Opuntia sp.</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	66	0	0	0	-/-	
96	80	0	100	0	-	0	0	0	7/20	
01	80	0	75	25	-	0	0	0	4/19	
06	180	0	100	0	-	0	0	0	5/15	
11	100	0	100	0	-	0	0	0	7/22	
<i>Purshia tridentata</i>										
84	265	25	75	0	-	50	25	0	30/34	
90	265	25	75	0	-	0	100	0	22/41	
96	260	0	100	0	-	38	62	0	14/40	
01	320	13	81	6	-	31	56	0	11/36	
06	240	0	100	0	-	0	100	0	21/51	
11	260	8	92	0	-	15	38	0	19/49	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Symphoricarpos oreophilus</i>										
84	265	0	75	25	-	75	0	0	11/15	
90	465	29	57	14	-	57	14	14	12/14	
96	1000	14	86	0	80	38	26	0	24/42	
01	560	11	86	4	-	7	4	0	29/49	
06	840	10	83	7	-	2	0	17	27/39	
11	620	13	84	3	-	39	3	3	27/41	
<i>Tetradymia canescens</i>										
84	66	100	0	0	-	0	0	0	-/-	
90	66	0	100	0	-	100	0	0	13/14	
96	60	33	67	0	40	100	0	0	11/19	
01	60	67	33	0	20	0	0	0	9/17	
06	240	25	67	8	-	0	0	0	9/16	
11	60	33	67	0	-	0	0	0	13/25	

MAHOGANY HILLS - TREND STUDY NO. 6-10-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Loam \(Oak\), R047XA446UT](#)

Land Ownership: Private

Elevation: 7,020 ft (2,140 m)

Aspect: Southeast

Slope: 12-15%

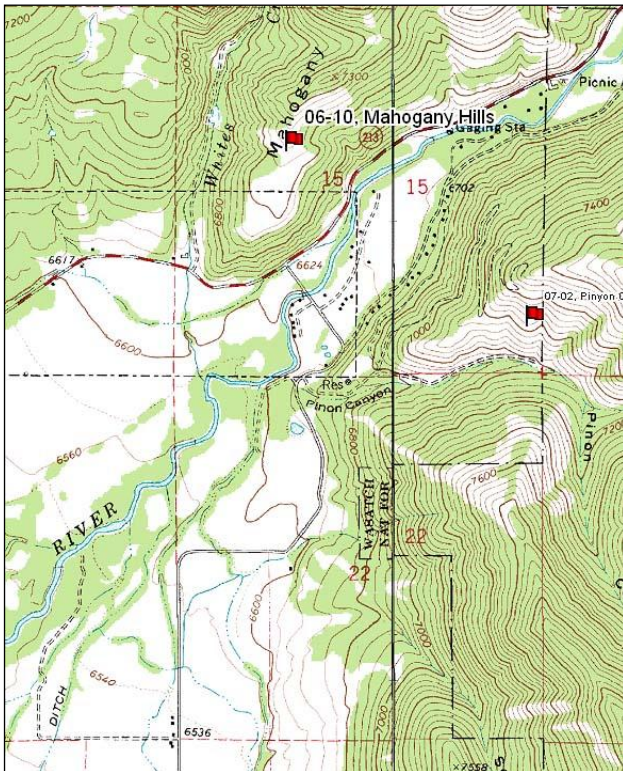
Transect bearing: 162° magnetic

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

Directions:

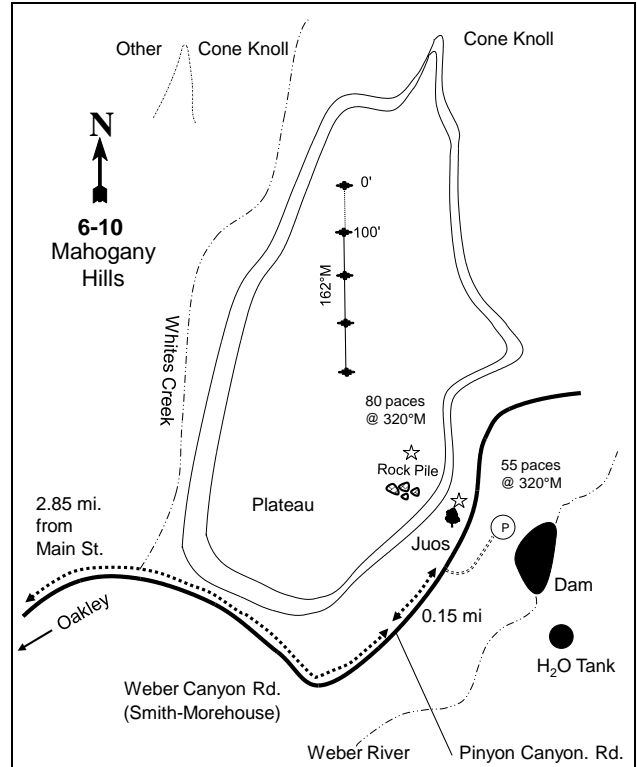
From Oakley, proceed up Weber Canyon watching for Pinyon Canyon Lane which is a right turn. From this road proceed 0.15 miles farther up Weber Canyon and park opposite a small irrigation canal dam. The main river dam to supply the canal is 100 yards upstream. From the river diversion, walk up the steep 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 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:



GPS: NAD 83, UTM 12S 478363 E 4509507 N

MAHOGANY HILLS - TREND STUDY NO. 6-10

Site Information

Site Description: The study is located on private land, on a ridge at the mouth of the Upper Weber River Canyon. The area has a lot of recreational development, with newer cabins and summer homes in the general vicinity of the site. The vegetation is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), other mountain brush, and grass community. Elk pellet groups have been sampled in high abundance since 2001. Deer pellet groups have fluctuated in abundance throughout the sample years with low abundance in 2001, high abundance in 2006, and moderate abundance in 2011. There has been no evidence of livestock sign (Table - Pellet Group Data).

Browse: There is a good mixture of mountain brush species on the site, but mountain big sagebrush and mountain snowberry (*Symphoricarpos oreophilus*) dominate the browse component. There was a large decrease in mountain big sagebrush cover (Table - Browse Trends) and density in 2001. Sagebrush density has remained similar since 2001. The sagebrush population has displayed high decadence and moderate to heavy utilization since the outset of the study. Recruitment of young sagebrush plants into the population has been poor. Due to the poor recruitment and heavy competition from the grass species smooth brome (*Bromus inermis*); the sagebrush density may continue to decrease. Snowberry has a moderately dense, healthy population, but receives little use. Other valuable browse species that contribute to the community include Saskatoon serviceberry (*Amelanchier alnifolia*), true mountain mahogany (*Cercocarpus montanus*), and antelope bitterbrush (*Purshia tridentata*). These less prevalent species, display moderate to heavy use, but with low decadence and normal vigor. True mountain mahogany occurs primarily around the upper third of the sample transect. Gambel oak (*Quercus gambelii*) is also on the site, but is isolated around the first sample belt. Utilization of oak has been mostly moderate. A late snow storm and cold temperatures in June 2001 killed many of the leaf and meristematic biomass of the oak in the 2001 sampling. Also present are some less desirable shrubs such as stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are an important component and have provided the majority of the vegetation cover on the site since 2001. Smooth brome is the dominant grass and has increased in abundance since 1984. Smooth brome 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 bluegrass (*Poa secunda*), Kentucky bluegrass (*P. pratensis*), mutton bluegrass (*P. fendleriana*), and prairie junegrass (*Koeleria cristata*) are also fairly abundant. Other perennial species are diverse, but are not abundant. Forbs also have a diverse composition and include several palatable and valuable species. Desirable forb species on the site include arrowleaf balsamroot (*Balsamorhiza sagittata*), one-flowered helianthella (*Helianthella uniflora*), low penstemon (*Penstemon humilis*), and redroot eriogonum (*Eriogonum racemosum*) (Table - Herbaceous Trends).

Soil: The soil is in the Agassiz series, which occurs on mountain slopes. Parent material consists of colluviums derived from limestone (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). This area has a diverse plant composition, especially among grasses. Vegetation and litter cover are very high, with little bare ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of mountain big sagebrush decreased by 21% from 4,132 plants/acre to 3,265 plants/acre. However, decadence of sagebrush decreased from 82% to 45%, and

poor vigor decreased from 27% to 16%. Both measurements are still considered to be high. Both serviceberry and bitterbrush also decreased in density.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. There was little change in the decadence, vigor, or the recruitment of young plants in the sagebrush population. Decadence and poor vigor decreased in the small serviceberry population, but decadence is still considered to be high at 32%.
- **1996 to 2001 - down (-2):** Mountain big sagebrush density decreased by 31% from 2,780 plants/acre to 1,920 plants/acre, and cover decreased from 16% to 11%. Decadence and poor vigor of sagebrush remained high, and recruitment of young plants remained poor. Density of serviceberry increased 57% from 560 plants/acre to 880 plants/acre, but cover remained similar at 3%. The small density of mahogany remained similar, but cover decreased from 1% to near 0%.
- **2001 to 2006 - stable (0):** The density and cover of mountain big sagebrush remained similar at 1,960 plants/acre and 12%, respectively. Serviceberry decreased 30% to 620 plants/acre, and cover decreased to 2%. The small populations of mahogany and bitterbrush remained similar.
- **2006 to 2011 - stable (0):** Mountain big sagebrush density increased by 9% to 2,140 plants/acre, but cover decreased to 8%. The other preferred browse species populations remained similar.

Grass:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though there was a significant increase in the nested frequency of the dominant grass species smooth brome.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 16%, with a significant increase in the nested frequency of the dominant grass species smooth brome.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 13%, but cover increased slightly from 33% to 35%. There was a significant decrease in the nested frequency of the desirable species bluebunch wheatgrass (*Agropyron spicatum*), which became rare on the site.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 11%, but cover increased slightly to 36%. Much of the increase in cover was due to a significant increase in the nested frequency of the weedy species bulbous bluegrass (*Poa bulbosa*).
- **2006 to 2011 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased slightly to 37%.

Forb:

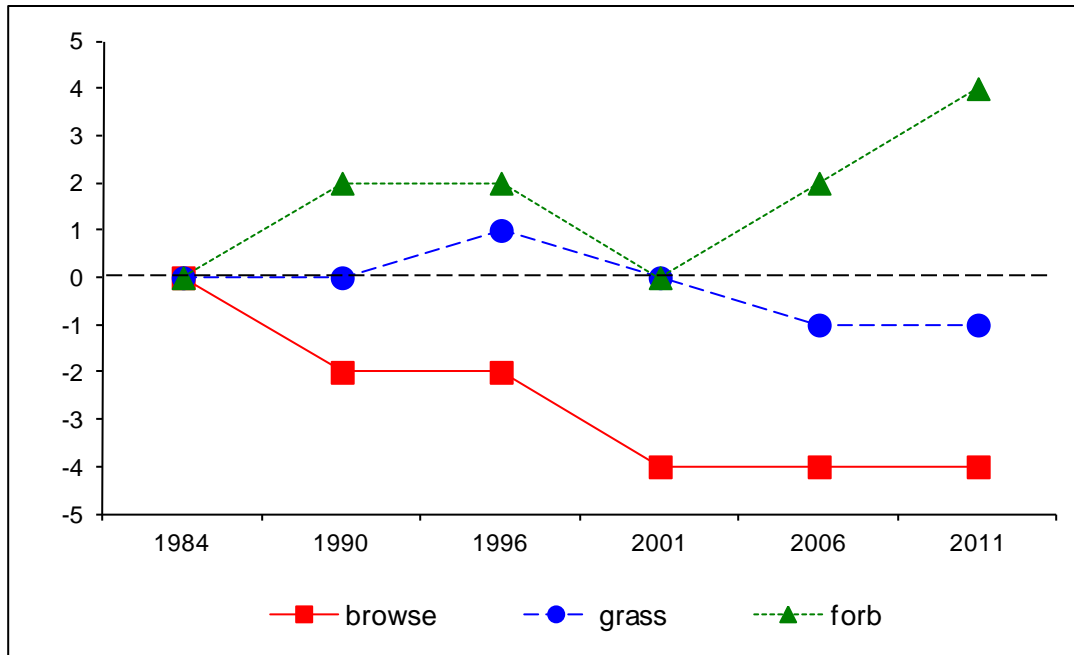
- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased by 66%. Forbs are diverse, and there are several palatable species for deer that inhabit the area year-round.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 21%, and cover decreased slightly from 6% to 5%.
- **2001 to 2006 - up (+2):** There was a 49% increase in the sum of nested frequency of perennial forbs, and cover increased to 9%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased 48%, and cover increased to 10%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 6, study no: 10

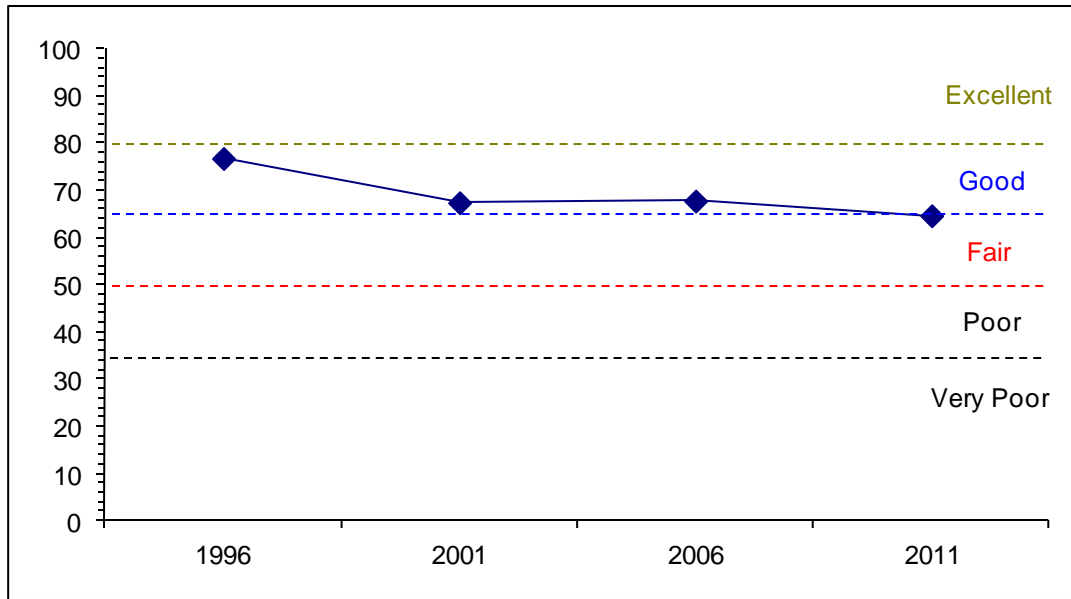
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	5.4	1.4	30.0	0.0	10.0	0.0	76.8	Good
01	21.4	4.4	1.6	30.0	0.0	10.0	0.0	67.4	Good
06	20.2	4.0	3.5	30.0	0.0	10.0	0.0	67.7	Good
11	16.4	4.3	4.0	30.0	0.0	10.0	0.0	64.6	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6 Study no: 10



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 6, Study no: 10



HERBACEOUS TRENDS--
 Management unit 06, Study no: 10

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	11	7	8	5	4	5	.27	.03	.00	.03
G	Agropyron dasystachyum	b13	ab8	a2	b17	a-	ab9	.00	.52	-	.04
G	Agropyron spicatum	b97	b120	b85	a37	a23	a14	2.52	.98	.43	.24
G	Bromus inermis	a159	b217	c278	c293	c295	c310	19.99	25.12	24.01	29.56
G	Bromus tectorum (a)	-	-	-	2	-	-	-	.00	-	-
G	Carex sp.	-	-	-	-	2	5	-	-	.15	.01
G	Dactylis glomerata	1	-	5	1	-	-	.15	.00	-	-
G	Koeleria cristata	a-	a-	b33	b19	c76	b42	.82	.83	6.19	1.43
G	Melica bulbosa	-	-	7	-	1	-	.01	-	.00	.00
G	Phleum pratense	2	-	-	-	-	-	-	-	-	-
G	Poa bulbosa	a-	a8	ab9	a3	bc31	c28	.33	.06	1.14	.81
G	Poa fendleriana	ab55	ab35	b65	b76	ab33	a24	2.61	2.40	1.07	.56
G	Poa pratensis	b80	b76	b115	ab70	a34	ab56	3.40	1.42	.34	1.75
G	Poa secunda	a129	ab133	ab117	b129	a79	ab113	2.68	3.29	2.91	2.42
G	Stipa columbiana	b40	b25	a-	a-	a-	a-	-	-	-	-
G	Stipa comata	ab8	b12	ab22	a1	a-	a-	.58	.03	-	-
Total for Annual Grasses		0	0	0	2	0	0	0	0.00	0	0
Total for Perennial Grasses		595	641	746	651	578	606	33.41	34.70	36.30	36.89
Total for Grasses		595	641	746	653	578	606	33.41	34.71	36.30	36.89
F	Achillea millefolium	7	2	1	-	3	2	.00	-	.15	.15
F	Agoseris glauca	a-	a-	a-	a6	a5	b27	-	.01	.01	.19
F	Allium sp.	a-	b28	a3	a4	c65	d139	.01	.01	.33	1.06
F	Alyssum alyssoides (a)	-	-	a14	a23	a32	b81	.05	.27	.09	.69

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Antennaria rosea</i>	1	-	1	-	-	-	.03	-	-	-
F	<i>Arabis</i> sp.	ab8	a1	b17	a-	ab9	a-	.04	-	.05	-
F	<i>Arenaria</i> sp.	-	4	-	-	-	16	-	-	-	.07
F	<i>Artemisia ludoviciana</i>	-	-	3	3	3	4	.38	.15	.38	.38
F	<i>Astragalus convallarius</i>	a4	b32	ab61	ab53	b34	c62	1.10	.84	.61	1.27
F	<i>Balsamorhiza sagittata</i>	10	4	5	9	13	17	.57	.92	2.14	2.18
F	<i>Calochortus nuttallii</i>	a-	a5	a-	a-	b27	ab14	-	-	.09	.06
F	<i>Castilleja linariaefolia</i>	6	3	11	2	10	8	.52	.12	.27	.33
F	<i>Cirsium undulatum</i>	3	4	6	5	-	-	.07	.15	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	a24	a17	a15	b56	.12	.06	.06	.27
F	<i>Collomia linearis</i> (a)	-	-	-	-	-	3	-	-	-	.00
F	<i>Comandra pallida</i>	-	2	10	2	5	11	.08	.16	.56	.13
F	<i>Cordylanthus ramosus</i> (a)	-	-	a1	ab7	b16	b17	.00	.04	.34	.31
F	<i>Crepis acuminata</i>	a-	c97	b59	b56	b68	b72	.56	.60	1.47	1.55
F	<i>Descurainia</i> sp. (a)	-	-	a-	a-	a-	b38	-	-	-	.38
F	<i>Draba</i> sp. (a)	-	-	a-	a-	a4	b30	-	-	.01	.22
F	<i>Erigeron pumilus</i>	3	4	5	5	4	-	.04	.01	.06	-
F	<i>Eriogonum racemosum</i>	7	11	10	9	2	-	.24	.13	.01	-
F	<i>Eriogonum umbellatum</i>	-	-	6	5	8	14	.12	.06	.33	.51
F	<i>Hackelia patens</i>	d88	c38	bc22	ab4	a-	a2	.24	.03	.00	.01
F	<i>Helianthella uniflora</i>	a-	a-	bc29	b18	bc26	c30	1.39	1.51	1.60	1.61
F	<i>Holosteum umbellatum</i> (a)	-	-	11	3	-	3	.05	.00	-	.01
F	<i>Lappula occidentalis</i> (a)	-	-	-	-	6	-	-	-	.01	-
F	<i>Lithospermum ruderales</i>	3	-	7	6	3	3	.21	.12	.21	.15
F	<i>Lomatium</i> sp.	-	-	-	-	11	2	-	-	.07	.01
F	<i>Lupinus argenteus</i>	-	-	-	-	-	1	-	-	-	.03
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b15	b12	c42	-	.13	.03	.31
F	<i>Penstemon humilis</i>	11	13	5	-	-	-	.06	-	-	-
F	<i>Phlox longifolia</i>	-	3	-	3	-	-	-	.00	-	-
F	<i>Polygonum douglasii</i> (a)	-	-	15	-	13	13	.04	-	.04	.05
F	<i>Ranunculus testiculatus</i> (a)	-	-	a-	a-	a1	b7	-	-	.00	.02
F	<i>Schoenocrambe linifolia</i>	-	-	2	1	-	-	.00	.03	-	-
F	<i>Senecio integerrimus</i>	a-	a-	a-	b15	b14	c39	-	.10	.15	.58
F	<i>Zigadenus paniculatus</i>	-	-	3	3	2	-	.01	.03	.00	-
Total for Annual Forbs		0	0	65	65	99	290	0.28	0.51	0.59	2.28
Total for Perennial Forbs		151	251	266	209	312	463	5.73	5.02	8.51	10.32
Total for Forbs		151	251	331	274	411	753	6.01	5.53	9.10	12.61

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	24	31	24	26	3.34	2.84	1.99	1.77
B	Artemisia tridentata vaseyana	80	69	68	65	16.30	11.05	11.46	7.88
B	Cercocarpus montanus	1	3	1	3	1.31	.18	.15	.18
B	Chrysothamnus depressus	4	6	7	4	.30	.27	.71	.21
B	Chrysothamnus viscidiflorus viscidiflorus	39	50	41	46	2.55	1.41	2.56	1.77
B	Gutierrezia sarothrae	0	0	1	0	-	-	-	-
B	Purshia tridentata	9	10	11	12	1.49	1.10	.60	.91
B	Quercus gambelii	7	7	6	7	.91	1.08	.91	1.95
B	Symphoricarpos oreophilus	54	46	51	52	10.48	6.54	7.14	8.47
B	Tetradymia canescens	4	5	5	6	.18	.18	.15	.15
Total for Browse		222	227	215	221	36.89	24.68	25.70	23.31

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 10

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	3.96	4.68
Artemisia tridentata vaseyana	9.46	7.61
Cercocarpus montanus	-	.18
Chrysothamnus depressus	.10	-
Chrysothamnus viscidiflorus viscidiflorus	2.88	3.15
Purshia tridentata	2.00	2.06
Quercus gambelii	1.03	2.34
Symphoricarpos oreophilus	9.10	11.36
Tetradymia canescens	.30	.08

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 10

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.6	4.1	4.7
Artemisia tridentata vaseyana	1.8	1.7	1.8
Cercocarpus montanus	2.4	2.7	4.1
Purshia tridentata	-	3.3	2.9

BASIC COVER--

Management unit 06, Study no: 10

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	5.00	16.50	61.87	61.94	66.13	65.62
Rock	.50	0	.05	.03	.01	.01
Pavement	.50	0	.09	.14	.07	0
Litter	80.50	76.00	75.13	70.69	58.55	63.47
Cryptogams	.50	.75	.74	.19	.06	.19
Bare Ground	13.00	6.75	5.88	3.95	5.35	5.69

SOIL ANALYSIS DATA --

Management unit 06, Study no: 10, Study Name: Mahogany Hills

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.7	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	1	-	-	-	-
Elk	22	17	14	12	41 (101)	59 (146)	42 (103)
Deer	12	3	11	12	11 (26)	48 (119)	23 (58)

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 10

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier alnifolia									
84	399	17	0	83	-	0	100	67	-/-
90	265	25	0	75	-	75	25	25	-/-
96	560	0	68	32	-	64	25	4	33/39
01	880	5	80	16	-	23	34	0	33/36
06	620	13	81	6	-	48	35	3	36/32
11	620	10	77	13	-	55	39	0	37/36
Artemisia tridentata vaseyana									
84	4132	0	18	82	-	34	61	27	32/41
90	3265	2	53	45	-	76	4	16	27/30
96	2780	4	56	40	-	60	32	17	28/39
01	1920	1	51	48	-	56	21	18	26/34
06	1960	4	48	48	-	43	27	21	26/33
11	2140	9	54	36	140	54	19	20	29/37

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Cercocarpus ledifolius									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	63/49
Cercocarpus montanus									
84	0	0	0	0	-	0	0	0	-/-
90	132	50	0	50	-	0	50	50	-/-
96	20	0	100	0	-	0	0	0	54/63
01	60	33	67	0	-	0	67	0	40/37
06	40	0	100	0	-	0	100	0	46/59
11	80	25	75	0	-	0	75	0	37/43
Chrysothamnus depressus									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	220	0	100	-	-	0	0	0	7/10
01	200	0	100	-	-	0	0	0	8/9
06	340	35	65	-	-	53	0	0	8/13
11	200	20	80	-	-	0	0	0	8/16
Chrysothamnus viscidiflorus viscidiflorus									
84	398	17	17	67	-	0	0	0	10/13
90	66	0	100	0	-	0	0	0	13/3
96	1740	1	99	0	-	0	0	1	14/16
01	1680	1	99	0	40	0	0	0	12/15
06	1500	4	96	0	-	4	0	0	14/19
11	2000	0	100	0	-	4	0	0	13/16
Gutierrezia sarothrae									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	20	0	100	-	-	0	0	0	8/8
11	0	0	0	-	-	0	0	0	-/-
Opuntia sp.									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	6/9
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Purshia tridentata										
84	466	0	100	-	-	0	100	43	23/39	
90	266	0	100	-	-	75	0	0	25/40	
96	240	0	100	-	-	42	42	0	16/36	
01	280	7	93	-	-	7	64	0	14/34	
06	360	11	89	-	-	28	28	0	18/34	
11	340	6	94	-	-	6	76	0	15/43	
Quercus gambelii										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	460	0	100	0	-	83	4	0	32/22	
01	1120	9	79	13	-	68	4	70	22/18	
06	1180	22	68	10	-	34	0	10	23/11	
11	1260	79	21	0	-	76	24	0	30/22	
Symphoricarpos oreophilus										
84	1265	5	90	5	-	5	0	0	20/30	
90	1265	26	32	42	-	26	5	26	22/37	
96	3380	15	84	1	100	18	0	0	19/32	
01	1860	3	92	4	-	4	0	0	18/36	
06	3720	6	94	0	60	0	0	0	18/27	
11	2700	17	83	0	-	7	0	0	21/39	
Tetradymia canescens										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	80	0	100	0	-	25	0	0	17/18	
01	100	0	100	0	-	0	0	0	15/22	
06	100	0	100	0	-	40	0	0	14/18	
11	120	17	50	33	-	17	0	0	18/28	

STAG CANYON - TREND STUDY NO. 6-12-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Summer (Fawning habitat), Crucial Elk Summer (Calving habitat)

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA308UT](#)

Land Ownership: Private

Elevation: 6,610 ft (2,015 m)

Aspect: East

Slope: 15%

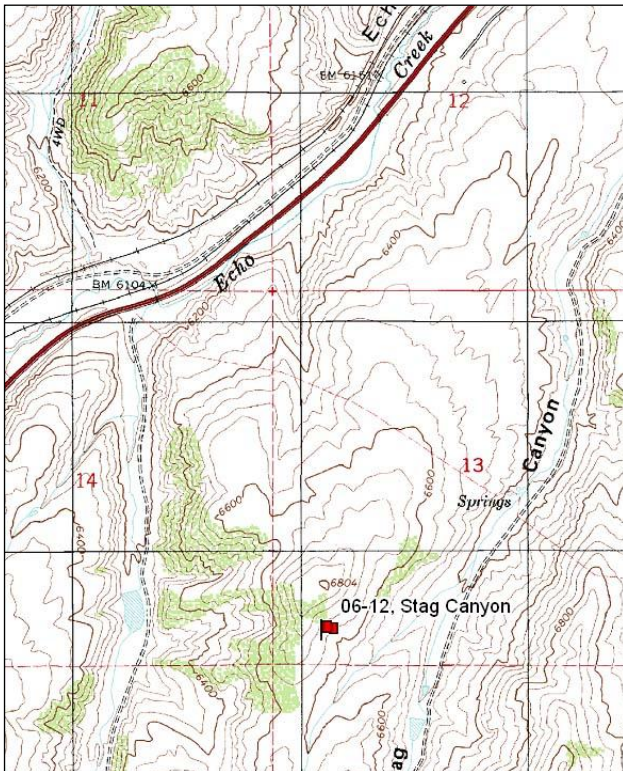
Transect bearing: 177° magnetic

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

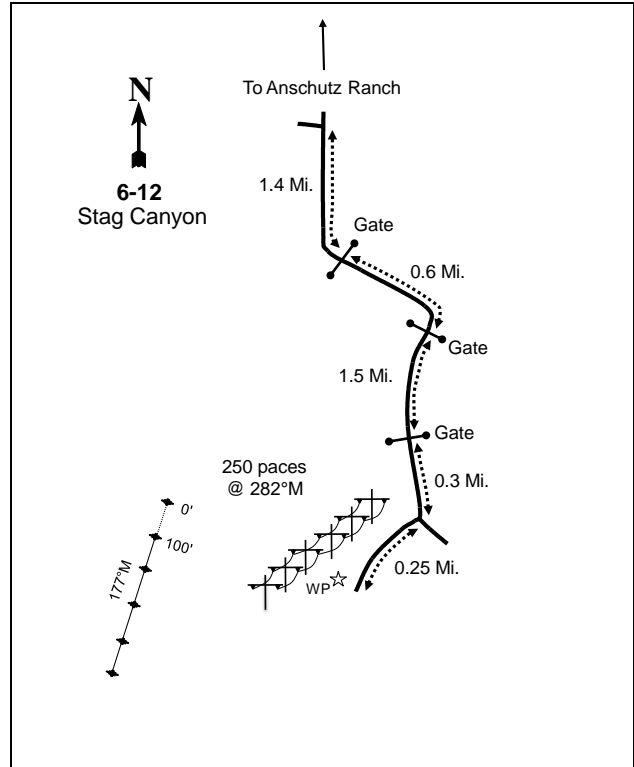
Directions:

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

GPS: NAD 83, UTM 12S 481026 E 4546813 N

STAG CANYON - TREND STUDY NO. 6-12

Site Information

Site Description: The study is located on private land that is part of the Ensign Ranches Cooperative Wildlife Management Unit (CWMU) up Echo canyon. The area is an old burn that is again dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with adequate Utah juniper (*Juniperus osteosperma*) located a short distance up the ridge that provides thermal cover. The study was established in 1996 because of concerns about heavy elk presence. Elk pellet groups were sampled in high abundance in 2001, but moderate in abundance since 2006. Deer pellet groups have been low to moderate in abundance since 2001. Sampled cattle sign has been low since 2001 (Table - Pellet Group Data).

Browse: The browse composition consists primarily of mountain big sagebrush and stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). Mountain big sagebrush provides the majority of the browse cover on the site, and cover has steadily increased since 1996 (Table - Browse Trends). Despite the increase in cover, density of mountain big sagebrush has steadily decreased since 2001. Most of the decrease in density of sagebrush is in conjunction with a decrease in the recruitment of young plants over the same period. There was an infestation by the sagebrush defoliator moth (*Aroga websteri*) between the 2001 and 2006 study years, similar to other studies in the region. There were 20% of the sagebrush plants that were classified as insect infested in 2006, though poor vigor and decadence have remained low throughout the study years. Utilization of sagebrush has been mostly light, but was more moderate in 2011. Increaser species make up the remainder of the browse; these species include stickyleaf low rabbitbrush, broom snakeweed (*Gutierrezia sarothrae*), and prickly pear (*Opuntia* sp.) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is marginal and weedy. Grasses are dominated by the annual species cheatgrass (*Bromus tectorum*), which has steadily increased in nested frequency and cover since 2001. Perennial grasses are diverse, but are not very abundant. The most prevalent perennial grass species include thickspike wheatgrass (*Agropyron dasystachyum*) and Indian ricegrass (*Oryzopsis hymenoides*). Perennial forbs are diverse, but are not very abundant. Wavyleaf thistle (*Cirsium undulatum*) and flannel mullein (*Verbascum thapsus*) were prevalent at the outset of the study, but both decreased significantly in 2001 and are now rare on the site. Annual forb species have increased in frequency and cover since the outset of the study, and the annual species pale alyssum (*Alyssum alyssoides*) is the dominant forb species on the site (Table - Herbaceous Trends). The noxious weed musk thistle (*Carduus nutans*) was very thick on the road and surrounding meadows in 2001 and 2006, but has not been sampled on the site.

Soil: The soil is in the Richsum-Heiners complex, which occurs on mountain slopes. Parent material consists of slope alluvium or colluvium derived from sandstone, conglomerate, and shale (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a slightly alkaline soil reaction (pH 7.4) (Table - Soil Analysis Data). There is little surface rock, but there is considerable rock throughout the profile. Bare ground cover is high. Most of the vegetation cover is provided by sagebrush, with little vegetation in the interspaces (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2011, but was slight in 2006.

Trend Assessments

Browse:

- **1996 to 2001 - slightly up (+1):** The density of mountain big sagebrush increased 12% from 5,120 plants/acre to 5,720 plants/acre, and cover increased from 10% to 12%. Decadence and poor vigor remained low. Recruitment of young sagebrush plants decreased from 71% to 29%, but recruitment is still considered to be very good.
- **2001 to 2006 - down (-2):** Mountain big sagebrush density decreased by 32% to 3,880 plants/acre, but cover increased to 17%. The average height/crown of sagebrush also increased. The population may be going through a period of self-thinning and stabilization. Recruitment of young plants decreased to

21%. The sagebrush defoliator moth was also identified on 780 plants/acre in 2006, but did not appear to have affected the vigor of the plants.

- **2006 to 2011 - down (-2):** The density of mountain big sagebrush decreased by 26% to 2,860 plants/acre, but cover remained similar. Much of the decrease in density is due to a decrease in the recruitment of young sagebrush plants, which decreased to 8% of the population.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased 21%, though cover remained similar at 6%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 4% to 2%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 13%, but cover remained similar at 6%. Cheatgrass increased significantly in nested frequency, and cover increased to 4%.
- **2006 to 2011 - down (-2):** There was a 23% decrease in the sum of nested frequency of perennial grasses, and cover decreased to 5%. Cheatgrass increased significantly in nested frequency, and cover increased to 11%.

Forb:

- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 68%, and cover decreased from 8% to 1%. There was a significant decrease in many of the desirable forbs including scarlet globemallow (*Sphaeralcea coccinea*). Annual forb sum of nested frequency increased substantially, and cover increased from less than 1% to 4%.
- **2001 to 2006 - slightly up (+1):** There was a 49% increase in the sum of nested frequency of perennial forbs, but most of this increase was in low growing species. Cover of perennial forbs increased slightly to 2%. Annual forb sum of nested frequency again increased substantially, but cover remained similar at 5%.
- **2006 to 2011 - up (+2):** The perennial forb sum of nested frequency increased 81%, and cover increased to 5%. The sum of nested frequency of annual forbs remained similar, but cover increased to 18%. Most of the increase in annual forbs was due to a significant increase in the nested frequency of pale alyssum and burr buttercup (*Ranunculus testiculatus*).

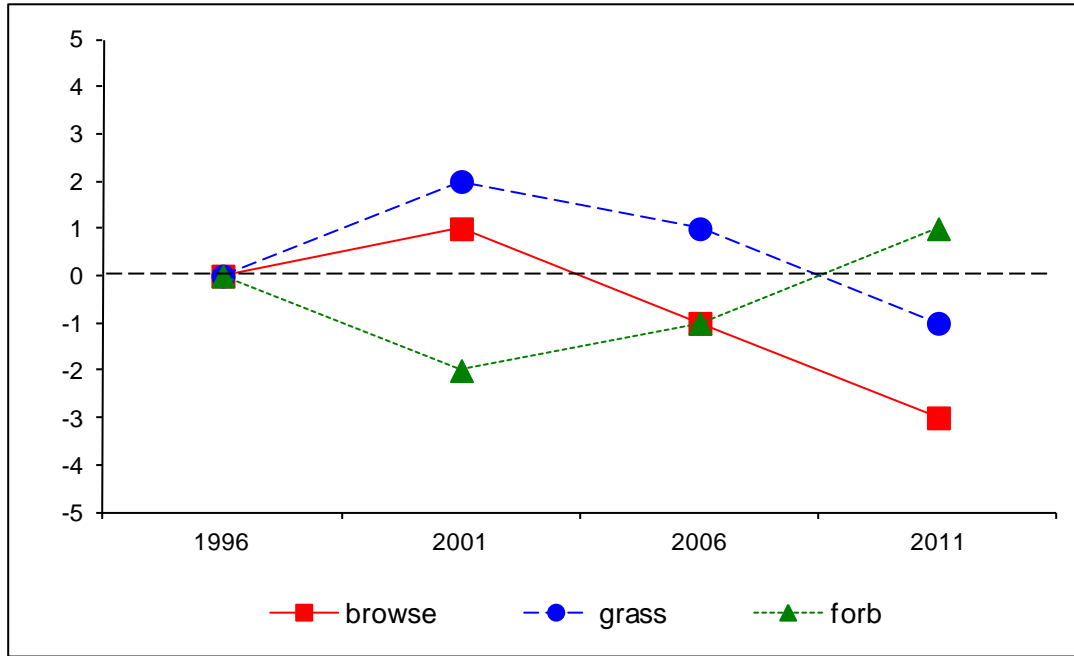
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 6, study no: 12

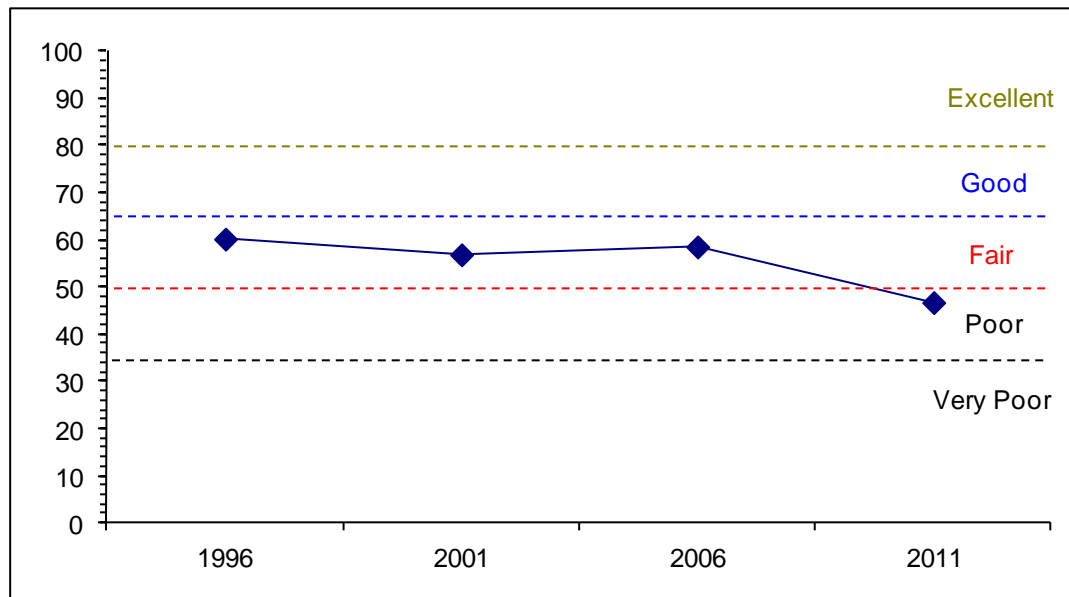
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.0	15.0	15.0	11.5	-3.3	10.0	0.0	60.2	Fair
01	14.6	14.4	14.5	12.0	-1.4	2.7	0.0	56.8	Fair
06	20.8	13.2	10.5	12.5	-3.0	4.5	0.0	58.5	Fair
11	20.6	11.7	4.0	9.9	-8.3	8.9	0.0	46.7	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 6 Study no: 12



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 6, Study no: 12



HERBACEOUS TRENDS--
Management unit 06, Study no: 12

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron dasystachyum</i>	78	91	57	63	2.58	2.12	1.14	1.29
G	<i>Agropyron spicatum</i>	11	11	11	6	.18	.19	.52	.21
G	<i>Bromus tectorum</i> (a)	b272	a154	b273	c349	4.43	1.85	3.98	11.13
G	<i>Elymus cinereus</i>	5	5	5	1	.03	.41	.15	.03
G	<i>Oryzopsis hymenoides</i>	ab57	ab64	b66	a37	2.05	1.42	3.57	1.41
G	<i>Poa fendleriana</i>	-	2	3	5	-	.00	.03	.30
G	<i>Poa pratensis</i>	a14	b34	ab23	a2	.45	1.35	.08	.06
G	<i>Poa secunda</i>	a10	a8	ab17	b32	.12	.05	.42	1.01
G	<i>Stipa comata</i>	ab15	a14	b18	ab8	.34	.42	.34	.59
Total for Annual Grasses		272	154	273	349	4.43	1.85	3.98	11.13
Total for Perennial Grasses		190	229	200	154	5.77	5.99	6.27	4.93
Total for Grasses		462	383	473	503	10.21	7.84	10.26	16.06
F	<i>Agoseris glauca</i>	-	-	-	3	-	-	-	.03
F	<i>Allium</i> sp.	a-	a2	b13	c35	-	.00	.10	.11
F	<i>Alyssum alyssoides</i> (a)	a103	b342	b355	c420	.27	3.48	1.23	13.89
F	<i>Arabis</i> sp.	2	-	-	-	.00	-	-	-
F	<i>Aster</i> sp.	-	-	-	8	-	-	-	.41
F	<i>Astragalus beckwithii</i>	a-	a1	b28	c48	-	.15	.61	1.35
F	<i>Astragalus convallarius</i>	a3	ab9	b16	ab4	.00	.07	.28	.06
F	<i>Astragalus</i> sp.	-	-	-	-	-	-	.00	-
F	<i>Astragalus utahensis</i>	2	-	2	7	.03	-	.03	.33
F	<i>Calochortus nuttallii</i>	a-	a-	a9	b23	-	-	.03	.13
F	<i>Cirsium undulatum</i>	b144	a32	a8	a24	4.98	.51	.07	.79
F	<i>Collinsia parviflora</i> (a)	a18	a6	c167	b110	.07	.01	.53	.49
F	<i>Collomia linearis</i> (a)	-	4	-	-	-	.00	-	-
F	<i>Cordylanthus ramosus</i> (a)	a1	ab19	b51	bc29	.03	.58	1.51	.29
F	<i>Cordylanthus</i> sp. (a)	-	-	-	10	-	-	-	.07
F	<i>Crepis acuminata</i>	a-	a-	a1	b19	-	-	.00	.07
F	<i>Delphinium nuttallianum</i>	a-	a-	a-	b9	-	-	-	.05
F	<i>Draba</i> sp. (a)	-	-	10	3	-	-	.02	.01
F	<i>Epilobium brachycarpum</i> (a)	1	-	9	3	.00	-	.04	.00
F	<i>Erigeron pumilus</i>	3	2	-	4	.00	.00	-	.01
F	<i>Gayophytum ramosissimum</i> (a)	-	2	3	-	-	.01	.00	-
F	<i>Gilia</i> sp. (a)	-	4	-	-	-	.00	-	-
F	<i>Holosteum umbellatum</i> (a)	5	-	7	4	.01	-	.01	.01
F	<i>Lithospermum ruderales</i>	-	-	4	2	-	.00	.07	.15
F	<i>Machaeranthera</i> spp	-	1	-	-	-	.15	-	-
F	<i>Microsteris gracilis</i> (a)	a-	a4	c91	b40	-	.00	.24	.15
F	<i>Phlox longifolia</i>	b42	a19	b49	b40	.19	.09	.62	.33
F	<i>Polygonum douglasii</i> (a)	b26	a-	a-	a4	.05	-	-	.00
F	<i>Ranunculus testiculatus</i> (a)	a5	a3	b178	b213	.01	.00	1.08	3.13
F	<i>Sisymbrium altissimum</i> (a)	1	-	-	-	.00	-	-	-
F	<i>Sphaeralcea coccinea</i>	b26	a9	a7	ab12	.28	.05	.39	.51

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Tragopogon dubius (a)	6	-	-	6	.01	.00	.00	.01
F	Unknown forb-perennial	2	-	-	-	.03	-	-	-
F	Verbascum thapsus	_c 59	_b 17	_a -	_a -	2.33	.32	-	-
F	Viola sp.	-	-	-	10	-	-	-	.09
Total for Annual Forbs		166	384	871	842	0.47	4.11	4.70	18.08
Total for Perennial Forbs		283	92	137	248	7.87	1.37	2.23	4.46
Total for Forbs		449	476	1008	1090	8.34	5.48	6.93	22.54

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	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	66	74	77	75	9.56	11.69	16.64	16.47
B	Chrysothamnus viscidiflorus viscidiflorus	59	61	48	49	5.48	5.69	5.32	4.92
B	Gutierrezia sarothrae	35	27	9	9	1.61	.86	.09	.03
B	Opuntia sp.	3	3	4	2	.15	.03	.03	.15
Total for Browse		163	165	138	135	16.80	18.27	22.09	21.57

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 12

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	25.86	29.86
Chrysothamnus viscidiflorus viscidiflorus	6.66	5.73
Gutierrezia sarothrae	-	.03

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 06, Study no: 12

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.9	1.6	1.8

BASIC COVER--

Management unit 06, Study no: 12

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	33.05	32.68	34.59	49.90
Rock	1.72	1.37	1.80	.62
Pavement	2.63	5.55	5.02	5.72
Litter	40.31	36.14	26.92	23.44
Cryptogams	.04	.24	.57	1.15
Bare Ground	34.56	45.35	45.02	30.00

SOIL ANALYSIS DATA --

Management unit 06, Study no: 12, Study Name: Stag Canyon

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.8	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	3	5	22	2	-	-	-
Horse	-	-	2	-	-	1 (3)	-
Elk	47	9	6	18	60 (149)	35 (86)	27 (68)
Deer	10	13	10	7	15 (36)	21 (51)	25 (63)
Cattle	6	4	1	-	11 (27)	-	-

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 12

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata vaseyana</i>									
96	5120	71	29	0	1960	2	.78	.39	33/40
01	5720	29	68	2	20	2	0	.34	30/35
06	3880	21	73	6	400	13	0	6	33/41
11	2860	8	80	11	-	43	0	10	28/37
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	2660	3	92	5	40	5	.75	0	11/23
01	3480	1	87	12	40	0	0	4	9/21
06	2280	7	84	9	-	2	0	4	10/22
11	2060	16	84	0	20	0	0	0	9/21
<i>Gutierrezia sarothrae</i>									
96	3120	18	81	1	-	0	0	0	7/10
01	1840	0	97	3	-	0	0	3	7/11
06	240	8	83	8	-	0	0	8	5/6
11	320	6	94	0	-	0	0	0	4/6
<i>Juniperus osteosperma</i>									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	20	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Opuntia sp.</i>									
96	100	0	100	-	-	0	0	0	5/8
01	140	0	100	-	-	0	0	0	4/10
06	100	0	100	-	-	0	0	0	5/7
11	40	0	100	-	-	0	0	0	4/8

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Purshia tridentata</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	10/63	
06	0	0	0	-	-	0	0	0	10/78	
11	0	0	0	-	-	0	0	0	-/-	
<i>Tetradymia canescens</i>										
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	6/26	
11	0	0	0	-	-	0	0	0	8/22	

SUMMARY WILDLIFE MANAGEMENT UNIT 6 - CHALK CREEK

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Nine interagency range trend studies were sampled in Unit 6 during the summer of 2011.

Two studies [Echo Canyon Reservoir (6-2) and Crandall Canyon (6-7)] are categorized as high potential deer winter range sites, and sample mountain big sagebrush and mountain brush communities. Both of the studies are also considered to be elk winter range. The seven other studies [Anshutz Ranch (6-1), Spring Hollow Burn (6-3), Echo Reservoir (6-4), Spring Canyon (6-5), North Oakley Bench (6-9), Mahogany Hills (6-10), and Stag Canyon (6-12)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush or low sagebrush communities. Though categorized as winter range for the purpose of this report, the Anshutz Ranch, Spring Hollow Burn, and Stag Canyon studies are considered deer summer range and fawning habitat. These three studies are also considered to be elk summer range and calving habitat, with all of the other mid-level potential studies considered to be elk winter range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains (Division 5). The Northern Mountains had a historic annual mean precipitation of 19.16 inches from 1895 to 2011. The

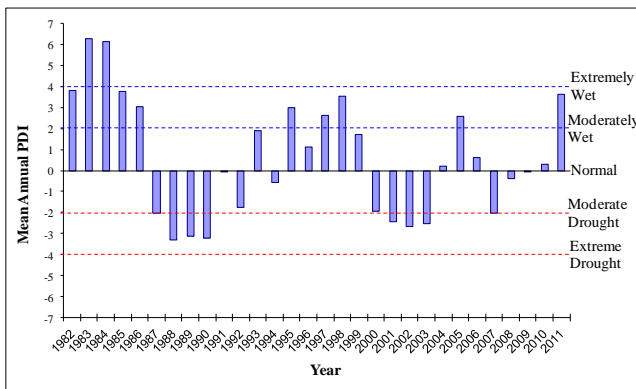


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

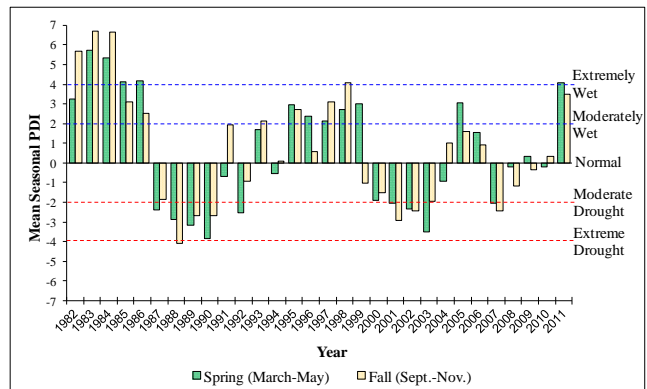


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

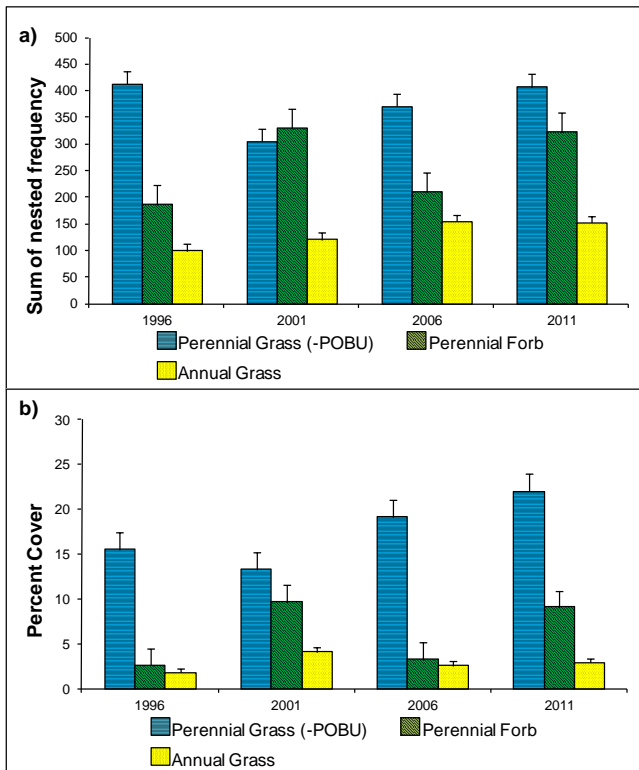


Figure 3. a) High potential sites mean perennial grass (-POBU), perennial forb, and annual grass sum of nested frequency by year for WMU 6, Chalk Creek. b) High potential sites mean perennial grass (-POBU), perennial forb, and annual grass cover by year for WMU 6.

mean annual PDSI of the Northern Mountains displays a cycle of several wet years followed by several drought years, over the course of study years in the unit. Over the course of the study wetter than normal years in the Northern Mountains included 1982-1986, 1993, 1995-1999, 2005, and 2011. Drought years included 1987-1992, 2000-2003 and 2007 (Figure 1 and Figure 2) (Time Series Data 2012).

The 1961-1990 mean annual precipitation was 12-14 in. on the Anshutz Ranch and Stag Canyon studies; 14-16 in. on the Echo Reservoir study; 16-18 in. on the Spring Hollow Burn and Spring Canyon studies; 18-20 in. on the Echo Canyon Rest Area, Crandall Canyon, and North Oakley Bench study; and 20-24 in. on the Mahogany Hills study (PRISM Climate Group 2011).

Mountain Brush Communities (High Potential)

Browse: The high potential site cumulative median browse trend for the unit has decreased slightly from the outset of the study. Trend had a slight decrease in 1990, a slight increase in 1996, then slight decreases in 2001 and 2006 (Figure 7a). The two high potential studies are within communities of mixed mountain brush species. A wildfire removed most of the browse from the Echo Canyon Rest Area study in 1999. The mean density and cover of mountain big sagebrush decreased substantially in 2001 due to the fire on the Echo

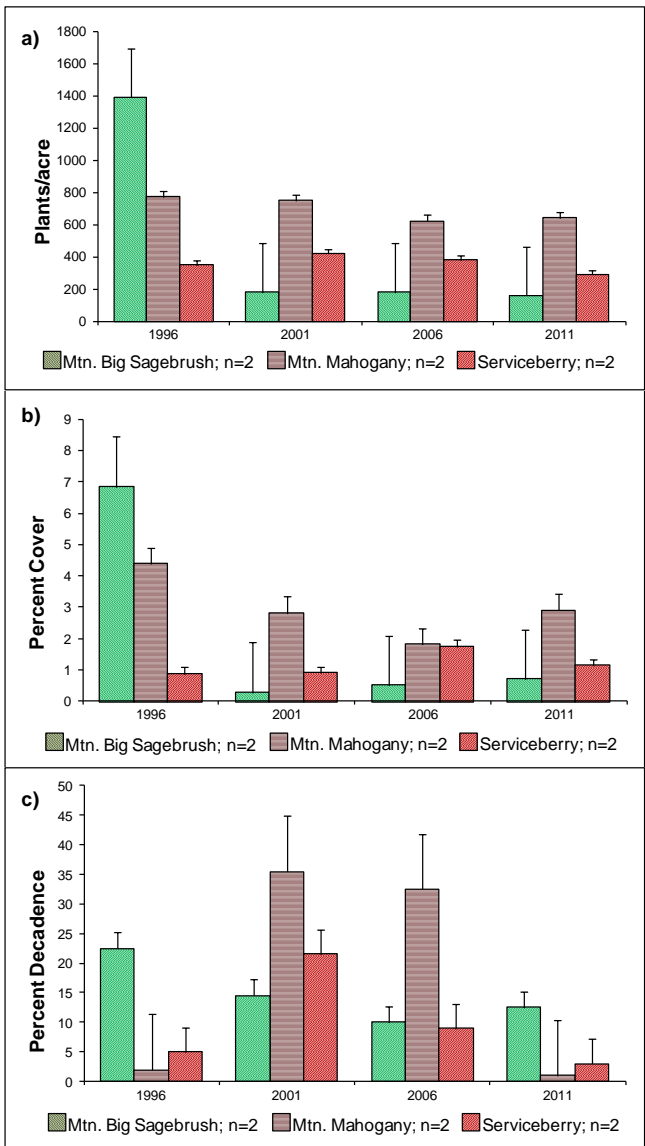


Figure 4. a) High potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), true mountain mahogany (*Cercocarpus montanus*), and Saskatoon serviceberry (*Amelanchier alnifolia*) by year for WMU 6, Chalk Creek. b) High potential sites mean cover of mountain big sagebrush, true mountain mahogany, and Saskatoon serviceberry by year for WMU 6. c) High potential sites mean decadence of mountain big sagebrush, true mountain mahogany, and Saskatoon serviceberry by year for WMU 6.

Canyon Rest Area study, and remained low through 2011 (Figure 4a and Figure 4b). The mean decadence of mountain big sagebrush also decreased in 2001, and has remained low to moderate since that time (Figure 4c). True mountain mahogany (*Cercocarpus montanus*) is common on both of the high potential studies, and is the dominant browse species on the Crandall Canyon study. Despite the fire on the Echo Canyon Rest Area study mean density of mahogany remained similar in 2001, but decreased significantly in 2006 and remained lower in 2011 (Figure 4a). The mean cover of mahogany decreased significantly in 2001, and has remained at lower levels through 2011 (Figure 4b). Mean decadence of mahogany was significantly higher in 2001 and 2006 due to increased decadence on the Echo Canyon Rest Area study (Figure 4c). Saskatoon serviceberry (*Amelanchier alnifolia*) is also common on the studies. Though mean density is moderate (Figure 4a), mean cover has been fairly low (Figure 4b). Mean decadence of serviceberry has been fairly low, but was high in 2001 due to high decadence on the Echo Canyon Rest Area study in that year (Figure 4c).

Herbaceous Understory: The high potential median cumulative grass trend for the unit has remained relatively stable since the outset of the study. There was a large decrease in trend in 2001, but slight increases in 2006 and 2011 returned trend to past levels (Figure 7a). Desirable perennial grass species are generally diverse and abundant on these studies. The annual grass species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are common, but are a minor component of the herbaceous understory. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) was only sampled on the Echo Canyon Rest Area study at low frequency and cover. For more information on this species, refer to the Echo Canyon Rest Area discussion section. The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased significantly in 2001, but steadily increased in 2006 and 2011 returning to 1996 levels (Figure 3a). Much of the decrease in 2001 was likely due to the fire on the Echo Canyon Rest Area study in 1999. Despite the decrease in the mean sum of nested frequency the mean cover of perennial grasses remained similar in 2001, and has steadily since that time (Figure 3b). The mean sum of nested frequency of annual grasses increased significantly in 2006, and remained at higher levels in 2011 (Figure 3a). However, mean cover of annual grasses was similar in 1996, 2006, and 2011, with significantly higher mean cover in 2001 (Figure 3b).

The high potential median cumulative forb trend for the unit has improved throughout the course of the study years. There were slight increases in trend in 1996 and 2001, a large decrease in 2006, but a large increase again in 2011 (Figure 7a). Perennial forbs have been diverse and abundant within the sampled communities. The mean sum of nested frequency and cover of perennial forbs has fluctuated since 1996, with significantly higher measurements in 2001 and 2011 than in 1996 and 2006 (Figure 3a and Figure 3b).

Browse Utilization & Animal Presence: Many of the preferred browse species have displayed moderate to heavy use over the course of the study years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of browse is a primary concern for the high potential studies on this unit.

Pellet group transect data indicates that deer predominately occupy these high potential studies. The mean abundance of sampled deer pellet groups on the unit decreased from high abundance in 2001, to moderate abundance in 2006, and decreased further to low abundance in 2011. The mean abundance of elk pellet groups was low in 2001, increasing to moderate in 2006, and decreasing to lower abundance in 2011. Use by both species may have been lower in 2011 due to the severe winter of 2010-2011, which likely limited access to the sites. Livestock sign was only sampled on the Crandall Canyon study, and has been low on the study since 2001 (Figure 9a).

Deer Desirable Components Index (DCI): The mean high potential deer DCI decreased slightly in 2001 due to a large decrease in preferred browse cover. Most of the decrease was due to the wildfire on the Echo Canyon Rest Area study in 1999. Preferred browse cover, perennial grass cover, and perennial forb cover have increased since 2001. Rankings have ranged from fair to fair-good since 1996 (Table 1 and Figure 7).

Discussion: The decreases in mountain big sagebrush are almost entirely due to the fire on the Echo Canyon Rest Area study. Despite the decreases in sagebrush these sites appear to be healthy, and other preferred

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	20.4	10.2	8.0	25.5	-1.3	5.3	0.0	68.0	Fair-Good
01	9.1	9.0	10.2	26.0	-3.1	7.7	0.0	58.9	Fair
06	9.8	12.1	6.4	30.0	-1.9	6.6	0.0	62.8	Fair
11	12.1	13.9	7.9	30.0	-2.2	9.2	0.0	70.9	Fair-Good

Table 1. High potential scale mean deer DCI scores and rankings (n=2) by year for WMU 6, Chalk Creek. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

browse species are increasing slowly on the Echo Canyon Rest Area study. Annual grass species are common on the studies, but do not appear to pose a major threat to these high potential sites.

Mountain Big Sagebrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse trend for the unit decreased substantially in 1990, but has remained fairly stable since that time (Figure 7b). Preferred browse is limited on the Spring Hollow Burn, Echo Reservoir, and Spring Canyon studies. Mountain big sagebrush is the dominant browse species on the majority of the other mid-level potential studies. Basin big sagebrush occurs on the Anshutz Ranch study, and

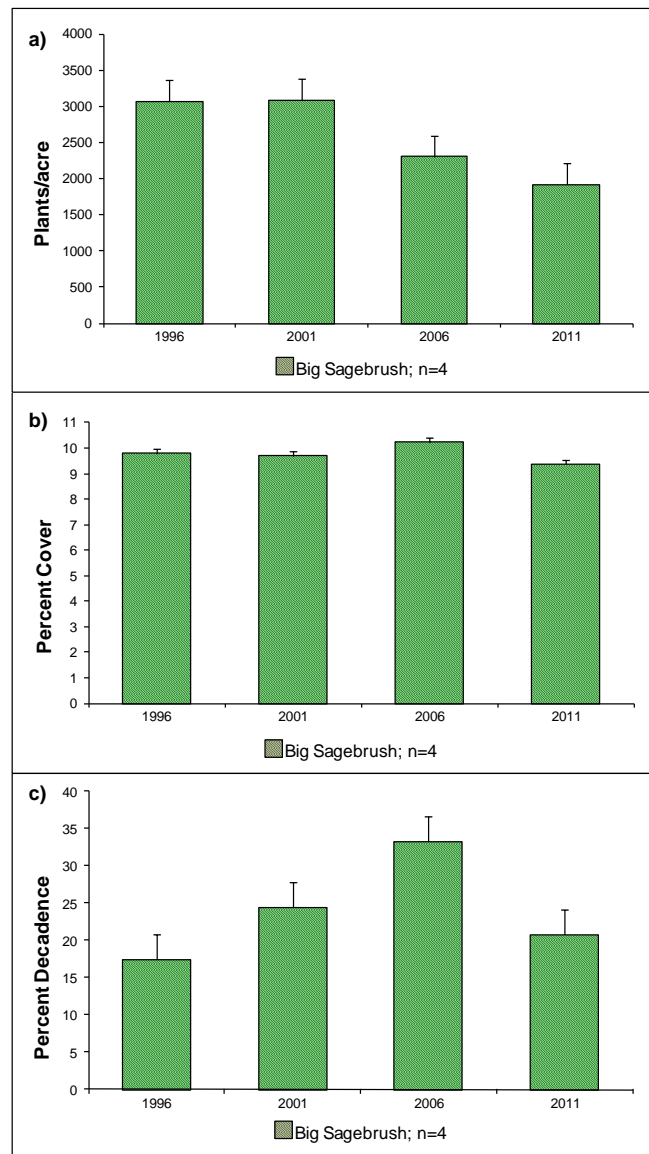


Figure 6. a) Mid-level potential sites mean density of big sagebrush (*Artemisia tridentata*) by year for WMU 6, Chalk Creek. **b)** Mid-level potential sites mean cover of big sagebrush by year for WMU 6. **c)** Mid-level potential sites mean decadence of big sagebrush by year for WMU 6.

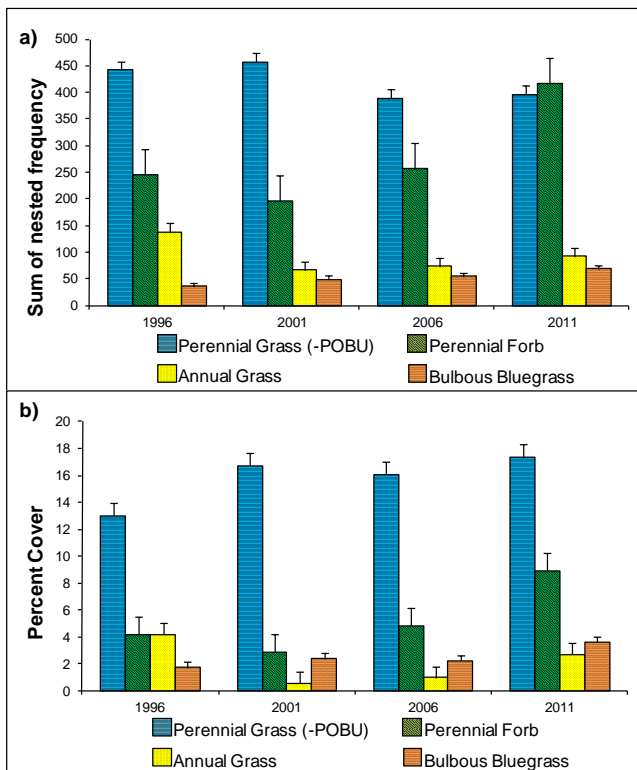


Figure 5. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass (*Poa bulbosa*) sum of nested frequency by year for WMU 6, Chalk Creek. **b)** Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 6.

was summarized with mountain big sagebrush in this report as big sagebrush. Low sagebrush is the dominant browse species on the Anshutz Ranch study, but does not occur on any other studies in the unit. For more information on low sagebrush, refer to the Anshutz Ranch discussion section. The mean density of big sagebrush was similar from 1996 to 2001, but decreased significantly in 2006 and remained at lower levels in 2011 (Figure 6a). Despite the decrease in density, mean cover of big sagebrush has remained similar since 1996 (Figure 6b). Mean decadence of big sagebrush has ranged from moderate to high levels of decadence; with the highest decadence occurring in 2006 (Figure 6c).

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit increased substantially in 1990, remained stable through 2001, then decreased slightly in 2006 (Figure 7b). Perennial grasses comprise the majority of the herbaceous understory on most of these studies. Grasses within these communities are generally diverse and abundant. The annual grass species cheatgrass is common on the Echo Reservoir, Spring Canyon, and Stag Canyon studies, but is much less common on the other mid-level potential communities. The weedy species bulbous bluegrass was common only on the North Oakley Bench study, but has increased slightly on other studies in the unit as well. Mean sum of nested frequency of perennial grasses decreased significantly in 2006, and remained at decreased levels in 2011 (Figure 5a). Despite the decrease in the mean sum of nested frequency, the mean cover of perennial grasses increased significantly in 2001, and has remained higher since that time (Figure 5b). Mean sum of nested frequency of annual grasses decreased significantly in 2001, and has remained similar since that time (Figure 5a). Mean cover of annual grasses also decreased significantly in 2001, but increased significantly again in 2011 (Figure 5b). Most of the increase in cover of annual grasses in 2011 was due to an increase on the Stag Canyon study in that year. Bulbous bluegrass has steadily increased on the unit since 1996 (Figure 5a and Figure 5b), but remains rare on most sites except the North Oakley Bench study.

The mid-level potential median cumulative forb trend for the unit increased slightly in 1990 then increased more markedly in 2006 and 2011 (Figure 7b). Perennial forbs are also diverse and abundant, though they do not provide as much cover as perennial grasses within the sampled communities. The mean sum of nested frequency and cover of perennial forbs remained similar from 1996 to 2006, then increased significantly in 2011 (Figure 5a and Figure 5b). The increase of perennial forbs in 2011 is likely due to the wet, cool spring of that year (Figure 1 and Figure 2).

Browse Utilization & Animal Presence: Preferred browse is limited on the Spring Hollow Burn, Echo Reservoir, and Spring Canyon studies. Big sagebrush plants on the Anshutz Ranch and Stag Canyon studies have displayed light to moderate use over the course of the study years. Utilization of big sagebrush plants has been moderate to heavy on the North Oakley Bench and the Mahogany Hills studies throughout the study years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group transect data indicates that deer and elk both use these study areas. The mean abundance of both deer and elk pellet groups on the unit increased from moderate abundance in 2001 to moderately high abundance in 2006, but decreased again in 2011. Presence of both species may have been lower in 2011 due to the severe winter of 2010-2011. Deer pellet groups were sampled in the highest abundance on the Echo Reservoir, Spring Canyon, North Oakley Bench, and Mahogany Hills studies. Elk pellet groups were sampled in the highest abundance on the Anshutz Ranch, North Oakley Bench, Mahogany Hills, and Stag Canyon studies. The mean abundance of livestock sign has been mostly low on the studies (Figure 9b).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has increased slightly since 1996 with rankings ranging from poor to poor-fair. The DCI shows that preferred browse cover is limited on some of the studies in this unit, but that perennial grass and perennial forb cover is generally good (Table 2 and Figure 7).

Discussion: Decreases in the density of big sagebrush populations appears to be due to different factors on different studies. While there have been several periods of drought over the course of the study years (Figure 1 and Figure 2), lack of precipitation does not appear to be the primary cause of the decline. A primary reason for decline appears to be an abundance of weedy annual species and the exotic weedy perennial grass bulbous bluegrass. These weedy species can form dense mats of cover that compete with seedling and young sagebrush plants, which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event. Bulbous bluegrass is most prevalent on the North Oakley Bench study, increasing substantially since 1996. It is expected that further declines will occur in the sagebrush population on this study. Bulbous bluegrass is much less common on the other mid-level potential studies, but has shown increases in frequency and cover since 1996. Annual grass species are prevalent on the Stag Canyon study and may be in part responsible for the reduced recruitment of big sagebrush on that study. However, annual grasses were not the dominant grass component until 2011. Other weedy annual forb species have been common on this study, however.

Decreases in density of big sagebrush on the Anshutz Ranch appear to be due in part to competition with low sagebrush, which is the dominant browse species on that study. The decrease in density on the Mahogany Hills study appears to be due in part to competition from perennial herbaceous species, especially the seeded grass species smooth brome (*Bromus inermis*).

The cause of decline in the sagebrush populations in more recent years on the North Oakley Bench and Stag Canyon studies may also be due in part to a sagebrush defoliator moth (*Aroga websteri*) outbreak that occurred between the 2001 and 2006 sample years on several units in the region. The sagebrush defoliator moth is an obligate parasite of sagebrush (*Artemisia spp.*) that can have periodic outbreaks that cause substantial damage. This pest reduces the production and flowering of plants or, in high enough concentrations, can kill host plants. The defoliator moth was detected on the North Oakley Bench and Stag Canyon studies in 2006. Poor vigor and decadence also increased substantially in the North Oakley Bench study sagebrush population in 2006.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	12.3	6.2	3.8	18.2	-3.3	6.1	0.0	43.4	Poor
01	11.7	5.3	3.2	21.6	-0.4	5.8	0.0	47.2	Poor
06	11.4	4.2	2.9	22.4	-0.8	6.7	0.0	46.8	Poor
11	11.9	5.9	2.4	22.1	-2.0	8.8	0.0	49.0	Poor-Fair

Table 2. Mid-level potential scale mean deer DCI scores and rankings (n=7) by year for WMU 6, Chalk Creek. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

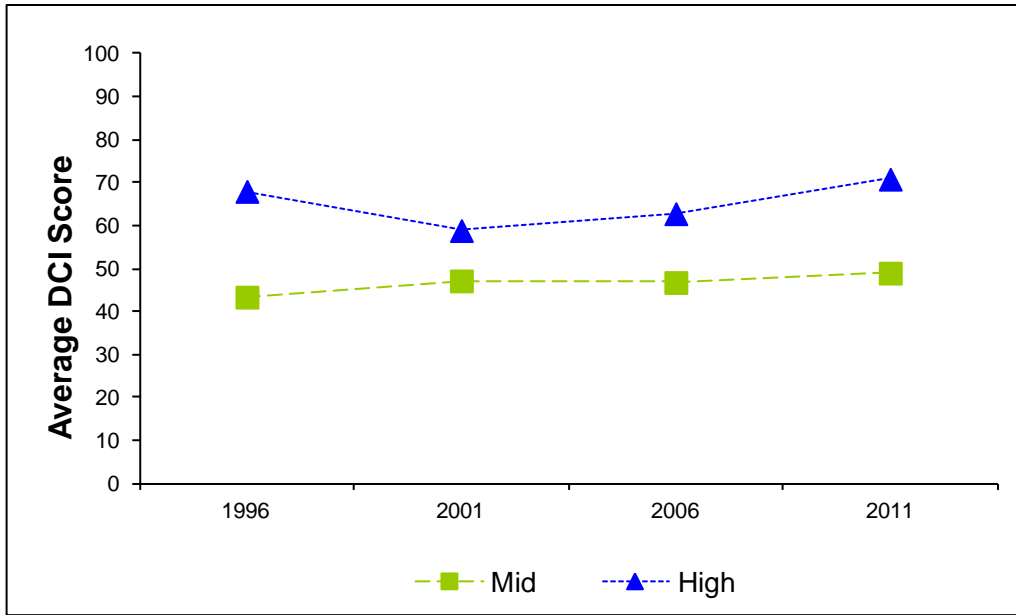


Figure 7. Mean mid-level (n=7) and high (n=2) potential scale deer DCI scores by year for WMU 6, Chalk Creek. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

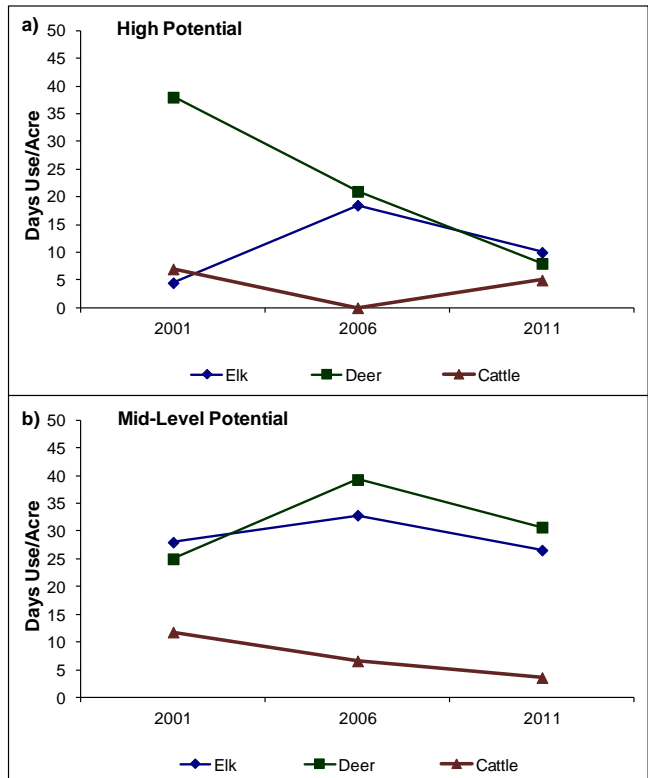
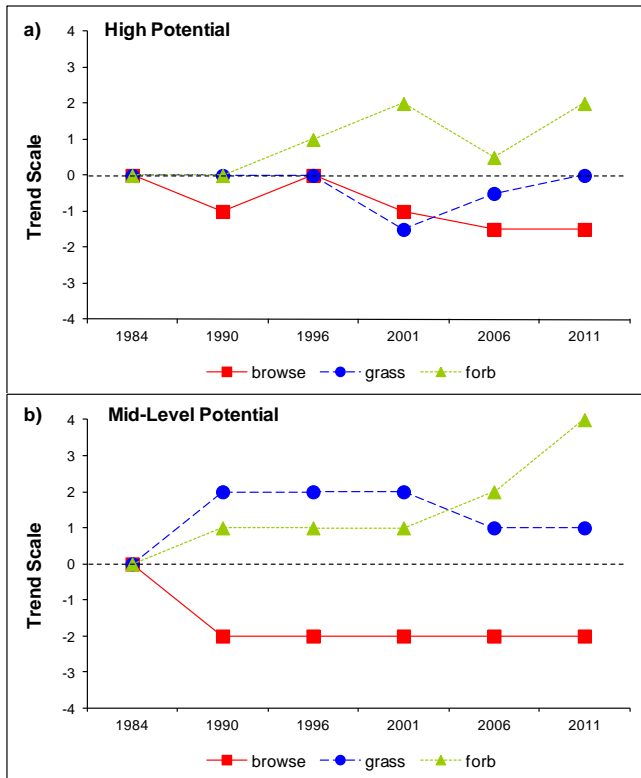
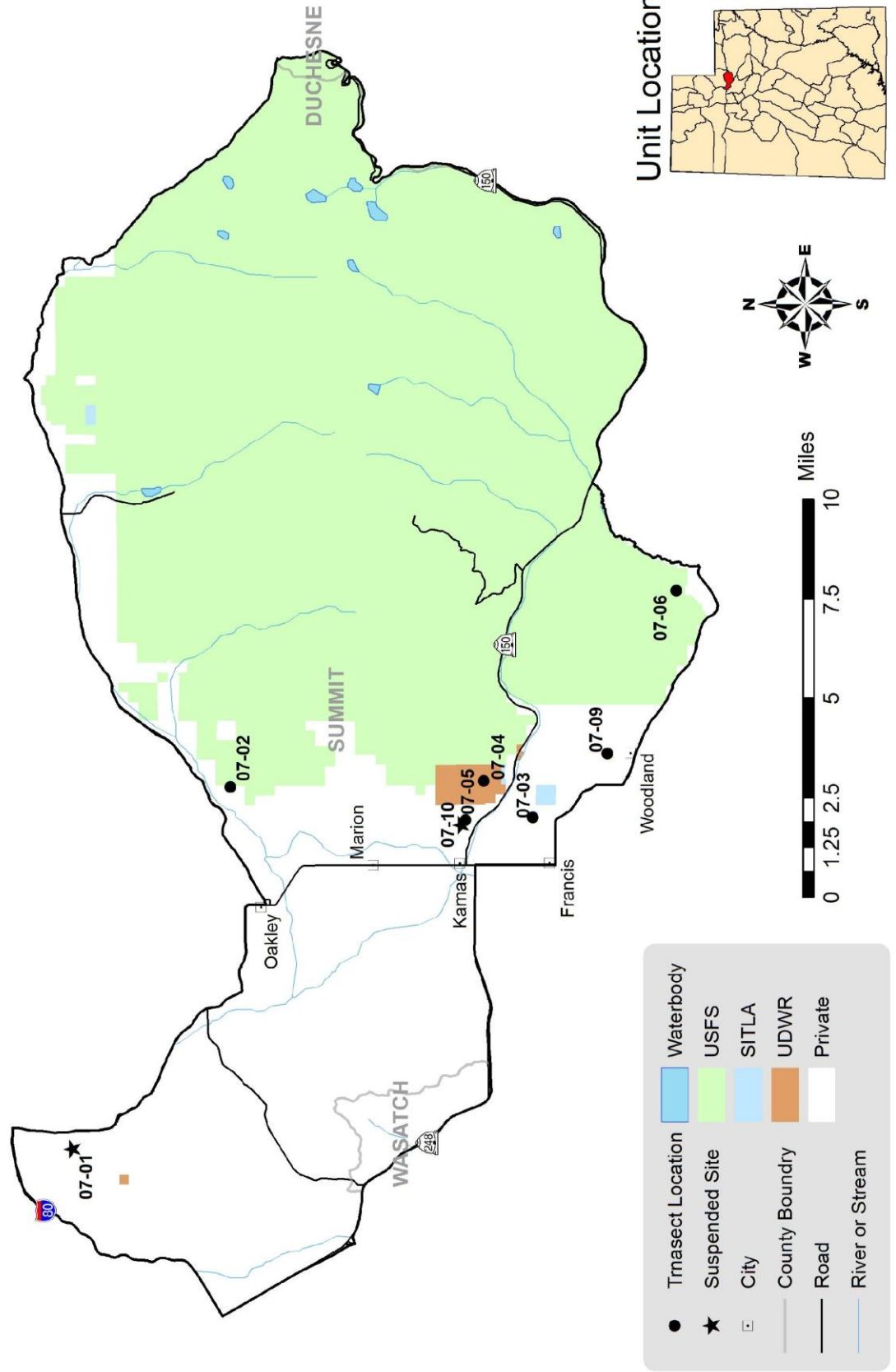


Figure 8. a) High potential sites cumulative median browse, grass and forb trends by year for WMU 6, Chalk Creek. b) Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 6. **Figure 9.** a) High potential sites mean animals days use/acre (n=2) by year for WMU 6, Chalk Creek. b) Mid-level potential sites mean animal days use/acre (n=7) by year for WMU 6.

Management Unit 7



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 Management 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 Division of Wildlife Resources. 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 crucial 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 crucial 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.

Range Trend Studies

Six interagency range trend studies were sampled in Unit 7 during the summer of 2011. A total of eight studies have been established within unit 7 since 1984. Six studies were established in 1984, and of these studies, four studies [Pinyon Canyon (7-2), Above Samak (7-4), Cedar Hollow (7-6), and Stevens Hollow (7-1)] sample a mountain brush community, and two studies [Foothill Drive (7-3) and Kamas Water Tanks (7-5)] sample mountain big sagebrush communities. One study [Elder Hollow (7-10)] was established in 1996, and samples a mountain brush community. One study [Above Woodland (7-9)] was established in 2001, and samples a mountain brush community.

In 1996, two studies (Stevens Hollow and Kamas Water Tanks) were suspended. If the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

PINYON CANYON - TREND STUDY NO. 7-2-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Oak\), R047XA446UT](#)

Land Ownership: Private

Elevation: 7,160 ft (2,182 m)

Aspect: 35-45%

Slope: South

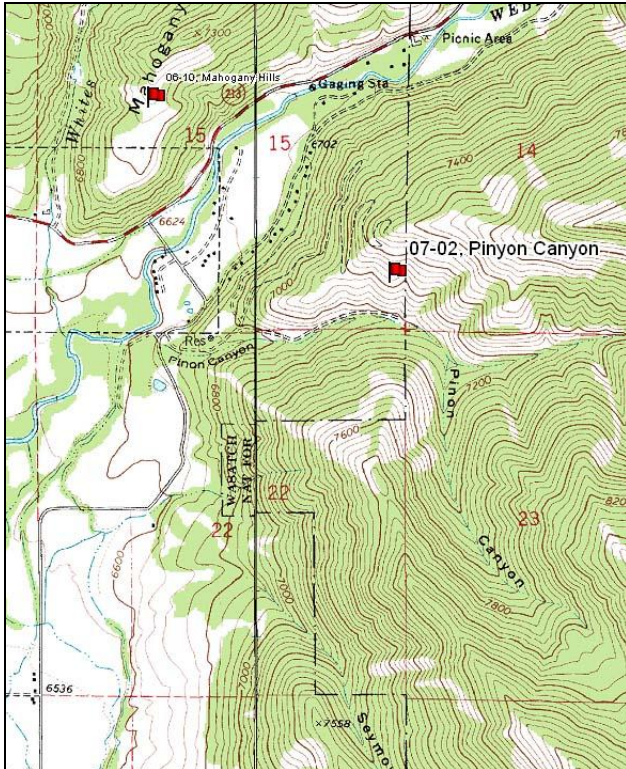
Transect bearing: 180° magnetic

Belt placement: line 1 (11, 59, & 95ft), line 2 (34 & 71ft)

Directions:

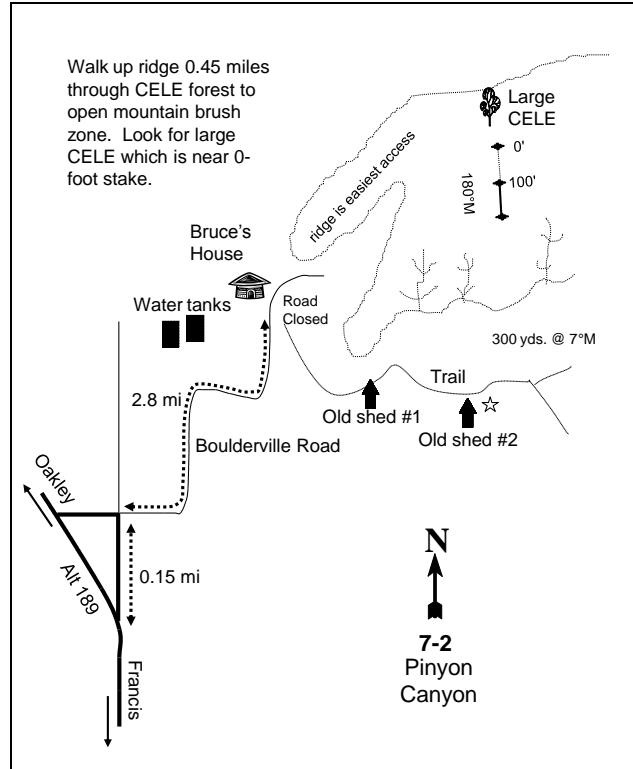
Where Highway 189 turns northwest between Kamas and Oakley, proceed north for 0.15 miles. At this intersection turn right (east) onto Boulderville Road and travel 2.8 miles. Turn right onto a dirt road proceeding up Pinyon Canyon to a private home, passing two water storage tanks. Contact landowner before proceeding through private land. From the land owners home, walk up the ridge through a Curleef 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 Curleef 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



Township: 1S Range: 6E Section: 15

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 479419 E 4508739 N

PINYON CANYON - TREND STUDY NO. 7-2

Site Information

Site Description: The study is located in a drainage containing one of the better and more important mountain brush big game wintering areas in the herd unit. This site is at a high elevation 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 data have indicated that elk are found in the area much more than deer. Elk pellet groups have been sampled in high abundance since 2001. Deer pellet groups were sampled in moderate abundance in 2001, but in low abundance since 2006 (Table - Pellet Group Data). Several moose pellet groups have also been observed on the site, but occurred outside the sampling area.

Browse: The mountain brush community throughout the area exhibits considerable variation in over-story dominance. The mixture of shrubs includes varying densities of true mountain mahogany (*Cercocarpus montanus* ssp. *montanus*), Saskatoon serviceberry (*Amelanchier alnifolia*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), Gambel oak (*Quercus gambelii*), mountain snowberry (*Symphoricarpos oreophilus*), and a few scattered curleaf mountain mahogany (*C. ledifolius* ssp. *ledifolius*). The browse component on the study is a mixture of true mountain mahogany, snowberry, mountain big sagebrush, bitterbrush, oak, and serviceberry. Total browse cover has remained similar on the site over the course of the study, but composition has changed with an increase in the cover of serviceberry and sagebrush, and a decrease in the cover of true mountain mahogany and snowberry (Table - Browse Trends). Health of the preferred species, serviceberry, mountain big sagebrush, true mountain mahogany, and bitterbrush, has been relatively good with low decadence and good vigor since 1996. Decadence was higher in the serviceberry and sagebrush populations at the outset of the study in 1984. Serviceberry, true mountain mahogany, and bitterbrush have displayed mostly moderate to heavy use, while sagebrush has had mostly light to moderate use. It was also noted that Gambel oak was heavily utilized in 1984 and 2011. Recruitment from young plants has been moderate to high for serviceberry and true mountain mahogany in all sample years. Recruitment of young sagebrush and bitterbrush plants has been poor over the course of the study, with the exception of 1996 when the recruitment of young sagebrush plants was high (Table - Browse Characteristics).

Herbaceous Understory: Grasses are abundant on the site, but are not particularly diverse. The grass component is dominated in cover by bluebunch wheatgrass (*Agropyron spicatum*). Sandberg bluegrass (*Poa secunda*) is the only other prevalent perennial grass species. Cheatgrass (*Bromus tectorum*) is also moderately abundant, but has decreased steadily in cover since 1996. Nested frequency of cheatgrass, however, has remained high. Perennial forbs are not particularly abundant on the study, with the dominant perennial forb being rock goldenrod (*Petradoria pumila*). The annual forb species pale alyssum (*Alyssum alyssoides*) has steadily increased since 1996, and was the dominant forb in 2011 (Table - Herbaceous Trends).

Soil: The study is part of the Agassiz-Rock outcrop complex, likely as part of the Agassiz component. These soils occur on mountain slopes, with parent material consisting of colluviums derived from limestone. Depth of these soils is considered to be shallow (Soil Survey Staff 2011). The soil texture is a clay loam with a slightly alkaline soil reaction (pH 7.7) (Table - Soil Analysis Data). Soils are moderately rocky on the surface and throughout the profile. 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. Bare ground is moderately low, with a fair amount of vegetation, litter, and rock cover providing protective ground cover (Table - Basic Cover). Under most conditions this will help prevent erosion from most high intensity summer rain events. The soil erosion condition was classified as slight 2001, but was stable in 2006 and 2011.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** The density of true mountain mahogany decreased by 12% from 1,064 plants/acre to 932 plants/acre. Decadence increased from 19% to 36%, though vigor remained good within the population. However, serviceberry increased 12% in density from 1,131 plants/acre to 1,265 plants/acre. Decadence of serviceberry decreased from 65% to 11%, and plants displaying poor vigor decreased from 65% to 0%.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of serviceberry and true mountain mahogany decreased to 2% and 3%, respectively. Mountain big sagebrush decadence also decreased from 100% of the population to 21%. Recruitment of young sagebrush plants increased from 0% to 42%.
- **1996 to 2001 - stable (0):** Density of true mountain mahogany remained similar at 760 plants/acre, but serviceberry increased by 34% from 940 plants/acre to 1,260 plants/acre. Most of this increase in serviceberry was due to an increase in the recruitment of young plants from 45% to 51% of the population. Cover of serviceberry decreased slightly from just over 1% to less than 1%. Decadence and poor vigor remained low in the preferred browse species on the study.
- **2001 to 2006 - stable (0):** The density of serviceberry decreased by 56% to 560 plants/acre, though cover remained similar at 1%. True mountain mahogany density remained similar at 740 plants/acre, though cover decreased slightly from 4% to 3%. Recruitment of young serviceberry and true mountain mahogany plants remained very good.
- **2006 to 2011 - stable (0):** Serviceberry density increased by 75% to 980 plants/acre, and cover increased to 2%. True mountain mahogany density decreased by 30% to 520 plants/acre, but cover remained similar. Decadence of mahogany has increased steadily since 1996 from 3% to 23%. Poor vigor of mahogany has also steadily increased since 2001 from 0% to 15%.

Grass:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased slightly by 9%, and there was a significant increase in the nested frequency of bluebunch wheatgrass.
- **1996 to 2001 - stable (0):** There was a slight decrease in the sum of nested frequency for perennial grasses, and cover decreased from 24% to 16%. There was a significant decrease in the nested frequency of bluebunch wheatgrass, but cheatgrass also decreased significantly in nested frequency.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 14%, which is due to a significant decrease in the nested frequency of Sandberg bluegrass. Cover of perennial grasses increased to 20%. There was a significant increase in the nested frequency of cheatgrass, though cover of cheatgrass decreased from 6% to 4%.
- **2006 to 2011 - stable (0):** There was a slight increase in the sum of nested frequency of perennial grasses, but cover decreased to 15%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 2%.

Forb:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased by 32%.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial forbs decreased by 44%.
- **1996 to 2001 - up (+2):** There was a 27% increase in the sum of nested frequency of perennial forbs, and cover increased from 3% to 4%.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs. The annual species pale alyssum increased significantly in nested frequency.

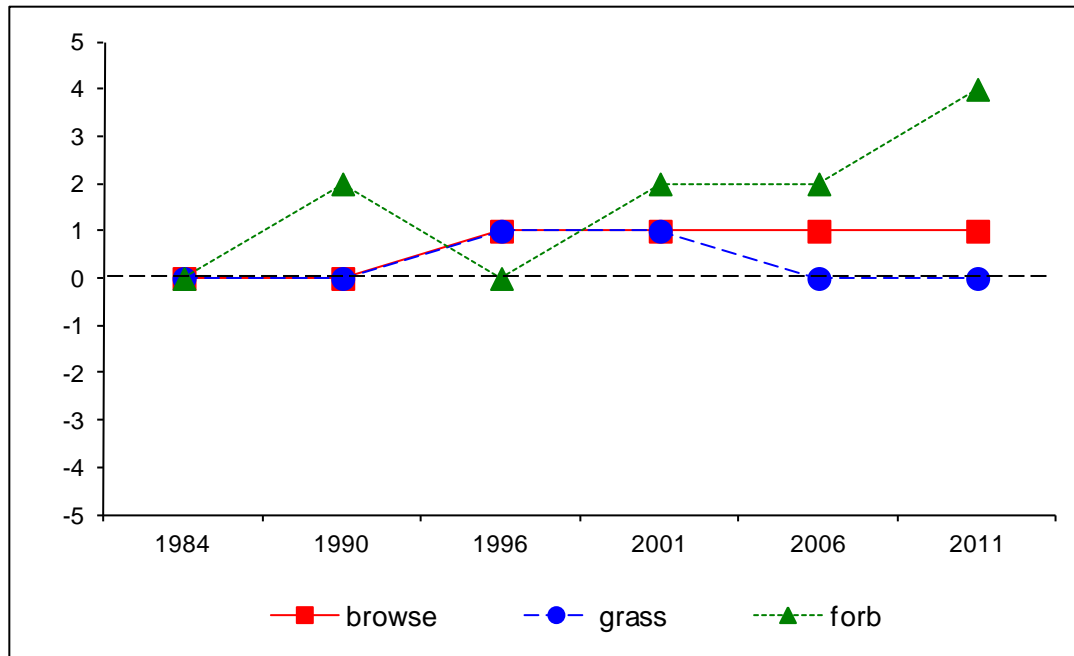
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 42%, and cover increased to 6%. The annual species pale alyssum increased significantly in nested frequency and was the dominant forb species in cover and frequency on the site in 2011.

DEER DESIRABLE COMPONENTS INDEX - HIGH POTENTIAL SCALE --
Management unit 7, study no: 2

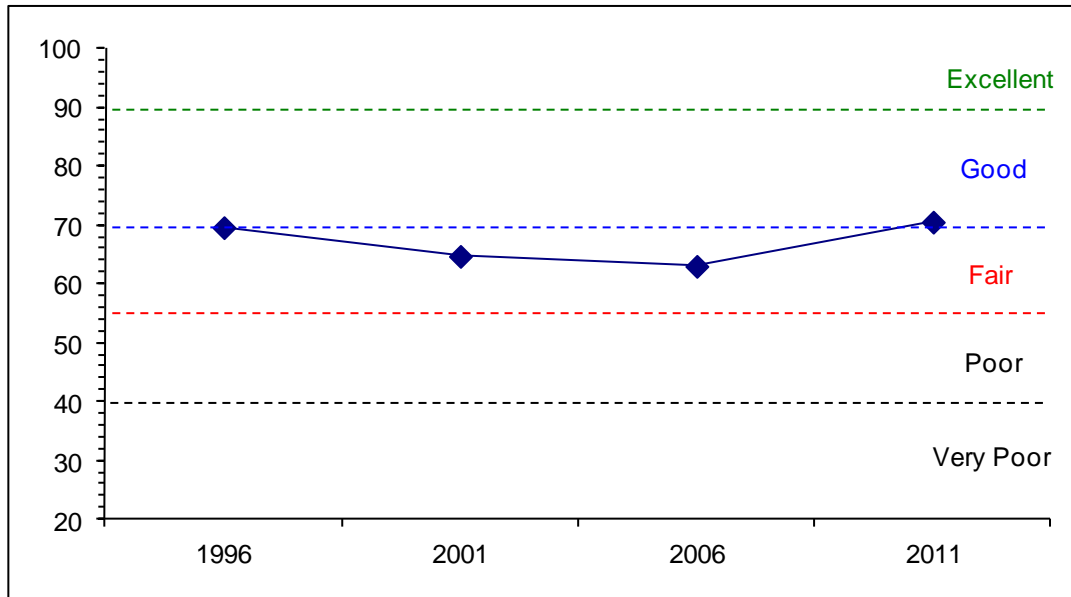
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	11.0	13.8	14.9	30.0	-4.9	4.7	0.0	69.6	Fair-Good
01	13.1	12.1	6.1	30.0	-4.2	7.6	0.0	64.7	Fair
06	12.9	10.2	5.4	30.0	-3.0	7.5	0.0	63.0	Fair
11	14.0	9.9	8.4	29.7	-1.4	10.0	0.0	70.5	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 7 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, HIGH POTENTIAL--
 Management unit 7, Study no: 2



HERBACEOUS TRENDS--
 Management unit 07, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	5	-	-	-	-	-	-	-	-	-
G	Agropyron spicatum	ab275	a266	c322	ab286	abc288	bc304	19.45	11.37	17.66	12.08
G	Bromus japonicus (a)	-	-	-	-	4	6	-	-	.01	.01
G	Bromus tectorum (a)	-	-	b274	a215	b272	a212	6.51	5.66	3.95	1.85
G	Poa fendleriana	d107	cd65	bc50	ab28	ab23	a9	.67	.60	.53	.21
G	Poa pratensis	-	-	-	-	-	7	-	-	-	.04
G	Poa secunda	a93	cd172	cd175	d196	ab127	bc147	3.40	4.27	1.92	2.51
Total for Annual Grasses		0	0	274	215	276	218	6.51	5.66	3.96	1.86
Total for Perennial Grasses		480	503	547	510	438	467	23.54	16.25	20.12	14.85
Total for Grasses		480	503	821	725	714	685	30.05	21.92	24.08	16.71
F	Agoseris glauca	-	-	-	10	11	17	-	.05	.07	.33
F	Allium acuminatum	b34	b37	a5	b50	b64	c101	.01	.25	.33	.55
F	Alyssum alyssoides (a)	-	-	a28	b64	c281	d334	.16	.61	2.60	11.84
F	Astragalus sp.	-	1	-	2	2	6	-	.01	.15	.30
F	Balsamorhiza sagittata	3	-	-	-	1	-	-	-	.15	.03
F	Calochortus nuttallii	6	3	-	4	6	-	-	.01	.02	-
F	Camelina microcarpa (a)	-	-	c117	b51	a3	a2	.61	.23	.03	.00
F	Chaenactis douglasii	a6	b28	a13	a-	a-	a-	.05	-	-	-
F	Chenopodium fremontii (a)	-	-	-	1	-	-	-	.00	-	-
F	Cirsium undulatum	b41	b40	a9	a12	a6	a3	.10	.54	.59	.09
F	Collinsia parviflora (a)	-	-	-	2	-	4	-	.00	-	.01
F	Comandra pallida	24	21	26	21	18	16	.23	.31	.53	.69
F	Crepis acuminata	-	3	1	2	7	2	.03	.03	.12	.09

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cymopterus sp.	-	-	2	5	1	3	.03	.36	.00	.01
F	Descurainia pinnata (a)	-	-	-	7	5	5	-	.07	.01	.01
F	Draba sp. (a)	-	-	-	-	6	-	-	-	.01	-
F	Epilobium brachycarpum (a)	-	-	-	9	8	9	-	.02	.04	.05
F	Erigeron pumilus	-	-	2	2	1	4	.15	.03	.03	.03
F	Erigeron strigosus	-	-	2	-	-	-	.00	-	-	-
F	Gayophytum ramosissimum(a)	-	-	6	-	1	-	.01	-	.00	-
F	Gilia sp. (a)	-	-	-	4	-	1	-	.00	-	.00
F	Helianthus sp.	-	-	7	-	-	3	.06	-	-	.00
F	Holosteum umbellatum (a)	-	-	8	8	-	10	.09	.01	-	.02
F	Ipomopsis aggregata	-	-	-	2	-	-	-	.00	-	-
F	Lappula occidentalis (a)	-	-	-	-	1	-	-	-	.00	-
F	Lomatium sp.	a-	a-	a1	a-	a5	b13	.01	-	.18	.34
F	Microsteris gracilis (a)	-	-	a-	b68	a7	a11	-	.24	.01	.02
F	Penstemon humilis	14	22	19	11	11	15	.43	.27	.45	1.00
F	Petrorhiza pumila	ab41	b61	ab38	a34	a24	a28	1.62	1.86	1.11	2.58
F	Phlox longifolia	-	-	1	-	-	-	.00	-	-	-
F	Polygonum douglasii (a)	-	-	3	-	-	-	.00	-	-	-
F	Ranunculus testiculatus (a)	-	-	a8	b47	b54	c109	.02	.41	.62	.49
F	Streptanthus cordatus	-	3	-	-	-	-	-	-	-	-
F	Tragopogon dubius (a)	a4	a-	ab7	b21	a5	ab15	.09	.38	.07	.08
F	Unknown forb-perennial	-	2	-	-	-	-	-	-	-	-
F	Viguiera multiflora	2	3	-	5	1	11	-	.03	.00	.09
F	Zigadenus paniculatus	-	1	-	-	-	3	-	-	-	.18
Total for Annual Forbs		4	0	177	282	371	500	1.00	2.01	3.43	12.55
Total for Perennial Forbs		171	225	126	160	158	225	2.75	3.80	3.76	6.35
Total for Forbs		175	225	303	442	529	725	3.75	5.82	7.20	18.90

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	27	25	19	21	1.41	.66	.93	2.32
B	Artemisia tridentata vaseyana	17	13	12	14	.68	1.86	2.51	3.10
B	Cercocarpus montanus	35	32	33	25	3.99	4.24	3.01	2.78
B	Gutierrezia sarothrae	3	0	1	0	.18	-	-	-
B	Mahonia repens	3	4	5	6	.15	.24	.09	.24
B	Purshia tridentata	4	3	4	5	1.14	1.66	1.76	1.62
B	Quercus gambelii	1	3	1	1	.33	.93	1.17	-
B	Symphoricarpos oreophilus	19	19	22	22	2.37	3.75	3.40	1.59
Total for Browse		109	99	97	94	10.26	13.35	12.91	11.68

CANOPY COVER, LINE INTERCEPT--

Management unit 07, Study no: 2

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	3.08	2.18
Artemisia tridentata vaseyana	3.63	3.86
Cercocarpus montanus	3.84	3.71
Mahonia repens	.08	.06
Purshia tridentata	2.90	2.95
Quercus gambelii	1.08	.23
Symphoricarpos oreophilus	1.54	.85

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 07, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	3.8	4.6	4.2
Artemisia tridentata vaseyana	-	1.3	4.0
Cercocarpus montanus	2.1	4.0	3.2
Purshia tridentata	-	3.7	2.3

BASIC COVER--

Management unit 07, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.50	9.50	43.43	39.25	39.79	46.36
Rock	23.00	25.25	17.19	15.94	18.73	17.00
Pavement	8.25	4.00	6.61	5.94	7.36	3.48
Litter	45.75	40.00	41.18	30.26	25.50	17.08
Cryptogams	1.75	0	.39	.15	.01	.42
Bare Ground	17.75	21.25	14.82	33.31	22.39	24.96

SOIL ANALYSIS DATA --

Management unit 07, Study no: 2, Study Name: Pinyon Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.9	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Elk	32	43	49	59	69 (170)	100 (248)	160 (395)
Deer	11	14	3	8	30 (74)	11 (26)	11 (26)

BROWSE CHARACTERISTICS--

Management unit 07, Study no: 2

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier alnifolia</i>									
84	1131	18	18	65	66	6	88	65	27/21
90	1265	42	47	11	-	21	26	0	22/22
96	940	45	53	2	80	53	13	2	29/37
01	1260	51	37	13	-	19	22	14	30/39
06	560	36	57	7	20	0	50	4	31/35
11	980	45	53	2	40	24	20	2	31/42
<i>Artemisia tridentata vaseyana</i>									
84	132	0	50	50	-	0	100	0	24/20
90	66	0	0	100	-	100	0	0	-/-
96	380	37	42	21	-	47	0	11	21/31
01	280	7	79	14	-	14	0	7	22/34
06	240	8	83	8	-	33	17	17	31/43
11	340	6	76	18	-	41	6	24	29/45
<i>Cercocarpus montanus</i>									
84	1064	44	38	19	-	0	56	0	46/28
90	932	36	29	36	-	14	64	0	42/27
96	780	26	72	3	-	44	41	0	34/40
01	760	16	71	13	20	34	50	0	34/37
06	740	16	65	19	40	19	70	8	32/36
11	520	15	62	23	-	23	58	15	28/33
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	14/21
01	0	0	0	-	-	0	0	0	19/27
06	0	0	0	-	-	0	0	0	12/24
11	0	0	0	-	-	0	0	0	8/23
<i>Gutierrezia sarothrae</i>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	140	0	100	-	-	0	0	0	7/10
01	0	0	0	-	-	0	0	0	9/32
06	20	0	100	-	-	0	0	0	8/9
11	0	0	0	-	-	0	0	0	-/-

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Mahonia repens									
84	8599	100	0	-	-	0	0	0	-/-
90	10465	46	54	-	-	0	0	0	4/4
96	380	21	79	-	20	0	0	0	4/5
01	680	0	100	-	-	0	0	0	4/6
06	840	7	93	-	-	0	0	0	4/4
11	1140	0	100	-	-	0	0	0	3/34
Purshia tridentata									
84	0	0	0	0	-	0	0	0	-/-
90	0	0	0	0	-	0	0	0	-/-
96	240	0	100	0	-	75	25	0	19/47
01	60	0	100	0	-	100	0	0	22/84
06	420	0	95	5	-	29	5	0	24/55
11	220	0	73	27	-	18	82	27	20/42
Quercus gambelii									
84	2197	18	64	18	-	15	61	0	47/19
90	1932	62	38	0	-	66	0	0	43/29
96	20	100	0	0	-	0	0	0	64/65
01	120	0	100	0	-	0	0	0	58/34
06	40	0	50	50	80	0	0	50	58/39
11	20	0	0	100	-	0	100	100	32/25
Sambucus cerulea									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	28/66
06	0	0	0	-	-	0	0	0	37/72
11	0	0	0	-	-	0	0	0	-/-
Symphoricarpos oreophilus									
84	1531	13	65	22	-	65	13	0	22/23
90	2198	18	52	30	-	42	0	3	21/26
96	600	27	73	0	40	27	0	0	18/33
01	420	0	100	0	-	14	0	0	20/43
06	700	11	83	6	40	0	3	3	20/25
11	700	17	83	0	-	20	0	0	17/29

FOOTHILL DRIVE - TREND STUDY NO. 7-3-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: Private

Elevation: 6,800 ft (2,073 m)

Aspect: Southeast

Slope: 30%

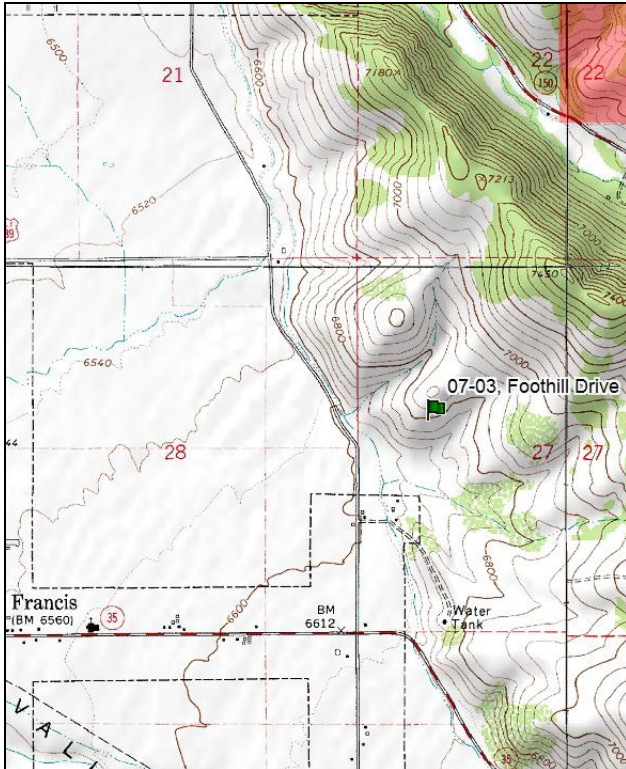
Transect bearing: 168° magnetic

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

Directions:

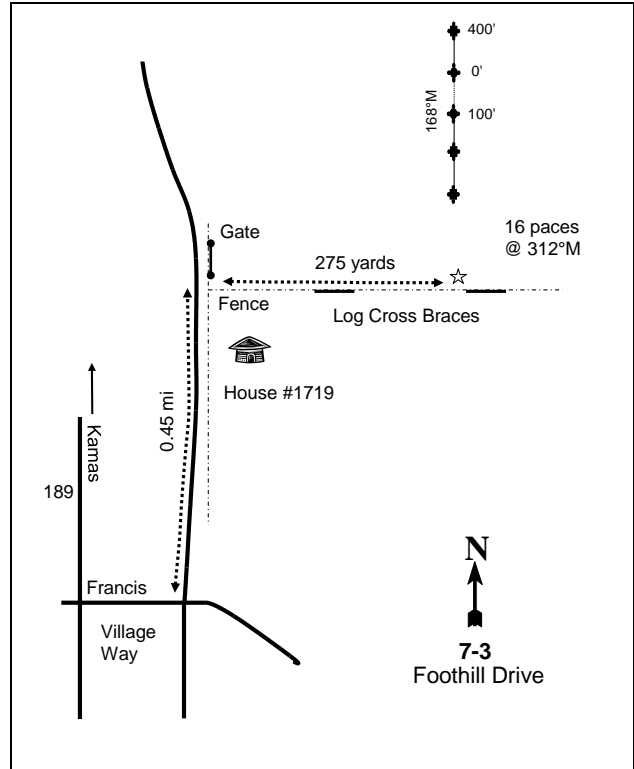
At the junction of Hwy 189 and Village Way in Francis, proceed east for 1.0 mile. Turn left (north) onto Foothill Drive, and proceed 0.45 miles to house #1719 on the right. Park here and walk east along the east-west running fence, just north of the house, for approximately 275 yards to the second large 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



Township: 2S Range: 6E Section: 27

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 478191 E 4496482 N

FOOTHILL DRIVE - TREND STUDY NO. 7-3

Site Information

Site Description: The study is located in the foothills east of Francis on privately owned, crucial deer winter range. This study samples an open mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass foothill that is surrounded by adjacent ridges dominated by Gambel oakbrush (*Quercus gambelii*). Elk, cattle, and horse pellet groups have been sampled in low abundance since 2001. Deer pellet groups were sampled in high abundance in 2001 and 2006, but moderate abundance in 2011 (Table - Pellet Group Data). The field crew observed the remains of seven winter-killed deer in 1984 and one winter-killed deer in 2006.

Browse: Mountain big sagebrush is the dominant browse species and provides the majority of the browse cover on the site (Table - Browse Trends). The sagebrush on the site consists of a moderately dense population that has had a mixture of light, moderate, and heavy use throughout the sample years. Decadence and poor vigor were high within the sagebrush population at the outset of the study, but have since decreased to lower levels. The average plant size of mature sagebrush has increased with each reading since 1996. Recruitment of young sagebrush plants has been moderate to low, with decreasing recruitment since 2001. Other preferred browse species on the site that are much less common include Saskatoon serviceberry (*Amelanchier alnifolia*), dwarf rabbitbrush (*Chrysothamnus depressus*), and Woods rose (*Rosa woodsii*). The few isolated serviceberry plants on the site display moderate to heavy use. Most of the other browse consists of low value increasers including broom snakeweed (*Gutierrezia sarothrae*), Oregon grape (*Mahonia repens*), and prickly pear cactus (*Opuntia* sp.) (Table - Browse Characteristics).

Herbaceous Understory: The grass component is dominated by the annual brome species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*). Cheatgrass provides the majority of the herbaceous cover and has provided from 22% to 43% of the total vegetation on the site since 1996. Perennial grass species are rare on the site. Perennial forbs have shown a general decrease on the site since 1990. Louisiana sage (*Artemisia ludoviciana*), hairy goldaster (*Heterotheca villosa*), and showy goldeneye (*Viguiera multiflora*) have been the most abundant perennial forbs. Annual forb species have dominated the site since 2006. The most abundant annual forb species include storksbill (*Erodium cicutarium*) and willowweed (*Epilobium brachycarpum*) (Table - Herbaceous Trends).

Soil: The site is part of the Horrocks-Cutoff soil complex, likely as part of the Horrocks component. These soils are found on mountain slopes with parent material consisting of colluviums derived from conglomerate, sandstone, and andesite (Soil Survey Staff 2011). Soils are a clay loam in texture with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover is very low, with good vegetation and litter cover coupled with a high amount of surface rock cover. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - up (+2):** Mountain big sagebrush density increased by 18% from 1,632 plants/acre to 1,931 plants/acre. Decadence of sagebrush decreased from 90% to 45%, and poor vigor decreased from 33% to 7%. In addition to a large number of seedlings sampled, recruitment of young sagebrush plants increased from 0% to 10% of the population.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 20%, and poor vigor decreased to 0%. Recruitment of young sagebrush plants remained similar at 10% of the population.

- **1996 to 2001 - stable (0):** The density of sagebrush remained the same at 1,180 plants/acre, though cover increased slightly from 6% to 7%. Decadence, poor vigor, and recruitment of young plants remained similar within the sagebrush population.
- **2001 to 2006 - slightly down (-1):** Sagebrush density decreased by 15% to 1,000 plants/acre, though cover increased slightly to 9%. Recruitment of young sagebrush plants decreased from 10% to 6% of the population.
- **2006 to 2011 - slightly down (-1):** Density of sagebrush decreased slightly by 8% to 920 plants/acre, and cover decreased to 8%. Decadence of sagebrush increased from 10% to 24% and poor vigor increased from 6% to 26%. Recruitment of young sagebrush plants decreased to just 2% of the population.

Grass:

- **1984 to 1990 - down (-2):** The sum of nested frequency of perennial grasses decreased 26%. There was a significant decrease in the nested frequency of Kentucky bluegrass (*Poa pratensis*).
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 11%.
- **1996 to 2001 - slightly up (+1):** There was a 19% increase in the sum of nested frequency of perennial grasses, though cover remained similar. Cheatgrass cover and frequency remained similar, and remained the dominant grass species on the site.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial grasses decreased by 64%, and cover decreased from 3% to less than 1%. Cheatgrass increased significantly in nested frequency, and cover increased from 10% to 16%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 45%, but did not return to 2001 levels. Cover of perennial grasses increased to 2%. The nested frequency of cheatgrass remained high, and cover increased slightly to 19%.

Forb:

- **1984 to 1990 - up (+2):** The perennial forb sum of nested frequency increased over two-fold. There was a significant increase in the nested frequency of thistle (*Cirsium undulatum*), low fleabane (*Erigeron pumilus*), and showy goldeneye.
- **1990 to 1996 - stable (0):** There was no change in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - down (-2):** The sum of nested frequency of perennial forbs decreased by 26%, though cover increased slightly from 9% to 11%. Most of the decrease in nested frequency was due to a significant decrease in showy goldeneye. Most of the increase in cover was due to a significant increase in the nested frequency of Louisiana sage, with a subsequent increase in cover.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 12%, and cover decreased to 3%. There was a significant decrease in the nested frequency of Louisiana sage and hairy goldaster, but there was a significant increase in the nested frequency of showy goldeneye.
- **2006 to 2011 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 11%, but cover increased slightly to 5%.

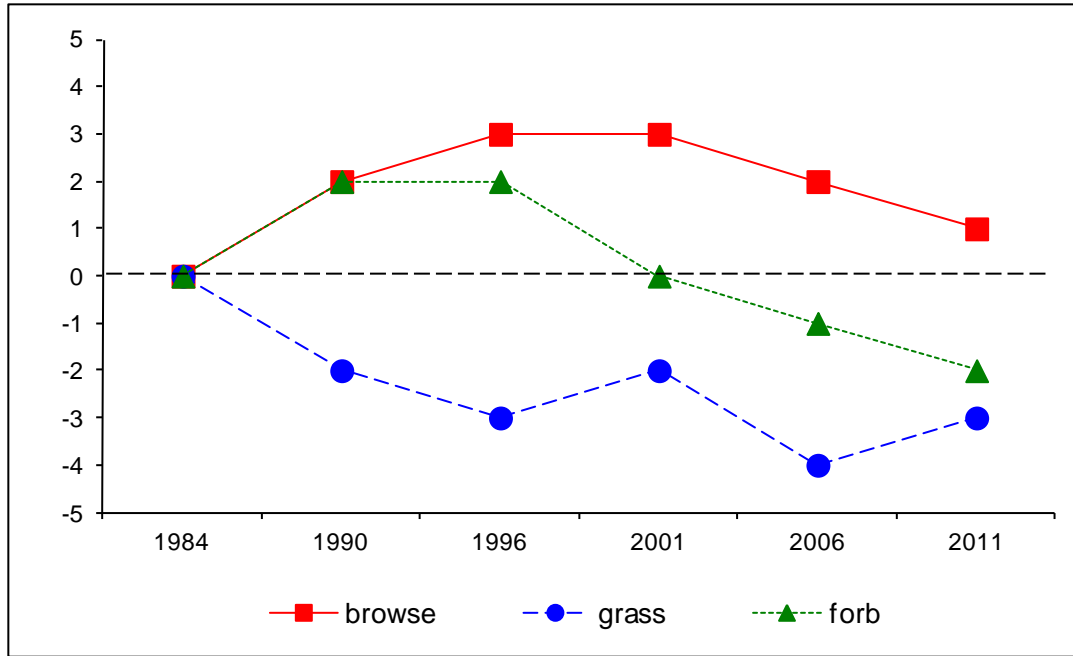
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 7, study no: 3

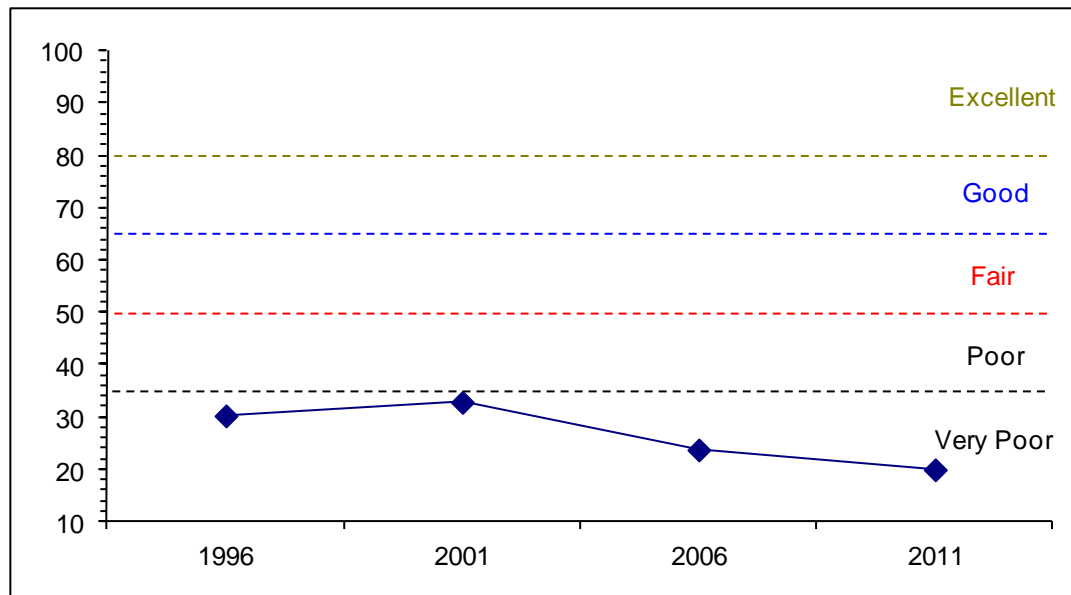
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	8.2	9.7	6.5	5.2	-9.4	10.0	0.0	30.3	Very Poor
01	10.4	10.4	4.5	6.0	-8.4	10.0	0.0	32.8	Very Poor
06	12.2	12.3	3.8	1.5	-12.5	6.5	0.0	23.8	Very Poor
11	12.8	9.0	0.8	4.2	-16.9	10.0	0.0	20.0	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 7 Study no: 3



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 7, Study no: 3



HERBACEOUS TRENDS--
Management unit 07, Study no: 3

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	14	17	19	15	9	15	.30	.41	.04	.63
G	Bromus japonicus (a)	-	-	b150	b123	a52	b145	2.35	1.10	.24	3.60
G	Bromus tectorum (a)	-	-	ab298	a292	bc337	c345	10.20	10.08	16.37	18.86
G	Poa bulbosa	-	-	-	-	1	-	-	-	.00	-
G	Poa fendleriana	-	-	-	-	1	-	-	-	.03	-
G	Poa pratensis	c138	b91	ab54	b100	a32	a46	1.06	2.16	.40	.89
G	Poa secunda	c48	ab41	ab59	c42	ab13	bc20	1.25	.43	.25	.58
G	Sitanion hystrix	-	-	-	-	-	-	-	-	.00	-
Total for Annual Grasses		0	0	448	415	389	490	12.55	11.19	16.61	22.47
Total for Perennial Grasses		200	149	132	157	56	81	2.61	3.00	0.73	2.10
Total for Grasses		200	149	580	572	445	571	15.17	14.20	17.34	24.57
F	Agoseris glauca	-	-	-	-	2	-	-	-	.00	-
F	Allium sp.	-	-	-	2	5	3	-	.00	.01	.01
F	Alyssum alyssoides (a)	-	-	b38	a8	b58	c105	.16	.07	.32	1.22
F	Antennaria rosea	-	3	-	-	-	-	-	-	-	-
F	Arabis sp.	-	-	-	5	4	-	-	.01	.01	-
F	Artemisia ludoviciana	a10	ab28	ab36	c67	ab32	bc45	2.03	3.72	.33	1.90
F	Aster sp.	5	-	3	-	10	3	.03	-	.21	.38
F	Astragalus sp.	9	-	-	2	3	-	-	.00	.00	-
F	Calochortus nuttallii	-	-	-	-	-	3	-	-	-	.00
F	Camelina microcarpa (a)	-	-	-	-	1	9	-	-	.00	.03
F	Carduus nutans (a)	-	-	a-	a-	a5	b18	-	-	.12	1.35
F	Cirsium undulatum	c51	d94	bc47	ab16	a5	ab23	1.09	1.32	.04	.71
F	Collinsia parviflora (a)	-	-	a-	b7	b13	c40	-	.02	.07	.60
F	Collomia linearis (a)	-	-	-	3	-	4	-	.00	-	.06
F	Comandra pallida	3	-	-	-	3	3	-	-	.03	.03
F	Crepis acuminata	1	-	-	-	-	-	-	-	-	-
F	Cryptantha sp.	10	3	1	2	-	-	.00	.00	-	-
F	Descurainia pinnata (a)	-	-	-	2	1	7	-	.00	.00	.06
F	Draba sp. (a)	-	-	2	-	8	7	.00	-	.01	.07
F	Epilobium brachycarpum (a)	-	-	b164	a81	b169	c247	2.44	.41	1.31	8.71
F	Erigeron pumilus	a-	c37	b11	a-	a-	a-	.40	-	-	-
F	Eriogonum racemosum	ab9	a6	ab9	ab16	ab13	b17	.13	.60	.15	.51
F	Eriogonum umbellatum	-	-	-	-	3	3	-	-	.03	.00
F	Erodium cicutarium (a)	b18	a-	b20	d220	d225	c173	.27	7.85	4.25	2.39
F	Galium aparine (a)	-	-	-	-	-	4	-	-	-	.41
F	Grindelia squarrosa	-	-	-	3	-	-	-	.00	-	-
F	Heterotheca villosa	a-	b15	b31	c55	b28	b30	1.60	4.15	.95	1.06
F	Holosteum umbellatum (a)	-	-	a59	a41	b146	b154	.44	.11	.59	.98
F	Lactuca serriola (a)	a-	a7	a22	a1	a7	b47	.07	.00	.01	.39
F	Lithophragma sp.	-	-	-	-	-	3	-	-	-	.00
F	Lithospermum ruderales	-	-	-	-	-	8	-	-	-	.21
F	Lupinus argenteus	b15	b12	a-	a-	a-	a-	.00	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Machaeranthera canescens</i>	2	-	-	-	-	-	-	-	-	-
F	<i>Marrubium vulgare</i>	-	-	-	-	-	-	-	.03	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	-	3	6	-	-	.00	.01
F	<i>Phlox longifolia</i>	-	-	-	1	1	-	-	.00	.00	-
F	<i>Polygonum douglasii</i> (a)	-	-	_b 17	_{ab} 8	_a 2	_a 4	.04	.07	.00	.01
F	<i>Potentilla gracilis</i>	-	-	2	2	1	-	.00	.00	.03	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	3	12	10	-	.00	.08	.04
F	<i>Sphaeralcea grossulariifolia</i>	-	-	1	-	-	-	.00	-	-	-
F	<i>Tragopogon dubius</i> (a)	3	2	11	9	2	15	.05	.04	.00	.28
F	<i>Verbascum thapsus</i>	-	-	5	-	1	-	.33	-	.03	-
F	<i>Viguiera multiflora</i>	_a 3	_b 63	_c 115	_a 21	_b 59	_a 11	3.50	.73	1.36	.17
Total for Annual Forbs		21	9	333	383	652	850	3.50	8.61	6.80	16.64
Total for Perennial Forbs		118	261	261	192	170	152	9.14	10.61	3.22	5.02
Total for Forbs		139	270	594	575	822	1002	12.64	19.23	10.03	21.66

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	1	2	1	2	.15	.06	.15	.15
B	<i>Artemisia tridentata vaseyana</i>	42	39	38	38	5.77	7.40	8.64	8.44
B	<i>Chrysothamnus depressus</i>	3	2	1	0	.03	-	-	-
B	<i>Gutierrezia sarothrae</i>	52	55	3	5	2.41	1.66	-	.09
B	<i>Mahonia repens</i>	28	29	32	32	.42	1.12	1.07	2.50
B	<i>Opuntia</i> sp.	13	17	14	17	.21	.45	.21	.53
B	<i>Rosa woodsii</i>	6	7	7	7	.59	.81	.93	1.58
B	<i>Symphoricarpos oreophilus</i>	0	0	0	0	-	-	-	.15
Total for Browse		145	151	96	101	9.60	11.51	11.00	13.46

CANOPY COVER, LINE INTERCEPT--

Management unit 07, Study no: 3

Species	Percent Cover	
	'06	'11
<i>Amelanchier alnifolia</i>	-	.30
<i>Artemisia tridentata vaseyana</i>	10.13	12.78
<i>Mahonia repens</i>	.96	2.88
<i>Opuntia</i> sp.	.25	.33
<i>Rosa woodsii</i>	1.00	2.38

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 07, Study no: 3

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	-	3.5	7.1
Artemisia tridentata vaseyana	2.3	1.7	3.9

BASIC COVER--

Management unit 07, Study no: 3

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.00	5.50	40.96	47.83	34.70	60.93
Rock	29.00	34.25	32.87	37.01	44.18	38.12
Pavement	1.00	2.50	1.21	3.64	4.41	2.08
Litter	52.50	50.50	41.41	30.40	22.21	23.02
Cryptogams	.75	.75	.31	0	.01	0
Bare Ground	13.75	6.50	1.34	4.97	6.54	2.26

SOIL ANALYSIS DATA --

Management unit 07, Study no: 3, Study Name: Foothill Drive

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
9.0	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	7	1	1	-	-	-
Horse	-	-	2	-	1 (1)	7 (17)	-
Elk	-	-	1	1	2 (5)	-	3 (7)
Deer	23	11	22	2	56 (139)	68 (169)	32 (79)
Cattle	7	-	6	-	7 (16)	9 (23)	4 (9)

BROWSE CHARACTERISTICS--

Management unit 07, Study no: 3

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia									
84	33	0	0	100	-	0	100	0	-/-
90	33	100	0	0	-	100	0	0	-/-
96	20	0	100	0	-	100	0	0	19/29
01	40	0	100	0	-	50	50	0	30/37
06	20	0	100	0	-	100	0	0	22/31
11	40	0	100	0	-	50	50	0	29/35
Artemisia tridentata vaseyana									
84	1632	0	10	90	99	16	84	33	15/13
90	1931	10	45	45	833	50	7	7	27/28
96	1180	10	69	20	-	32	2	0	18/34
01	1180	10	73	17	-	5	2	8	21/38
06	1000	6	84	10	180	35	29	6	25/43
11	920	2	74	24	-	28	26	26	27/48
Chrysothamnus depressus									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	80	0	100	-	-	25	0	0	9/18
01	40	0	100	-	-	0	0	0	-/-
06	20	0	100	-	-	0	100	0	6/11
11	0	0	0	-	-	0	0	0	-/-
Gutierrezia sarothrae									
84	1099	0	100	0	-	0	0	0	9/12
90	10599	35	65	0	-	0	0	0	9/13
96	4360	4	96	0	-	0	0	0	9/12
01	2680	0	97	3	-	0	0	.74	9/12
06	60	33	67	0	-	67	0	0	6/6
11	100	0	100	0	-	0	0	0	7/7
Mahonia repens									
84	933	100	0	-	-	0	0	0	-/-
90	1266	89	11	-	33	0	0	0	4/3
96	3260	11	89	-	-	0	0	0	5/8
01	7000	0	100	-	-	0	0	0	3/4
06	6740	5	95	-	-	0	0	0	3/4
11	11800	14	86	-	-	.16	0	0	4/12

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Opuntia sp.										
84	365	27	73	0	-	0	0	0	4/6	
90	166	0	80	20	66	0	0	20	4/9	
96	400	10	85	5	-	0	0	0	5/11	
01	620	6	90	3	-	0	0	0	5/12	
06	540	19	67	15	20	0	0	4	5/18	
11	480	0	96	4	-	0	0	4	5/18	
Rosa woodsii										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	1060	47	53	0	-	0	0	0	16/18	
01	1400	0	99	1	-	69	26	1	8/7	
06	1960	23	77	0	-	0	0	0	7/8	
11	1680	0	100	0	-	0	0	0	16/19	
Symphoricarpos oreophilus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	15/29	
11	0	0	0	-	-	0	0	0	24/32	

ABOVE SAMAK - TREND STUDY NO. 7-4-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 7,300 ft (2,225 m)

Aspect: Southwest

Slope: 23%

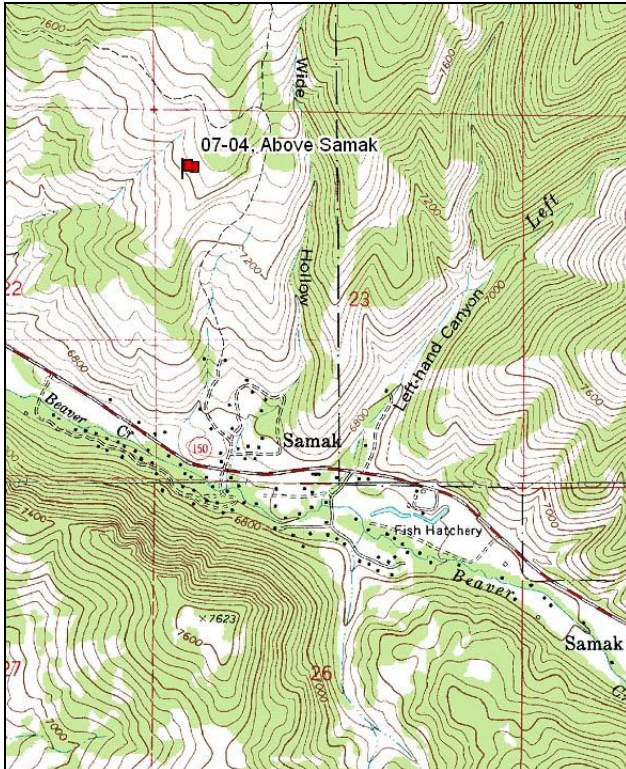
Transect bearing: 180° magnetic

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

Directions:

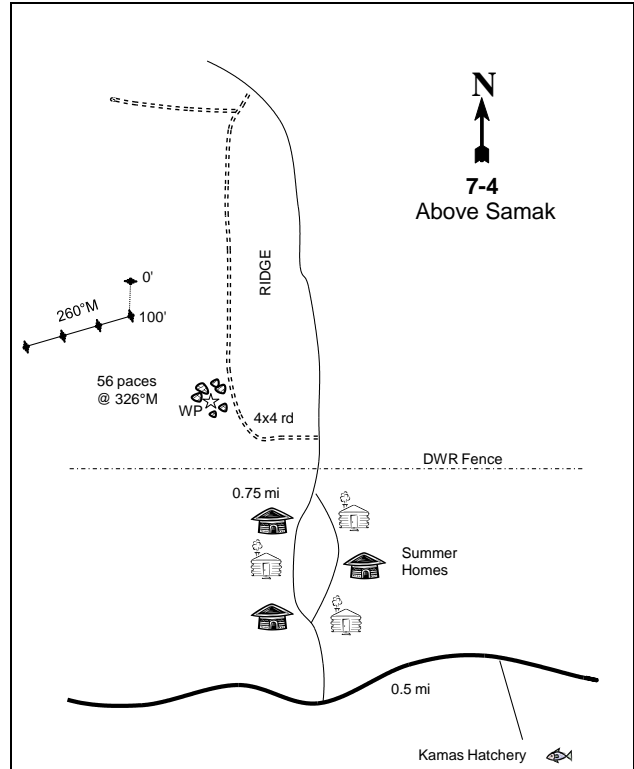
From the Kamas fish hatchery proceed west 0.5 miles. Turn right onto a dirt road and proceed north. The road will split (go left) around the summer houses and reunite in 0.2 miles. After passing the homes, you will come to a DWR fence and gate. Proceed 0.1 miles past the gate and turn left, proceeding up a very steep hill (4X4 recommended). Drive north to a half high witness post in the middle of a rock pile on the 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



Township: 2S Range: 6E Section: 22

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 479672 E 4498471 N

ABOVE SAMAK - TREND STUDY NO. 7-4

Site Information

Site Description: The study is located on the Kamas Wildlife Management Area in Beaver Creek Canyon. This area can be classified as deer and elk winter range during more mild winters or transitional spring-fall range during harsher winters. The site and surrounding area was burned and seeded in the early-1960's. Prior to the fire, the community was dominated by Gambel oak (*Quercus gambelii*) with a few other 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 presence has been variable depending on wintering conditions. Deer pellet groups has been sampled in moderate abundance since 2001. Elk pellet groups were sampled in moderate abundance in 2001, but in low abundance since 2006. Cattle pats were sampled in low abundance in 2001 and 2011, but in moderate abundance in 2006 (Table - Pellet Group Data).

Browse: Browse composition consists of a mix of Gambel oak, mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Saskatoon serviceberry (*Amelanchier alnifolia*), and several less numerous shrubs. There was moderate to heavy use on all browse species during the harsh winter of 1983-84. Following the initial sample year, Gambel oak utilization has been light. The oak population has consisted of a preponderance of young plants in the past. Oak clones are located primarily around the first two sample belts, and vary in height throughout the site with the larger ones being estimated at 12 to 15 feet. The serviceberry population is comprised of a small density of heavily utilized plants. Mountain big sagebrush is comprised of a moderately dense population of moderately used plants. Density of sagebrush has been decreasing steadily since the outset of the study. Recruitment of young sagebrush plants has been fairly poor over the course of the study. Mountain snowberry is a moderately dense population of lightly utilized plants. Antelope bitterbrush (*Purshia tridentata*) is found on the site in low density, with most plants growing in a prostrate growth form and displaying heavy use (Table - Browse Characteristics). Cover of bitterbrush has been increasing since 1996, but is still low on the site (Table - Browse Trends).

Herbaceous Understory: The composition of the herbaceous understory is dominated by seeded species, primarily grasses. The seeded grass species smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and intermediate wheatgrass (*A. intermedium*) are all very common and dominate the grass component of the site. The invasive perennial grass bulbous bluegrass (*Poa bulbosa*) is found on the site, and increased significantly in nested frequency in 2011. Perennial forb species are diverse on the site, but most individual species occur in low abundance. Alfalfa (*Medicago sativa*), also a seeded species, is the most abundant forb in terms of cover (Table - Herbaceous Trends). At this higher elevation, alfalfa has not shown signs of decline like it has on many other lower elevation range seedings.

Soil: Soils on the site are part of the Yeates Hollow-Henefer complex. Parent material for these soils consists either of colluvium derived from conglomerate, sandstone, and quartzite, or colluviums derived from quartzite, sandstone, and shale (Soil Survey Staff 2011). Soil texture was classified as a clay loam with a neutral soil reaction (6.8 pH) (Table - Soil Analysis Data). Bare ground cover is low, with a large amount of vegetation, litter, rock, and pavement cover (Table - Basic Cover). Due to 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. Some "trailing" and trampling damage associated with livestock use is apparent, but does not appear to cause substantial erosion problems. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of mountain big sagebrush decreased 31% from 2,398 plants/acre to 1,665 plants/acre. Decadence of sagebrush increased from 14% to 28%, and poor vigor

increased from 0% to 12%. Recruitment of young sagebrush plants decreased from 28% to 8% of the population. Serviceberry density decreased 29% from 465 plants/acre to 332 plants/acre.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of mountain big sagebrush decreased to 6%, and poor vigor decreased to 0%. However, recruitment of young sagebrush plants also continued to decrease to 5% of the population.
- **1996 to 2001 - slightly down (-1):** Mountain big sagebrush density decreased 11% from 1,320 plants/acre to 1,180 plants/acre, though cover increased slightly from 6% to 8%. Decadence of sagebrush increased to 17%, and poor vigor increased to 7%. Recruitment of young sagebrush plants continued to decrease to 2%.
- **2001 to 2006 - down (-2):** The density of sagebrush decreased by 24% to 900 plants/acre, and cover decreased to 6%. Decadence of sagebrush increased to 24%, and poor vigor increased slightly to 9%. Recruitment of young sagebrush plants increased to 11% of the population. Density of serviceberry decreased 31% from 260 plants/acre to 180 plants/acre.
- **2006 to 2011 - stable (0):** Sagebrush density decreased slightly to 820 plants/acre, and cover decreased slightly to 5%. Decadence of sagebrush remained similar at 20%, and poor vigor increased to 15%. Recruitment of young sagebrush plants decreased slightly to 7% of the population.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial grasses remained similar. Grass species identification was difficult due to heavy utilization before the study was sampled.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 11%.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover decreased from 23% to 16%.
- **2001 to 2006 - stable (0):** The sum of nested frequency and cover of perennial grasses remained similar.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, though cover increased to 25%. There was a significant increase in the nested frequency of the invasive perennial grass species bulbous bluegrass, and cover increased from less than 1% to 2%.

Forb:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 16%.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 13%.
- **1996 to 2001 - up (+2):** There was a 41% increase in the sum of nested frequency of perennial grasses, and cover increased from 6% to 8%.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial forbs decreased by 41%, and cover decreased to 6%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased nearly three-fold, and cover increased to 14%.

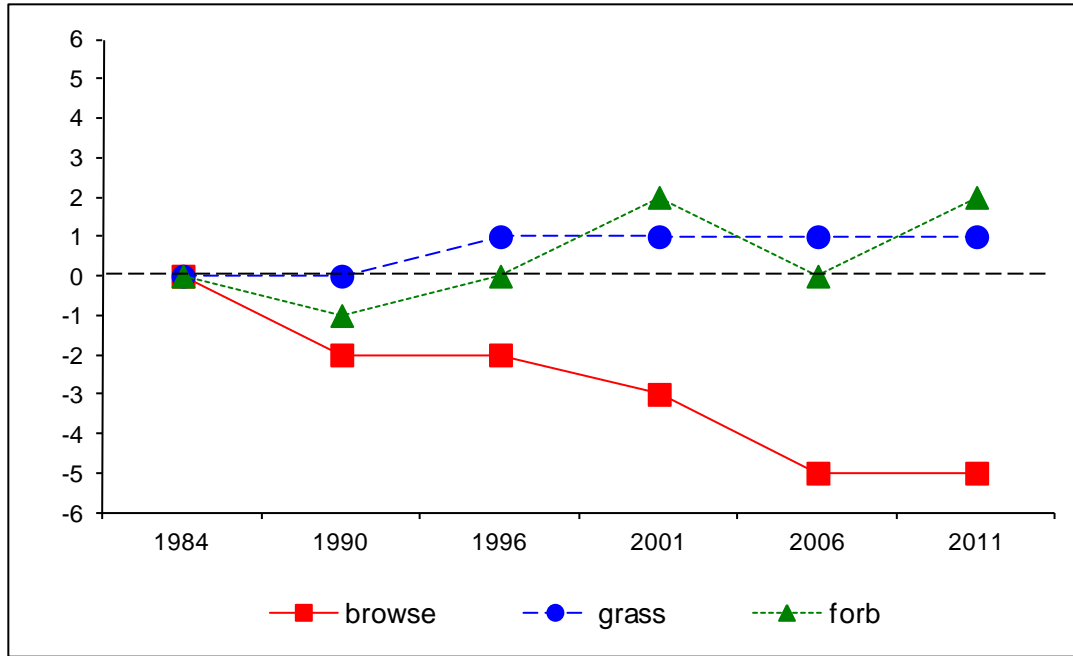
DEER DESIRABLE COMPONENTS INDEX - HIGH POTENTIAL SCALE --

Management unit 7, study no: 4

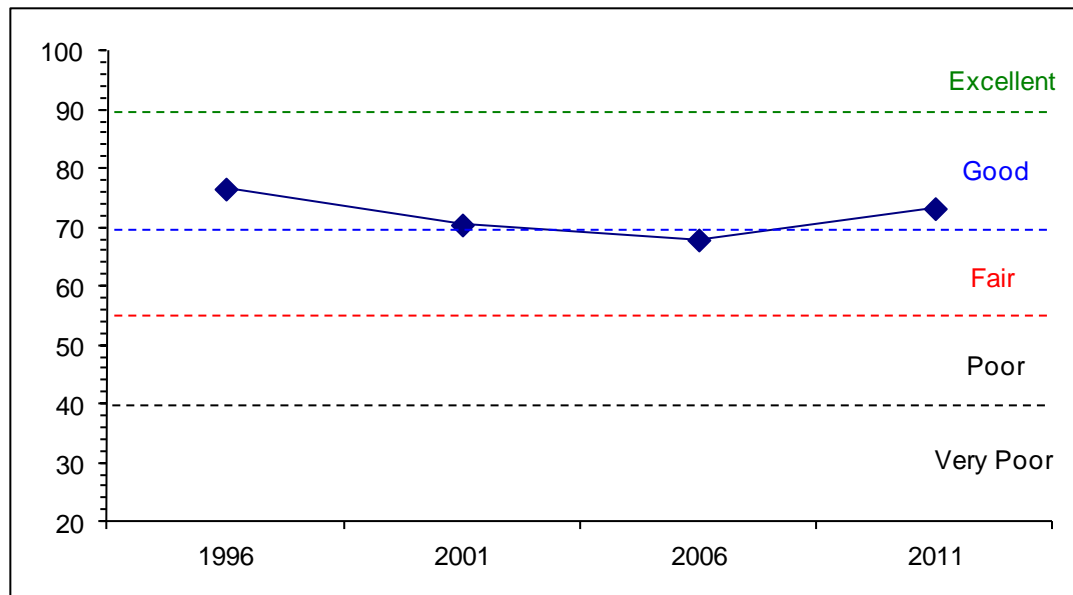
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	13.6	13.0	9.9	30.0	0.0	10.0	0.0	76.5	Good
01	15.6	10.1	4.7	30.0	0.0	10.0	0.0	70.4	Fair-Good
06	12.6	8.2	7.1	30.0	0.0	10.0	0.0	67.9	Fair
11	12.8	11.7	8.8	30.0	0.0	10.0	0.0	73.2	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 7 Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, HIGH POTENTIAL--
 Management unit 7, Study no: 4



HERBACEOUS TRENDS--
Management unit 07, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	abc117	ab100	bc145	abc124	c149	a108	5.53	2.86	4.31	4.83
G	Agropyron dasystachyum	a-	a-	a-	b11	a-	a-	-	.27	-	-
G	Agropyron intermedium	a55	a47	c103	ab77	ab78	a61	4.07	1.88	1.88	2.57
G	Agropyron spicatum	b26	ab20	ab16	ab5	a-	a1	.46	.04	-	.00
G	Bromus inermis	a243	ab267	ab249	ab266	ab260	b288	12.64	10.56	9.60	15.41
G	Bromus japonicus (a)	-	-	-	3	-	-	-	.03	-	-
G	Poa bulbosa	a-	a-	a3	a9	a10	b80	.00	.16	.13	2.35
G	Poa fendleriana	a-	b20	a1	a5	a3	a6	.00	.18	.18	.03
G	Poa pratensis	-	4	-	-	-	3	-	-	-	.15
G	Poa secunda	3	8	7	14	17	6	.10	.25	.57	.01
G	Stipa lettermani	-	7	-	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	3	0	0	0	0.03	0	0
Total for Perennial Grasses		444	473	524	511	517	553	22.83	16.22	16.69	25.37
Total for Grasses		444	473	524	514	517	553	22.83	16.25	16.69	25.37
F	Achillea millefolium	5	4	1	2	5	7	.06	.03	.03	.15
F	Agoseris glauca	a-	a-	a-	a3	a-	b28	-	.00	-	.24
F	Allium acuminatum	a10	a18	a6	a27	a19	b91	.04	.10	.06	.44
F	Alyssum alyssoides (a)	-	-	-	2	-	5	-	.00	-	.01
F	Arabis sp.	-	4	4	9	1	2	.04	.07	.03	.00
F	Aster sp.	-	-	-	-	3	-	-	-	.03	-
F	Astragalus convallarius	3	2	6	-	7	2	.06	-	.33	.03
F	Astragalus sp.	a-	a-	a-	b15	b11	c49	-	.34	.13	1.77
F	Calochortus nuttallii	-	-	-	4	-	3	-	.01	-	.00
F	Castilleja chromosa	-	-	-	-	3	4	-	-	.00	.06
F	Chaenactis douglasii	-	-	1	-	-	-	.00	-	-	-
F	Cirsium sp.	1	6	-	-	-	1	-	-	-	.03
F	Collinsia parviflora (a)	-	-	a31	bc86	ab53	c110	.14	.33	.14	.40
F	Comandra pallida	-	-	-	5	4	10	-	.07	.04	.09
F	Crepis acuminata	-	-	-	-	-	-	-	-	.00	-
F	Cryptantha sp.	b20	a-	a-	a-	a-	a-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	-	-	2	-	-	-	.00
F	Draba sp. (a)	-	-	-	-	-	3	-	-	-	.00
F	Epilobium brachycarpum (a)	-	-	a-	a2	a15	b17	-	.00	.11	.07
F	Erigeron pumilus	15	10	15	-	-	5	.13	-	-	.21
F	Eriogonum racemosum	-	-	-	7	1	-	-	.09	.03	-
F	Geranium sp.	a-	a-	a-	a-	a-	b23	-	-	-	.16
F	Holosteum umbellatum (a)	-	-	-	-	7	-	-	-	.02	-
F	Lithophragma sp.	-	-	-	-	-	5	-	-	-	.01
F	Lomatium triternatum	-	-	-	-	-	2	-	-	-	.00
F	Machaeranthera canescens	b35	a6	a4	a-	a-	a3	.04	-	-	.00
F	Medicago sativa	42	40	55	59	44	65	2.96	4.21	2.58	7.15
F	Microsteris gracilis (a)	-	-	a-	c51	b11	c75	-	.22	.02	.25
F	Penstemon humilis	b55	b55	b55	ab29	a8	a15	1.02	.32	.10	.60

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Petradoria pumila</i>	a ⁻	a ⁻	ab ²⁵	c ³⁸	ab ²⁹	b ²³	1.08	2.44	2.45	1.88
F	<i>Phlox longifolia</i>	a ⁻	ab ⁸	a ²	ab ⁹	ab ¹¹	b ²⁰	.00	.05	.07	.06
F	<i>Polygonum douglasii</i> (a)	-	-	ab ²¹	a ³	b ²³	ab ²¹	.04	.00	.05	.07
F	<i>Ranunculus testiculatus</i> (a)	-	-	a ²¹	b ⁹⁴	b ⁹⁸	b ⁹¹	.07	1.78	.93	.42
F	<i>Senecio integerrimus</i>	a ⁻	a ²	a ⁻	a ¹²	a ²	b ⁴⁰	-	.08	.00	.78
F	<i>Verbascum thapsus</i>	a ⁻	a ⁻	a ⁻	b ²⁸	a ⁻	a ⁻	-	.48	-	-
F	<i>Veronica biloba</i> (a)	-	-	b ¹¹⁷	b ¹¹⁶	a ⁵⁷	b ¹⁰⁵	.46	.50	.30	2.41
F	<i>Viola</i> sp.	a ⁻	a ⁻	a ⁻	a ⁻	a ⁻	b ¹⁶	-	-	-	.09
F	<i>Zigadenus paniculatus</i>	-	2	4	4	-	5	.09	.06	-	.09
Total for Annual Forbs		0	0	190	354	264	429	0.72	2.84	1.58	3.65
Total for Perennial Forbs		186	157	178	251	148	419	5.55	8.38	5.91	13.92
Total for Forbs		186	157	368	605	412	848	6.27	11.23	7.50	17.56

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	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	13	12	8	10	1.27	1.42	1.06	1.34
B	<i>Artemisia tridentata vaseyana</i>	39	38	35	35	6.27	8.01	5.76	4.97
B	<i>Cercocarpus montanus</i>	0	0	0	1	-	-	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	0	1	1	1	.12	.06	.24	.18
B	<i>Gutierrezia sarothrae</i>	3	7	8	8	-	-	-	.03
B	<i>Mahonia repens</i>	34	35	35	32	.90	.21	.70	.85
B	<i>Opuntia</i> sp.	0	0	0	1	-	-	-	-
B	<i>Purshia tridentata</i>	1	2	2	2	.03	.48	.56	1.41
B	<i>Quercus gambelii</i>	19	21	16	21	3.82	2.72	3.00	2.45
B	<i>Symphoricarpos oreophilus</i>	29	36	41	38	3.82	5.22	4.74	5.25
Total for Browse		138	152	146	149	16.25	18.13	16.08	16.48

CANOPY COVER, LINE INTERCEPT--

Management unit 07, Study no: 4

Species	Percent Cover	
	'06	'11
<i>Amelanchier alnifolia</i>	.70	.63
<i>Artemisia tridentata vaseyana</i>	6.73	8.60
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.33	-
<i>Mahonia repens</i>	.40	1.01
<i>Purshia tridentata</i>	1.18	1.50
<i>Quercus gambelii</i>	6.91	10.06
<i>Symphoricarpos oreophilus</i>	6.19	8.03

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 07, Study no: 4

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.3	2.4	3.4
Artemisia tridentata vaseyana	1.3	2.0	4.2

BASIC COVER--

Management unit 07, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	5.00	11.00	44.96	44.24	35.26	56.80
Rock	12.50	13.25	16.81	15.30	16.32	15.08
Pavement	9.25	15.00	3.97	5.63	6.30	2.11
Litter	54.75	40.50	45.09	35.33	39.91	39.33
Cryptogams	0	.75	.66	.33	.06	.03
Bare Ground	18.50	19.50	9.90	21.62	15.23	10.09

SOIL ANALYSIS DATA --

Management unit 07, Study no: 4, Study Name: Above Samak

Effective rooting depth (in)	pH	N/A			%OM	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	

PELLET GROUP DATA--

Management unit 07, Study no: 4

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	1	5	-	-	-	-
Elk	8	17	11	1	23 (56)	11 (26)	8 (20)
Deer	12	8	13	2	31 (76)	21 (51)	20 (50)
Cattle	3	4	6	3	9 (23)	22 (54)	7 (16)

BROWSE CHARACTERISTICS--

Management unit 07, Study no: 4

		Age class distribution					Utilization		
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia									
84	465	14	86	0	-	29	71	0	40/37
90	332	40	40	20	133	20	60	0	34/30
96	280	0	79	21	20	14	71	7	31/43
01	260	0	77	23	-	46	46	8	29/33
06	180	0	44	56	-	22	78	22	37/41
11	200	10	80	10	-	60	30	10	36/43

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
84	2398	28	58	14	199	61	39	0	20/29	
90	1665	8	64	28	-	52	8	12	19/23	
96	1320	5	89	6	20	61	6	0	21/35	
01	1180	2	81	17	40	41	14	7	25/34	
06	900	11	64	24	100	20	9	9	27/42	
11	820	7	73	20	20	32	5	15	27/48	
<i>Cercocarpus montanus</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	20	0	100	-	-	100	0	0	71/59	
<i>Chrysothamnus depressus</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	20	0	0	100	-	100	0	0	-/-	
06	20	0	0	100	-	0	0	0	2/2	
11	20	0	100	0	-	0	0	0	7/18	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	60	0	100	0	-	0	0	0	12/17	
01	180	0	100	0	-	0	0	0	10/12	
06	280	0	93	7	-	0	0	7	12/20	
11	480	42	58	0	-	0	0	0	15/24	
<i>Mahonia repens</i>										
84	15799	0	100	0	-	0	0	0	4/6	
90	4998	84	16	0	-	0	0	0	4/5	
96	2880	3	97	0	-	0	0	0	3/5	
01	4880	7	93	0	20	0	0	0	3/3	
06	4940	2	97	1	-	0	0	0	3/4	
11	3800	5	95	0	-	0	0	0	4/7	
<i>Opuntia sp.</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	4/8	
06	0	0	0	-	-	0	0	0	6/13	
11	20	0	100	-	-	0	0	0	4/15	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Purshia tridentata										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	20	0	100	-	-	0	100	0	11/41	
01	40	0	100	-	-	50	0	0	19/68	
06	40	0	100	-	-	50	50	0	13/48	
11	60	0	100	-	-	67	33	0	18/51	
Quercus gambelii										
84	12598	79	21	0	3066	75	8	0	47/37	
90	10798	78	8	14	4199	15	0	3	58/29	
96	1360	51	46	3	220	24	0	0	31/25	
01	3340	38	49	13	-	0	0	18	51/20	
06	1500	28	59	13	820	1	0	9	35/23	
11	2240	53	47	0	-	0	0	0	-/-	
Symphoricarpos oreophilus										
84	1066	12	88	0	-	100	0	0	18/29	
90	1999	7	67	27	66	20	7	33	14/15	
96	1200	10	77	13	-	38	12	7	16/31	
01	1500	9	88	3	-	0	0	0	15/28	
06	2240	29	70	2	180	2	.89	.89	16/29	
11	1500	8	92	0	-	3	0	0	17/35	
Tetradymia canescens										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	8/20	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	

CEDAR HOLLOW - TREND STUDY NO. 7-6-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 7,320 ft (2,231 m)

Aspect: South

Slope: 15%

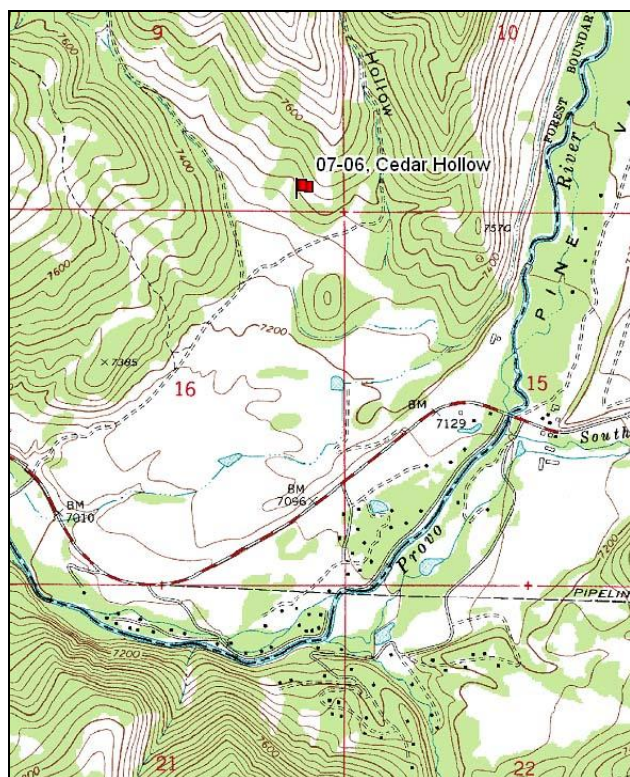
Transect bearing: 166° magnetic

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

Directions:

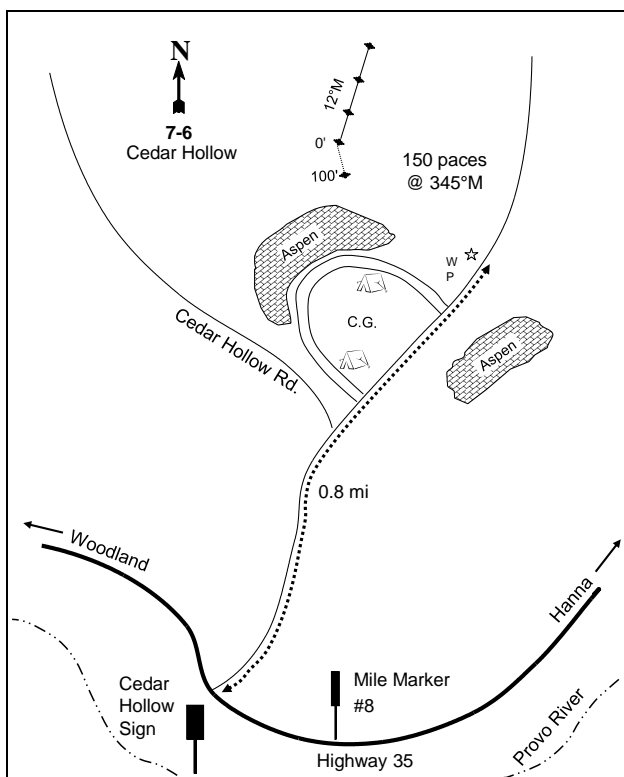
Travel eastbound on Highway 35 from Woodland and turn left (north) at the Cedar Hollow sign. If you pass mile-marker 8 you have gone too far. Travel 0.8 miles on the main dirt road passing two left turns, and stop next to a small witness post on the left side of the road. There is a small stand of aspen 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



Township: 3S Range: 7E Section: 16

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 487388 E 4490657 N

CEDAR HOLLOW - TREND STUDY NO. 7-6

Site Information

Site Description: The study is located on a hillside above Cedar Hollow, about a half mile west of Pine Valley and the Provo River. The hillside is intermixed with areas of quaking aspen (*Populus tremuloides*), Gambel oak (*Quercus gambelii*), and open areas of mixed mountain brush communities. The study samples one of the areas dominated by mixed mountain brush. The area is administered by the U.S. Forest Service as part of the Uintah-Cache-Wasatch National Forest. Deer, elk, and cattle pellet groups have been sampled in low abundance since 2001. Moose pellet groups were sampled in low abundance in 2001 (Table - Pellet Group Data).

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 (*Artemisia tridentata* ssp. *vaseyana*). Mountain big sagebrush consists of a moderately dense stand of mostly light to moderately used plants. There was a large decrease in density in 2006. Decadence of sagebrush has been highly variable through the years with very high decadence in 1984, but more moderate to low decadence in other sample years. Recruitment of young sagebrush plants has been fairly poor over the sample period. Saskatoon serviceberry (*Amelanchier alnifolia*) and antelope bitterbrush (*Purshia tridentata*) provide additional preferred forage, but both species occur in low densities. Both species have shown moderate to heavy use over the sample period. Over the sample years, serviceberry density has fluctuated with changes in the recruitment of young plants. Density of bitterbrush has steadily increased since it was first sampled with the increased sample area in 1996. Mountain snowberry (*Symphoricarpos oreophilus*) is the most numerous species on the site, but has displayed mostly light use (Table - Browse Characteristics).

Herbaceous Understory: This site has a fair herbaceous understory component. Grass composition is diverse, but also includes several aggressive increaser species. A sedge species (*Carex* sp.), several bluegrass species (*Poa* spp.), and bluebunch wheatgrass (*Agropyron spicatum*) are the most abundant grasses. The weedy increaser species bulbous bluegrass (*P. bulbosa*) increased substantially in cover in 2011. Forb species are diverse and are primarily composed of perennials. Cover of perennial forbs has steadily increased since 1996 (Table - Herbaceous Trends).

Soil: Soil texture is classified as a clay loam with a neutral soil reaction (7.0 pH) (Table - Soil Analysis Data). Bare ground cover is low on the site, with a large amount of vegetation, litter, rock, and pavement providing protective ground cover (Table - Basic Cover). However, there are interspaces where the soil appears compacted where noticeable erosion has occurred in the past. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** Density of mountain big sagebrush decreased by 15% from 1,332 plants/acre to 1,132 plants/acre, but decadence also decreased from 75% to 41%. Recruitment of young sagebrush plants increased from 0% to 12% of the population. Density of serviceberry increased substantially from 66 plants/acre to 731 plants/acre, with a large increase in the recruitment of young serviceberry plants at 82% of the population.
- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush decreased substantially to 19%, and poor vigor decreased from 18% to 5% of the population. Recruitment of young sagebrush decreased to 7%.

- **1996 to 2001 - slightly up (+1):** Sagebrush density remained similar decreasing slightly from 1,900 plants/acre to 1,800 plants/acre. Cover of sagebrush remained similar. Serviceberry increased in density 58% from 380 plants/acre to 600 plants/acre, mostly due to an increase in the recruitment of young plants. The density of bitterbrush increased 19% from 320 plants/acre to 380 plants/acre.
- **2001 to 2006 - down (-2):** The density of mountain big sagebrush decreased by 48% to 940 plants/acre, and cover decreased to 6%. Decadence of sagebrush increased from 29% to 43%, but poor vigor remained similar at 15%. Serviceberry density decreased 53% to 280 plants/acre, which was due to a decrease in the recruitment of young plants. Bitterbrush density increased 11% to 420 plants/acre.
- **2006 to 2011 - slightly up (+1):** Density of sagebrush remained similar at 980 plants/acre, but decadence and poor vigor decreased to 10% and 8%, respectively. The density of serviceberry increased 71% to 480 plants/acre, and decadence poor vigor decreased from 29% to 0% and 14% to 0%, respectively. Bitterbrush density increased by 24% to 520 plants/acre.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased 47%.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequency of perennial grasses remained similar, but the weedy, exotic species bulbous bluegrass increased significantly in nested frequency. More desirable native species such as bluebunch wheatgrass and Sandberg bluegrass decreased.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses remained similar, but composition changed slightly. There was a significant decrease in the nested frequency of bulbous bluegrass and a significant increase in the nested frequency of bluebunch wheatgrass. Despite the decrease in nested frequency, cover of bulbous bluegrass increased from 5% to 6%.
- **2006 to 2011 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, but bulbous bluegrass again increased significantly in nested frequency. Cover of bulbous bluegrass also increased to 11% and dominated the cover of grasses on the site.

Forb:

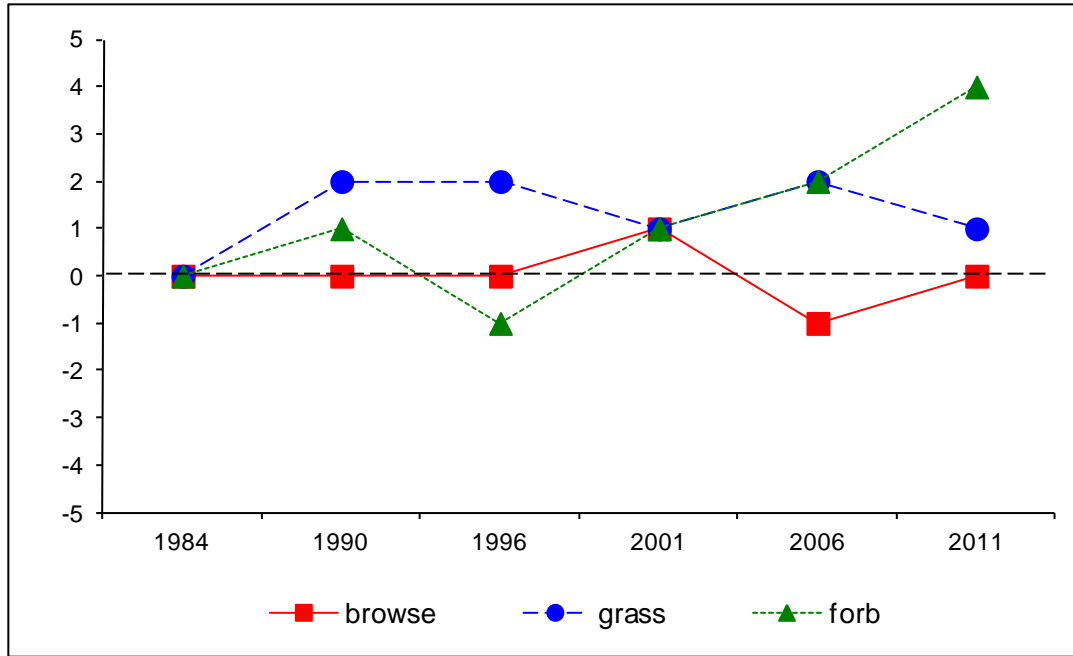
- **1984 to 1990 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 13%.
- **1990 to 1996 - down (-2):** There was a 38% decrease in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased by 49%, and cover increased from 2% to 5%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 15%, and cover increased to 7%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased 51%, and cover increased to 13%.

DEER DESIRABLE COMPONENTS INDEX - HIGH POTENTIAL SCALE --
Management unit 7, study no: 6

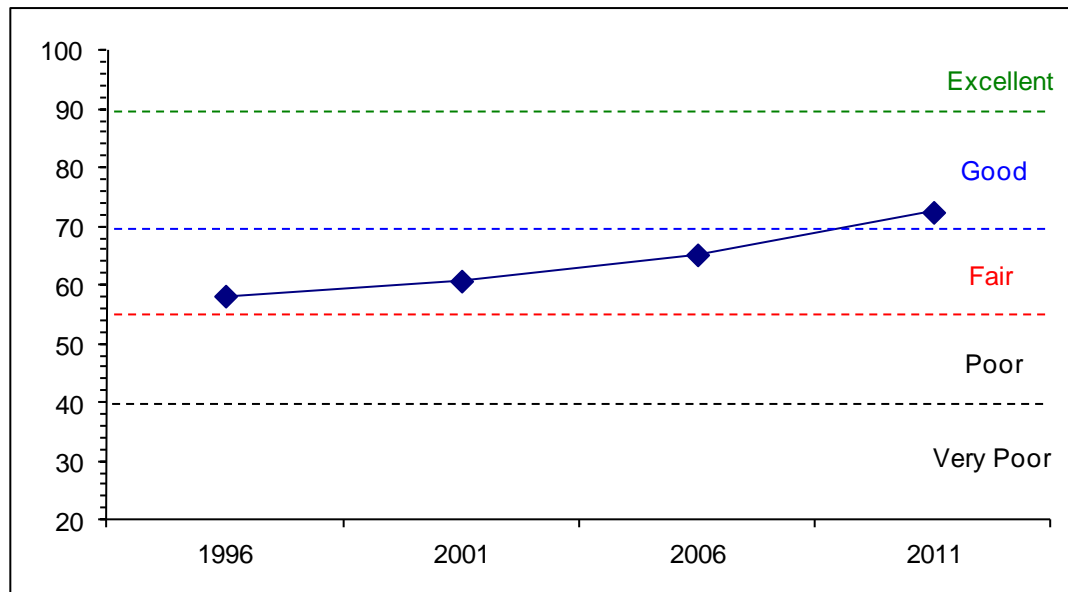
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	16.4	11.3	3.2	22.4	0.0	4.8	0.0	58.2	Fair
01	18.9	9.1	1.2	21.6	0.0	10.0	0.0	60.7	Fair
06	17.4	8.2	1.9	27.8	0.0	10.0	0.0	65.2	Fair
11	15.4	13.4	3.6	30.0	0.0	10.0	0.0	72.4	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 7 Study no: 6



DEER DESIRABLE COMPONENTS INDEX TREND, HIGH POTENTIAL--
 Management unit 7, Study no: 6



HERBACEOUS TRENDS--
Management unit 07, Study no: 6

T y p e	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	-	-	-	2	-	-	-	.00	-	-
G	Agropyron spicatum	b152	ab151	ab145	a107	b163	b152	2.03	2.06	5.82	5.13
G	Bromus carinatus	a-	a6	a-	b23	ab6	a3	-	.20	.09	.15
G	Bromus inermis	-	12	-	-	4	6	-	-	.06	.06
G	Bromus tectorum (a)	-	-	1	-	4	-	.00	-	.00	-
G	Carex sp.	73	92	68	78	47	53	4.08	4.29	2.37	4.03
G	Festuca sp.	-	-	3	-	-	-	.00	-	-	-
G	Koeleria cristata	a-	a-	a-	a2	a4	b38	-	.03	.06	.79
G	Melica bulbosa	a-	a-	a3	a1	b18	a3	.00	.03	.33	.00
G	Poa bulbosa	a-	b79	b107	d199	c161	d218	3.57	4.99	6.28	10.98
G	Poa fendleriana	b97	bc130	bc105	c140	bc126	a46	1.47	2.79	2.07	1.11
G	Poa pratensis	a46	ab83	b107	a48	a63	a51	2.80	.81	1.31	1.96
G	Poa secunda	abc31	ab19	c56	a23	bc49	abc49	.71	.33	1.54	2.04
G	Stipa lettermani	ab9	b28	a9	a7	a9	a-	.09	.21	.21	-
Total for Annual Grasses		0	0	1	0	4	0	0.00	0	0.00	0
Total for Perennial Grasses		408	600	603	630	650	619	14.79	15.77	20.16	26.30
Total for Grasses		408	600	604	630	654	619	14.80	15.77	20.17	26.30
F	Agoseris glauca	a-	a4	a-	a4	ab12	b17	-	.01	.07	.12
F	Allium sp.	a-	a-	a5	a24	b59	c96	.01	.10	.20	.53
F	Antennaria rosea	-	-	-	-	1	3	-	-	.03	.15
F	Arabis sp.	-	-	-	-	3	-	-	-	.00	-
F	Aster chilensis	b105	b121	a48	a35	a45	a58	.47	.44	1.04	1.99
F	Astragalus beckwithii	a-	a-	a-	a-	b12	a-	-	-	.30	-
F	Astragalus sp.	a-	a-	a2	b65	b54	b80	.01	.84	.95	2.53
F	Balsamorhiza sagittata	a7	a16	a11	a14	ab24	b46	.54	1.64	2.16	5.08
F	Calochortus nuttallii	a-	a2	a3	a4	a5	b29	.00	.01	.01	.14
F	Castilleja linariaefolia	3	1	6	6	12	6	.04	.21	.22	.09
F	Chenopodium fremontii (a)	-	-	-	-	-	1	-	-	-	.00
F	Cirsium undulatum	ab14	b17	ab8	ab8	ab5	a4	.07	.09	.33	.06
F	Collinsia parviflora (a)	-	-	-	8	12	18	-	.02	.05	.04
F	Collomia linearis (a)	-	-	a12	bc39	ab19	c56	.02	.16	.05	.36
F	Comandra pallida	c80	c83	abc58	bc69	a36	ab45	.29	.78	.43	.33
F	Crepis acuminata	-	1	3	-	1	1	.00	-	.03	.00
F	Epilobium brachycarpum (a)	-	-	a-	b26	a1	ab17	-	.05	.00	.06
F	Eriogonum racemosum	1	8	12	7	9	15	.16	.04	.21	.19
F	Eriogonum umbellatum	-	4	-	6	3	5	-	.21	.15	.06
F	Erythronium grandiflorum	-	-	-	-	9	3	-	-	.04	.15
F	Gayophytum ramosissimum(a)	-	-	-	-	7	-	-	-	.03	-
F	Hackelia patens	10	-	-	-	5	1	-	-	.06	.15
F	Holosteum umbellatum (a)	-	-	2	2	-	7	.00	.00	-	.02
F	Ligusticum sp.	-	5	-	-	-	-	-	-	-	-
F	Lithophragma sp.	-	-	-	-	-	8	-	-	-	.06
F	Lupinus argenteus	-	8	-	7	1	3	.03	.21	.03	.06

T y p e	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Machaeranthera canescens</i>	b30	a6	a-	a-	a-	a-	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b7	ab5	ab6	.00	.02	.01	.01
F	<i>Penstemon leonardi</i>	-	17	26	18	11	5	.65	.34	.10	.07
F	<i>Phlox longifolia</i>	a-	b32	ab15	a10	ab25	a7	.04	.05	.10	.02
F	<i>Polygonum douglasii</i> (a)	-	-	ab8	a-	b15	a1	.01	-	.03	.00
F	<i>Senecio integerrimus</i>	a-	a1	ab7	b21	ab13	c57	.07	.18	.13	1.14
F	<i>Solidago</i> sp.	b41	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Streptanthus cordatus</i>	1	2	-	3	-	2	-	.00	-	.00
F	<i>Tragopogon dubius</i> (a)	-	-	a1	b7	a-	a-	.00	.01	-	-
F	<i>Viola</i> sp.	a-	a-	a-	a-	a-	b11	-	-	-	.03
F	<i>Zigadenus paniculatus</i>	a-	a3	a-	a3	a5	b28	-	.00	.09	.33
Total for Annual Forbs		0	0	23	89	59	106	0.04	0.28	0.19	0.49
Total for Perennial Forbs		292	331	204	304	350	530	2.42	5.22	6.76	13.33
Total for Forbs		292	331	227	393	409	636	2.47	5.50	6.95	13.83

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

BROWSE TRENDS--

Management unit 07, Study no: 6

T y p e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	19	20	13	17	.22	.87	.56	.36
B	<i>Artemisia tridentata vaseyana</i>	59	58	39	38	8.10	8.01	6.19	5.99
B	<i>Ceanothus velutinus</i>	2	2	2	0	-	.15	.03	.41
B	<i>Chrysothamnus depressus</i>	0	1	1	2	-	-	-	.15
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	51	53	52	40	1.85	1.98	2.29	2.87
B	<i>Eriogonum heracleoides</i>	0	4	6	5	-	.06	.23	.71
B	<i>Eriogonum microthecum</i>	17	0	0	0	.22	-	-	-
B	<i>Juniperus scopulorum</i>	0	0	0	0	-	-	.03	.00
B	<i>Mahonia repens</i>	65	60	69	62	1.16	2.63	1.69	2.93
B	<i>Opuntia</i> sp.	3	3	2	3	.03	-	.15	.00
B	<i>Pachistima myrsinites</i>	4	0	3	5	.03	-	-	.00
B	<i>Purshia tridentata</i>	15	16	17	19	2.93	3.94	5.09	4.55
B	<i>Quercus gambelii</i>	3	5	4	4	1.25	1.63	1.16	.56
B	<i>Symphoricarpos oreophilus</i>	67	65	68	60	4.55	7.30	7.58	7.12
Total for Browse		305	287	276	255	20.35	26.61	25.04	25.69

CANOPY COVER, LINE INTERCEPT--

Management unit 07, Study no: 6

Species	Percent Cover		
	'01	'06	'11
Amelanchier alnifolia	-	.61	1.31
Artemisia tridentata vaseyana	-	6.30	7.43
Ceanothus velutinus	-	.41	-
Chrysothamnus viscidiflorus viscidiflorus	-	3.59	3.56
Eriogonum heracleoides	-	.48	.13
Mahonia repens	-	1.89	1.29
Opuntia sp.	-	.08	.06
Purshia tridentata	-	4.75	4.98
Quercus gambelii	3.40	2.33	3.06
Symphoricarpos oreophilus	-	10.25	10.68

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 07, Study no: 6

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	1.8	3.0	1.6
Artemisia tridentata vaseyana	1.8	1.8	1.9
Purshia tridentata	2.0	2.8	1.2

BASIC COVER--

Management unit 07, Study no: 6

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.75	16.50	39.31	51.52	44.29	55.95
Rock	12.00	12.25	15.11	14.48	14.86	11.75
Pavement	7.00	11.75	4.56	7.09	7.96	8.45
Litter	60.00	46.75	42.47	35.27	25.93	31.86
Cryptogams	.25	0	.53	.21	.55	.47
Bare Ground	17.00	12.75	11.13	17.47	21.65	13.23

SOIL ANALYSIS DATA --

Management unit 07, Study no: 6, Study Name: Cedar Hollow

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.6	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	9	2	-	-	-
Moose	-	2	1	-	1 (2)	-	-
Elk	5	-	1	2	5 (12)	2 (5)	1 (2)
Deer	7	11	22	12	20 (50)	12 (30)	7 (18)
Cattle	1	2	1	1	-	4 (9)	2 (4)

BROWSE CHARACTERISTICS--

Management unit 07, Study no: 6

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Amelanchier alnifolia										
84	66	0	0	100	-	0	100	0	-/-	
90	731	82	9	9	333	9	18	18	89/71	
96	380	26	63	11	-	63	5	11	30/32	
01	600	40	23	37	-	17	27	13	43/31	
06	280	29	43	29	-	14	43	14	29/33	
11	480	25	75	0	-	0	13	0	21/22	
Artemisia tridentata vaseyana										
84	1332	0	25	75	66	45	55	15	23/35	
90	1132	12	47	41	-	29	0	18	26/28	
96	1900	7	74	19	-	32	1	5	21/33	
01	1800	0	71	29	-	20	10	17	25/37	
06	940	2	55	43	80	13	0	15	22/36	
11	980	8	82	10	-	45	4	8	22/36	
Ceanothus velutinus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	40	0	100	-	-	0	0	0	24/90	
01	80	0	100	-	-	0	0	0	19/50	
06	40	0	100	-	-	100	0	0	23/78	
11	0	0	0	-	-	0	0	0	14/29	
Chrysothamnus depressus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	20	0	100	-	-	0	0	0	-/-	
06	20	0	100	-	-	0	0	0	6/14	
11	40	0	100	-	-	0	0	0	5/15	
Chrysothamnus viscidiflorus viscidiflorus										
84	199	0	0	100	-	67	0	0	-/-	
90	798	8	50	42	-	8	0	33	12/9	
96	2120	7	93	0	-	94	0	0	12/16	
01	1980	2	88	10	-	3	0	0	10/16	
06	1860	6	87	6	-	2	0	1	11/18	
11	1400	14	86	0	-	0	0	0	10/16	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Eriogonum heracleoides										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	80	0	100	0	-	0	0	0	10/10	
06	140	14	71	14	-	0	0	0	5/10	
11	100	0	100	0	-	0	0	0	9/17	
Eriogonum microthecum										
84	665	30	70	-	-	10	0	0	5/6	
90	0	0	0	-	-	0	0	0	-/-	
96	360	6	94	-	-	0	0	0	7/12	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Juniperus scopulorum										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	20	0	0	0	-/-	
Mahonia repens										
84	20599	96	4	0	-	0	0	0	6/4	
90	61799	54	46	0	3533	.10	0	0	6/4	
96	9660	26	74	0	-	0	0	0	4/6	
01	14260	0	100	0	-	0	0	.14	4/5	
06	14500	7	92	1	240	0	0	.27	3/5	
11	9860	6	94	0	-	0	0	0	4/4	
Opuntia sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	60	0	100	-	-	0	0	0	4/11	
01	180	11	89	-	-	0	0	0	4/10	
06	40	0	100	-	-	0	0	0	6/13	
11	60	0	100	-	-	0	0	0	6/18	
Pachistima myrsinites										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	200	40	60	-	-	0	0	0	12/36	
01	0	0	0	-	-	0	0	0	-/-	
06	180	0	100	-	-	0	0	0	5/6	
11	200	10	90	-	-	0	0	0	21/77	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Purshia tridentata										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	320	6	94	0	-	56	13	0	15/60	
01	380	0	95	5	-	11	32	0	16/70	
06	420	0	100	0	40	10	90	0	18/54	
11	520	4	96	0	20	0	62	0	12/52	
Quercus gambelii										
84	466	71	29	0	-	0	14	0	67/57	
90	2465	43	51	5	333	3	0	0	72/23	
96	60	0	100	0	20	0	0	0	77/98	
01	900	0	100	0	-	0	9	100	-/-	
06	340	18	71	12	260	0	0	6	49/23	
11	480	13	88	0	-	0	0	0	-/-	
Rosa woodsii										
84	332	60	40	-	-	0	40	20	25/5	
90	266	50	50	-	-	0	0	0	18/7	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
Symphoricarpos oreophilus										
84	2931	48	41	11	-	39	5	5	23/36	
90	7131	31	64	6	533	31	.93	18	18/24	
96	2640	14	84	2	80	2	0	5	17/28	
01	2100	0	97	3	-	5	0	0	16/28	
06	3740	16	83	1	20	0	0	0	16/27	
11	4820	10	90	0	20	1	0	0	15/25	

ABOVE WOODLAND - TREND STUDY NO. 7-9-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA463UT](#)

Land Ownership: Private

Elevation: 6,960 ft (2,121 m)

Aspect: Southwest

Slope: 25-35%

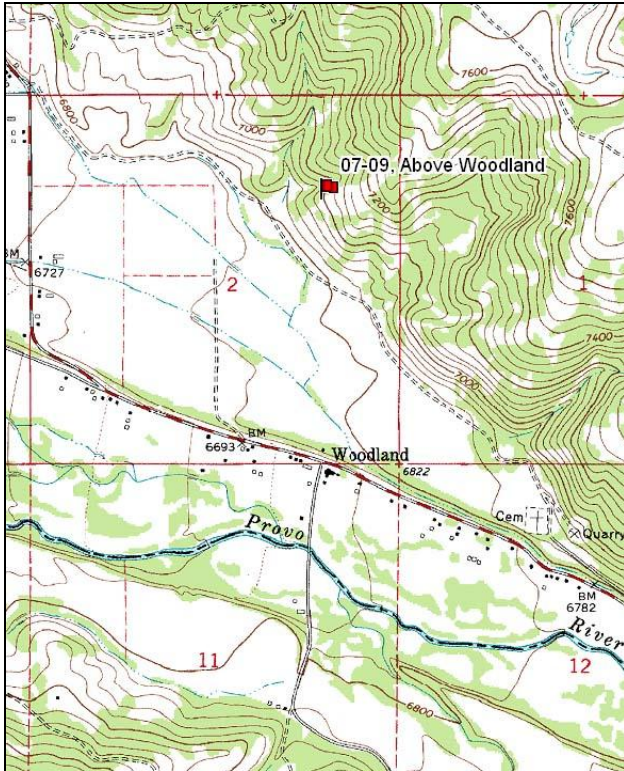
Transect bearing: 76° magnetic

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

Directions:

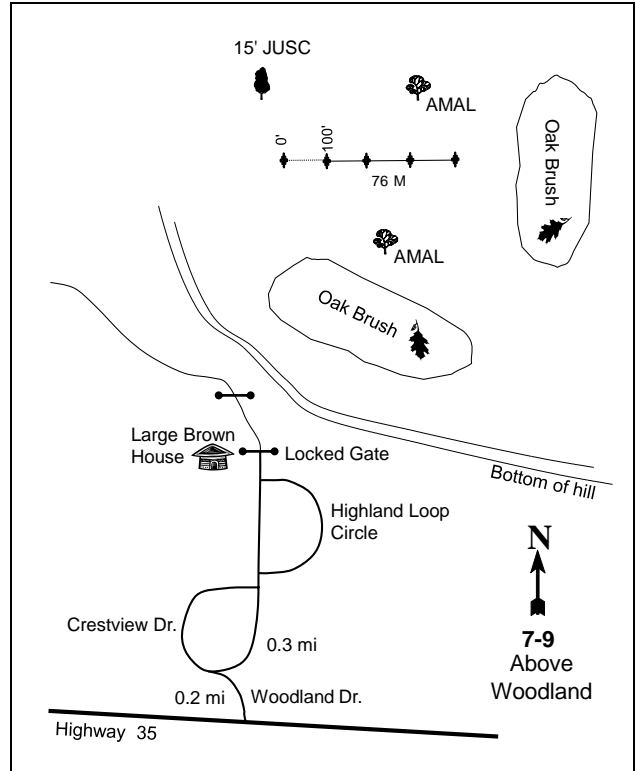
From the intersection of Highway 35 and Woodland Drive, west of Woodland, turn onto Woodland Drive and proceed 0.2 miles. Turn onto Crestview Drive and proceed 0.3 miles to Highland Loop Circle. Turn left and follow the circle 0.1 miles to a dirt road. Travel along the road past a large brown house to 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 two large serviceberry.

Map Name: Woodland



Township: 3S Range: 6E Section: 2

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 480781 E 4493448 N

ABOVE WOODLAND - TREND STUDY NO. 7-9

Site Information

Site Description: The study is located on private land north of Woodland. A study was originally established in 1984 that sampled an intermixed mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), grass, and Gambel oak (*Quercus gambelii*) winter range farther to the north. 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 in 2001. The new study area supports a denser stand of sagebrush in association with other preferred browse species including Saskatoon serviceberry (*Amelanchier alnifolia*) and antelope bitterbrush (*Purshia tridentata*). This area is at a high enough elevation that deep snow may preclude use during severe winters. Elk pellet groups were sampled in moderate abundance in 2001, heavy abundance in 2006, and low abundance in 2011. Deer pellet groups have been sampled in low abundance since 2001. A few moose pellets were sampled in quadrat frequency in 2006 (Table - Pellet Group Data).

Browse: The browse composition consists primarily of mountain big sagebrush, with lesser amounts of serviceberry and antelope bitterbrush. Mountain big sagebrush provided over half of the total browse cover in 2001, but has decreased steadily since that time (Table - Browse Trends). The sagebrush population is moderately dense and displays mostly light to moderate use. Similar to cover, density of sagebrush has decreased since 2001. Decadence and poor vigor are both high in the sagebrush population, and recruitment of young sagebrush has been poor. In contrast to sagebrush, serviceberry has steadily increased in density, though the small population has displayed heavy use over the sample years. Only a few bitterbrush plants occur on the site, but have displayed moderate to heavy use. Despite the heavy use, both serviceberry and bitterbrush have low decadence and good vigor. Other browse sampled include low numbers of dwarf rabbitbrush (*Chrysothamnus depressus*), stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*), broom snakeweed (*Gutierrezia sarothrae*), snowberry (*Symphoricarpos oreophilus*), gray horsebrush (*Tetradymia canescens*), and high numbers of Oregon grape (*Mahonia repens*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is moderately abundant, but may be limited somewhat by competition with shrubs and poor site potential caused by the high rock content of the soil. Perennial grasses are diverse and abundant on the site. Bluebunch wheatgrass (*Agropyron spicatum*) provides the majority of the grass cover on the site, but the bluegrass species Kentucky bluegrass (*Poa pratensis*), Sandberg bluegrass (*P. secunda*), and bulbous bluegrass (*P. bulbosa*) are also common. Bulbous bluegrass is an introduced weedy species that increased significantly on the site in 2011. The annual grasses Japanese chess (*Bromus japonicus*) and cheatgrass (*B. tectorum*) are also common on the site. Forbs are also diverse and moderately abundant, but consist of a mixture of perennial and annual species. The only moderately abundant perennial forb species consist of Louisiana sage (*Artemisia ludoviciana*) and silvery lupine (*Lupinus argenteus*). Most other perennial forb species occur infrequently (Table - Herbaceous Trends).

Soil: Soils on the site are part of the Horrocks-Agassiz very cobbly loams, likely as part of the Horrocks component. These soils are found on mountain slopes and parent material consists of colluvium derived from sandstone, conglomerate, and andesite (Soil Survey Staff 2011). The soil texture is a clay loam with a slightly acid soil reaction (pH 6.2) (Table - Soil Analysis Data). The site is very rocky and surface rocks vary in size from pavement to large rock. Percent surface rock and pavement cover is high. There is also abundant protective ground cover provided by vegetation and litter, which leaves little exposed bare ground (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **2001 to 2006 - down (-2):** Mountain big sagebrush is the most abundant browse species, but has decreased in density by 44% from 2,260 plants/acre to 1,260 plants/acre, and cover decreased from 16% to 12%. Decadence of sagebrush increased from 21% to 38%, and poor vigor increased from 8% to 29%. Serviceberry density increased 12% from 840 plants/acre to 940 plants/acre, and bitterbrush increased from 20 plants/acre to 80 plants/acre.
- **2006 to 2011 - slightly down (-1):** The density of mountain big sagebrush decreased by 10% to 1,140 plants/acre, and cover decreased to 7%. However, serviceberry density increased by 15% to 1,080 plants/acre, and cover increased from 6% to 7%. Sagebrush and serviceberry are now co-dominant browse species on the site.

Grass:

- **2001 to 2006 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, but annual grasses increased substantially on the site. Cheatgrass increased significantly in nested frequency, and cover increased from less than 1% to 4%. There was also an increase in the nested frequency and cover of Japanese chess, though not significant.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses changed little, though cover increased from 13% to 20%. The weedy species bulbous bluegrass increased significantly in nested frequency, and cover increased from near 0% to 2%.

Forb:

- **2001 to 2006 - stable (0):** The perennial forb sum of nested frequency remained similar, though annual forb sum of nested frequency increased almost two-fold. Cover of perennial forbs remained similar at 3%, but annual forb cover increased from 1% to 2%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased more than two-fold, and cover increased to 7%. Annual forb sum of nested frequency also increased substantially, and cover increased to 12%.

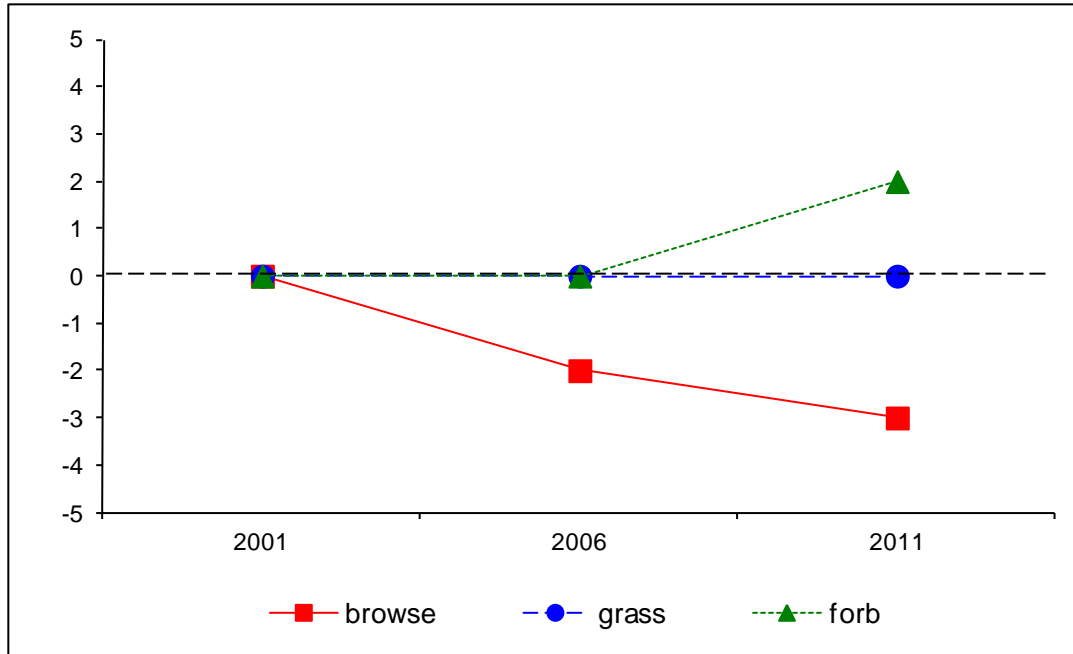
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 7, study no: 9

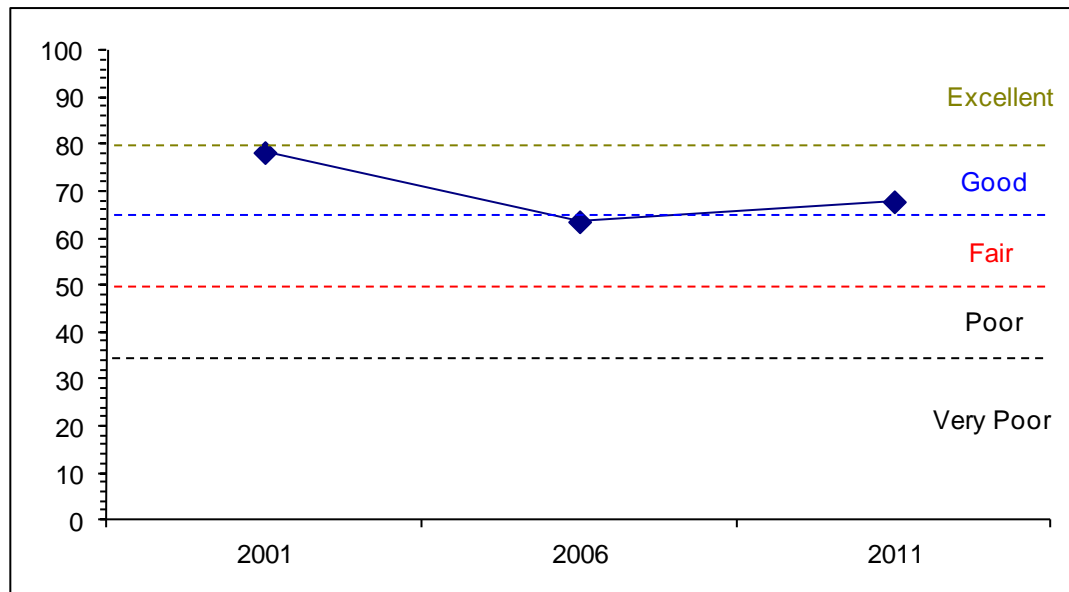
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
01	30.0	10.0	3.5	29.6	-1.2	6.4	0.0	78.3	Good-Excellent
06	25.9	6.9	3.2	25.1	-4.3	6.7	0.0	63.5	Fair-Good
11	20.3	8.5	2.6	30.0	-3.5	10.0	0.0	67.8	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 7 Study no: 9



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 7, Study no: 9



HERBACEOUS TRENDS--
Management unit 07, Study no: 9

T y p e	Species	Nested Frequency			Average Cover %		
		'01	'06	'11	'01	'06	'11
G	Agropyron spicatum	198	205	211	9.50	8.21	13.27
G	Agropyron trachycaulum	17	4	-	.54	.03	-
G	Bromus carinatus	a1	b29	ab17	.03	.83	.13
G	Bromus japonicus (a)	a135	b179	ab175	1.26	1.75	1.53
G	Bromus tectorum (a)	a48	b233	b208	.39	3.94	3.12
G	Koeleria cristata	8	6	8	.56	.36	.21
G	Melica bulbosa	-	3	8	-	.00	.18
G	Oryzopsis hymenoides	-	3	-	-	.03	-
G	Poa bulbosa	a-	a5	b32	-	.06	1.82
G	Poa fendleriana	a28	ab23	a7	.23	.48	.06
G	Poa pratensis	b87	a47	ab72	1.56	.68	1.59
G	Poa secunda	ab135	b159	a114	1.94	1.86	2.42
G	Sitanion hystrix	b23	a1	a-	.43	.03	-
Total for Annual Grasses		183	412	383	1.65	5.69	4.65
Total for Perennial Grasses		497	485	469	14.80	12.61	19.72
Total for Grasses		680	897	852	16.46	18.30	24.38
F	Achillea millefolium	-	-	2	-	-	.00
F	Agoseris glauca	a7	a1	b24	.01	.00	.14
F	Allium sp.	a36	a20	b98	.11	.11	.32
F	Alyssum alyssoides (a)	a55	b132	c250	.19	.36	2.49
F	Arabis sp.	4	3	1	.06	.00	.03
F	Artemisia ludoviciana	40	33	39	1.64	.80	1.62
F	Astragalus sp.	-	-	-	-	-	.00
F	Calochortus nuttallii	6	3	5	.01	.00	.02
F	Cirsium undulatum	a8	a11	b41	.10	.18	1.54
F	Collinsia parviflora (a)	a24	b46	b78	.04	.13	.25
F	Collomia linearis (a)	a44	a29	b103	.12	.27	.64
F	Cymopterus sp.	a3	b17	b18	.00	.14	.30
F	Descurainia pinnata (a)	8	2	22	.01	.01	.13
F	Draba sp. (a)	a-	b49	c161	-	.44	2.84
F	Epilobium brachycarpum (a)	a3	b72	c220	.01	.27	3.64
F	Erigeron pumilus	-	-	4	-	-	.06
F	Eriogonum racemosum	a4	a15	b31	.06	.48	.47
F	Eriogonum umbellatum	4	2	6	.01	.15	.18
F	Erodium cicutarium (a)	a-	b12	c50	-	.03	.48
F	Galium aparine (a)	a3	a2	b48	.03	.00	1.49
F	Gayophytum ramosissimum(a)	a-	a-	b29	-	-	.16
F	Holosteum umbellatum (a)	7	5	9	.01	.01	.01
F	Lithophragma sp.	a-	a-	b11	-	-	.10
F	Lupinus argenteus	10	16	7	.97	1.30	.96
F	Microsteris gracilis (a)	a2	c50	b32	.00	.19	.07
F	Phlox longifolia	14	9	2	.03	.07	.01
F	Polygonum douglasii (a)	b50	a14	a4	.18	.05	.01

Type	Species	Nested Frequency			Average Cover %		
		'01	'06	'11	'01	'06	'11
F	Ranunculus testiculatus (a)	-	4	1	-	.01	.03
F	Senecio integerrimus	2	1	5	.03	.03	.03
F	Senecio multilobatus	1	-	-	.03	-	-
F	Taraxacum officinale	-	-	5	-	-	.06
F	Tragopogon dubius (a)	_b 25	_a 2	_a 1	.23	.03	.03
F	Viguiera multiflora	_{ab} 3	_a 1	_b 26	.09	.03	.93
F	Viola sp.	-	-	2	-	-	.00
F	Zigadenus paniculatus	-	-	5	-	.03	.03
Total for Annual Forbs		221	419	1008	0.84	1.83	12.32
Total for Perennial Forbs		142	132	332	3.19	3.35	6.87
Total for Forbs		363	551	1340	4.04	5.19	19.19

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	'11	'01	'06	'11
B	Amelanchier alnifolia	34	38	45	6.10	6.43	7.19
B	Artemisia tridentata vaseyana	62	44	45	15.92	12.15	6.66
B	Chrysothamnus depressus	10	11	8	.45	.45	.31
B	Chrysothamnus viscidiflorus viscidiflorus	5	1	8	.15	.00	1.41
B	Gutierrezia sarothrae	20	14	16	.98	.48	.93
B	Mahonia repens	37	39	33	1.29	1.16	2.49
B	Opuntia sp.	9	6	1	.03	.00	.03
B	Purshia tridentata	1	3	3	1.78	.71	.76
B	Symphoricarpos oreophilus	24	24	19	1.37	2.37	2.03
B	Tetradymia canescens	1	0	0	-	-	-
Total for Browse		203	180	178	28.10	23.79	21.83

CANOPY COVER, LINE INTERCEPT--

Management unit 07, Study no: 9

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	7.96	8.06
Artemisia tridentata vaseyana	9.21	6.59
Chrysothamnus depressus	.85	.51
Chrysothamnus viscidiflorus viscidiflorus	.20	-
Gutierrezia sarothrae	.46	.51
Mahonia repens	.80	1.04
Purshia tridentata	1.89	.38
Symphoricarpos oreophilus	3.86	1.81

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 07, Study no: 9

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.6	4.4	2.6
Artemisia tridentata vaseyana	1.5	2.2	3.0
Purshia tridentata	3.4	4.1	1.2

BASIC COVER--

Management unit 07, Study no: 9

Cover Type	Average Cover %		
	'01	'06	'11
Vegetation	48.56	41.57	52.95
Rock	23.71	22.26	18.85
Pavement	15.28	7.81	8.62
Litter	36.37	32.12	34.15
Cryptogams	.39	.57	.44
Bare Ground	5.36	13.60	5.73

SOIL ANALYSIS DATA --

Management unit 07, Study no: 9, Study Name: Above Woodland

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
6.6	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			Days use per acre (ha)		
	'01	'06	'11	'01	'06	'11
Rabbit	12	2	3	-	-	-
Moose	-	3	-	-	-	-
Elk	15	31	30	31 (78)	64 (157)	13 (31)
Deer	7	6	4	16 (40)	11 (28)	14 (33)

BROWSE CHARACTERISTICS--

Management unit 07, Study no: 9

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
01	840	17	74	10	20	48	26	7	30/38
06	940	19	72	9	20	6	72	2	33/42
11	1080	4	94	2	-	35	52	2	28/35
Artemisia tridentata vaseyana									
01	2260	4	75	21	-	6	0	8	22/34
06	1260	0	62	38	20	21	3	29	22/37
11	1140	7	53	40	20	39	2	33	22/38

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Chrysothamnus depressus									
01	260	0	100	-	-	0	0	0	7/14
06	300	0	100	-	20	0	7	0	7/14
11	220	0	100	-	-	0	0	0	6/13
Chrysothamnus viscidiflorus viscidiflorus									
01	140	0	100	-	-	0	0	0	13/15
06	20	0	100	-	-	0	0	0	16/21
11	180	44	56	-	-	0	0	0	8/13
Gutierrezia sarothrae									
01	700	9	89	3	-	0	0	3	8/14
06	520	4	96	0	-	0	0	0	7/11
11	600	0	100	0	-	0	0	0	6/13
Mahonia repens									
01	10760	1	99	0	-	0	0	0	4/5
06	8420	2	98	0	-	0	0	0	3/4
11	4660	20	80	0	-	0	0	0	4/5
Opuntia sp.									
01	340	6	94	-	-	0	0	0	3/8
06	120	17	83	-	-	0	0	0	3/8
11	20	0	100	-	-	0	0	0	4/10
Purshia tridentata									
01	20	0	100	0	-	100	0	0	26/122
06	80	0	100	0	-	0	100	0	21/68
11	80	0	50	50	-	50	50	50	12/37
Symphoricarpos oreophilus									
01	500	4	80	16	-	0	0	4	18/29
06	700	6	89	6	-	6	3	6	16/23
11	440	9	86	5	40	27	5	14	19/28
Tetradymia canescens									
01	20	0	100	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-

ELDER HOLLOW - TREND STUDY NO. 7-10-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: Private

Elevation: 7,000 ft (2,134 m)

Aspect: Southwest

Slope: 25-35%

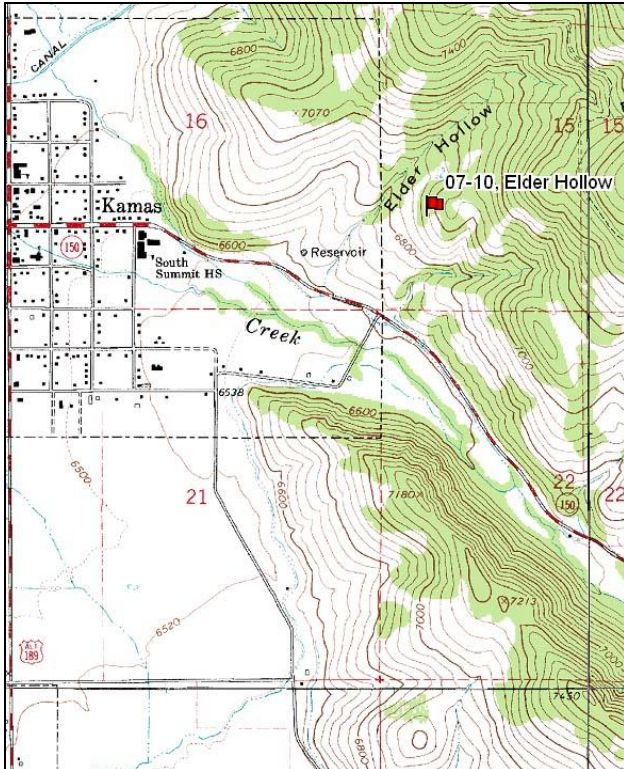
Transect bearing: 169° magnetic

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

Directions:

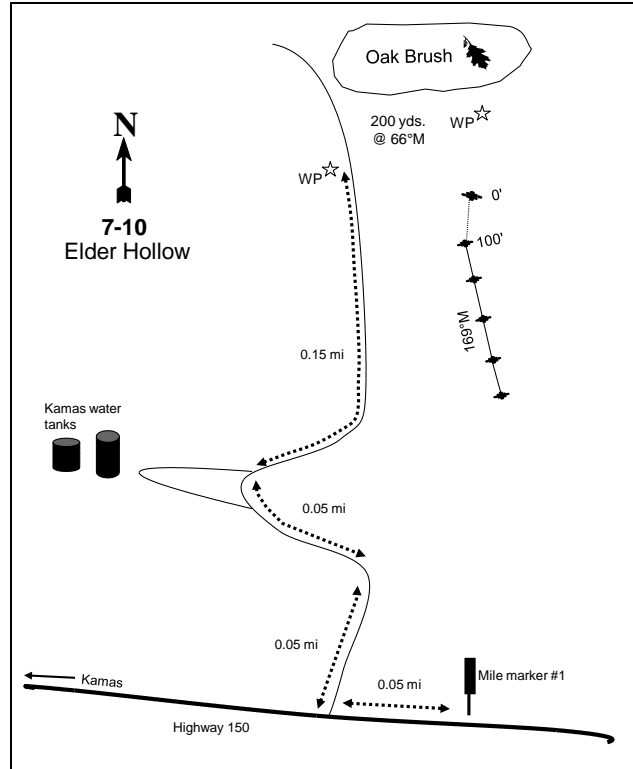
Westbound on Highway 150 (Mirror Lake Highway) from mile marker 1, proceed 0.05 miles to a locked gate on the right. Contact the Wildlife Biologist in the area to obtain a key. The site can also be reached by walking. Proceed through the gate, turn left, travel 0.05 miles, turn right, travel 0.05 miles, bear right, and travel 0.15 miles to green steel stake on the left. The post is in dense sagebrush 3 feet from the 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:



GPS: NAD 83, UTM 12S 478092 E 4499214 N

ELDER HOLLOW - TREND STUDY NO. 7-10

Site Information

Site Description: This study replaces the Kamas Water Tank trend study established in 1984, which sampled crucial deer winter range located immediately east of Kamas. This new study is on privately owned land in the foothills east of Kamas that has been intensively grazed by sheep, cattle, and horses for many years. The study is in a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community that also contains a diverse mix of other shrub species. Deer pellet groups were sampled in high abundance in 2001 and 2006, but pellet groups were moderate in abundance in 2011. Sampled elk and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The site supports several preferred browse species. These include mountain big sagebrush, Saskatoon serviceberry (*Amelanchier alnifolia*), and antelope bitterbrush (*Purshia tridentata*). The key species is mountain big sagebrush which makes up the majority of the browse cover, but cover of sagebrush has steadily decreased since 1996 (Table - Browse Trends). The sagebrush on the site is comprised of a moderately dense population, with mixed light, moderate, and heavy utilization. Decadence and poor vigor of sagebrush are moderately high. Recruitment of young sagebrush plants has been mostly poor, but increased and was considered good in 2011. Damage from the sagebrush defoliator moth (*Aroga websteri*) was noted in 2006. Serviceberry is a moderately dense, healthy population of heavily utilized plants. The few scattered bitterbrush plants are heavily browsed, but display low decadence and good vigor. Mature bitterbrush plants have a low-growing, spreading growth form. Density of bitterbrush increased markedly in 2006. Mountain snowberry (*Symphoricarpos oreophilus*) is prevalent on the site, and has displayed mostly light use through the sample years. Other browse species are diverse, but none are abundant (Table - Browse Characteristics).

Herbaceous Understory: A variety of perennial grasses occur on the site, but none are particularly abundant. The only common species include Kentucky bluegrass (*Poa pratensis*) and Sandberg bluegrass (*P. secunda*). The annual species cheatgrass (*Bromus tectorum*) is common and provides the majority of the grass cover. Forbs are diverse on the site, but most occur rarely. The most common perennial forb species include wavyleaf thistle (*Cirsium undulatum*), redroot eriogonum (*Eriogonum racemosum*), silvery lupine (*Lupinus argenteus*), and low penstemon (*Penstemon humilus*). Annual forbs are also common, and have steadily increased in cover since 1996. Annual forbs like pale alyssum (*Alyssum alyssoides*), storksbill (*Erodium cicutarium*), and bur buttercup (*Ranunculus testiculatus*) dominate bare areas in the shrub interspaces. Storksbill has steadily increased over the course of the study, and pale alyssum increased substantially 2011 (Table - Herbaceous Trends).

Soil: Soil on the site is part of the Yeates Hollow-Henefer complex, likely as part of the Yeates Hollow component. These soils are found on mountain slopes, and parent material consists of colluviums derived from conglomerate, sandstone, and quartzite (Soil Survey Staff 2011). Soil texture is a sandy clay loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Rock is common on the surface and throughout the soil profile. Protective ground cover of vegetation and litter is abundant (Table - Basic Cover), 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 soil erosion condition was classified as slight in 2001, but conditions improved and were classified as stable in 2006 and 2011.

Trend Assessments

Browse:

- **1996 to 2001 - slightly down (-1):** The density of mountain big sagebrush decreased 16% from 2,540 plants/acre to 2,140 plants/acre, and cover decreased from 22% to 19%. Decadence of sagebrush increased from 20% to 38%, and poor vigor increased from 3% to 11%.

- **2001 to 2006 - down (-2):** Mountain big sagebrush density decreased 29% to 1,520 plants/acre, and cover decreased to 11%. Decadence of sagebrush remained similar at 37%, but poor vigor increased to 39%. The density of bitterbrush increased substantially from 60 plants/acre to 220 plants/acre, though cover remained similar.
- **2006 to 2011 - stable (0):** Density of mountain big sagebrush increased 11% to 1,680 plants/acre. The increase is primarily due to a large increase in the recruitment of young plants from 5% to 21% of the population. Prior to 2011, recruitment of young sagebrush plants was poor. Despite the increase in young plants, the density of mature sagebrush plants remained similar, and cover decreased slightly to 10%. Decadence of sagebrush remained similar at 33%, but poor vigor decreased to 12%.

Grass:

- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses. There was a significant decrease in the nested frequency of Kentucky bluegrass.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial grasses remained similar. However, cheatgrass increased significantly in nested frequency, and cover increased from 4% to 11%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 20%, and cover remained similar at 6%. Much of the increase in perennial grasses was due to a significant increase in the nested frequency of the weedy, exotic species bulbous bluegrass (*Poa bulbosa*). Cheatgrass remained similar in nested frequency, but cover decreased slightly to 8%.

Forb:

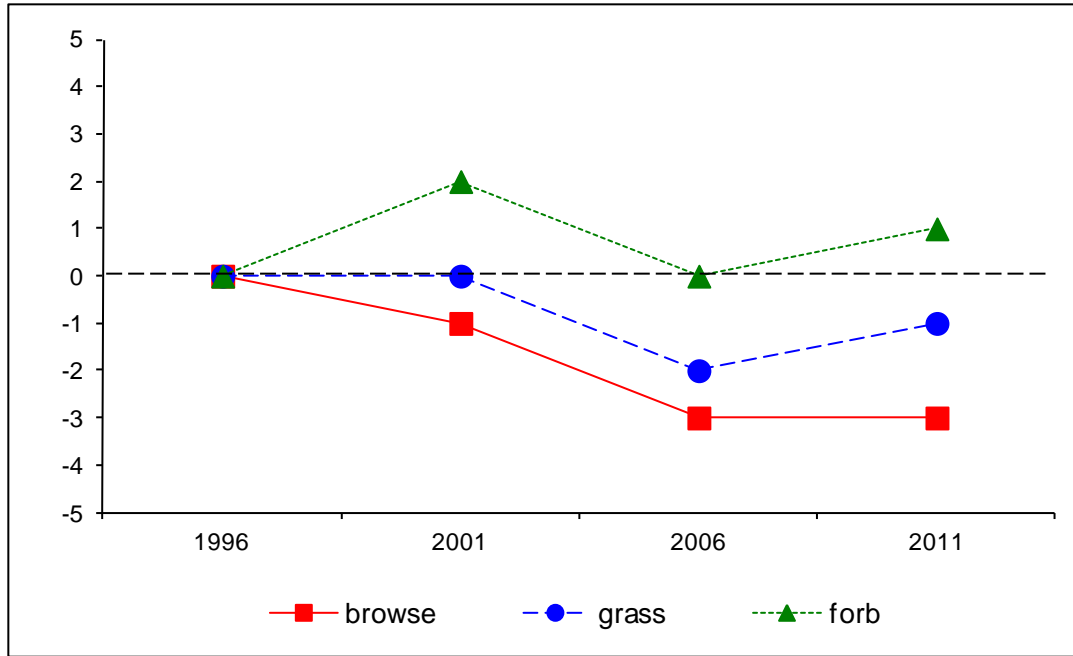
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased by 25%, and cover increased from 3% to 6%.
- **2001 to 2006 - down (-2):** There was a 35% decrease in the sum of nested frequency of perennial forbs, and cover decreased to 5%. Silvery lupine decreased significantly in nested frequency, and wavyleaf thistle and low penstemon have decreased significantly since 1996. The weedy annual forb storksbill increased significantly in nested frequency.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 33%, but cover remained similar at 5%. Annual forb sum of nested frequency also increased markedly, with an increase in cover from 7% to 14%. There was a significant increase in the nested frequency of pale alyssum and storksbill.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 7, study no: 10

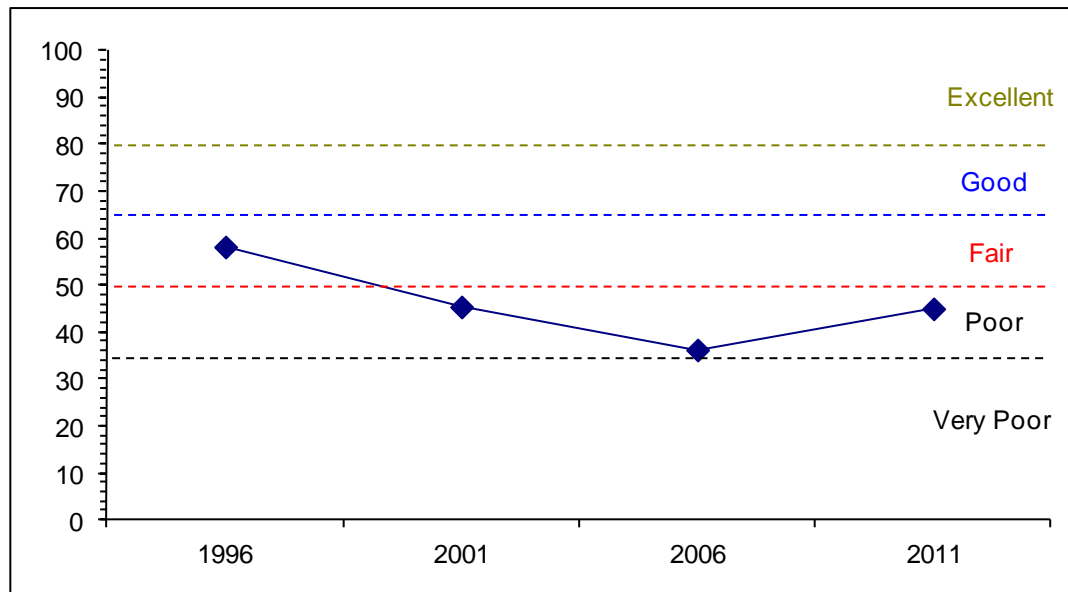
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	9.5	3.0	12.2	-2.9	6.3	0.0	58.2	Fair
01	26.8	4.9	1.2	7.4	-3.0	10.0	-2.0	45.4	Poor
06	16.2	5.5	2.6	10.6	-7.8	9.1	0.0	36.2	Very Poor-Poor
11	16.0	7.0	8.4	10.5	-5.9	9.0	0.0	45.0	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 7 Study no: 10



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 7, Study no: 10



HERBACEOUS TRENDS--
Management unit 07, Study no: 10

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	a16	ab25	b43	b34	.28	.47	1.37	1.07
G	Agropyron spicatum	a6	a11	b25	a1	.03	.13	1.07	.00
G	Bromus carinatus	10	2	-	10	.08	.01	-	.04
G	Bromus tectorum (a)	a303	a277	b388	b378	3.80	3.95	10.46	7.48
G	Carex sp.	17	17	15	9	.36	.28	.25	.30
G	Festuca myuros (a)	-	-	-	4	-	-	-	.38
G	Oryzopsis hymenoides	-	3	3	-	.00	.01	.03	-
G	Poa bulbosa	a-	a-	a11	b33	-	-	.39	.41
G	Poa fendleriana	4	1	4	4	.06	.00	.18	.06
G	Poa pratensis	c125	b65	a33	ab53	4.13	.64	.33	.80
G	Poa secunda	a50	a74	ab69	b108	.90	1.96	1.87	2.84
G	Sitanion hystrix	13	25	12	11	.25	.14	.13	.10
G	Stipa comata	-	8	6	1	-	.06	.04	.00
Total for Annual Grasses		303	277	388	382	3.80	3.95	10.46	7.86
Total for Perennial Grasses		241	231	221	264	6.12	3.72	5.70	5.66
Total for Grasses		544	508	609	646	9.93	7.68	16.16	13.52
F	Agoseris glauca	a2	ab13	ab11	b23	.00	.05	.08	.13
F	Alyssum alyssoides (a)	a272	a316	a318	b363	1.76	2.36	3.42	8.06
F	Arabis perennans	6	1	-	-	.01	.00	-	-
F	Artemisia ludoviciana	14	26	18	26	.22	.58	.40	.46
F	Astragalus convallarius	1	8	7	4	.00	.21	.12	.15
F	Astragalus sp.	-	-	1	9	-	.00	.01	.04
F	Astragalus utahensis	1	-	-	2	.00	-	-	.00
F	Calochortus nuttallii	6	10	1	8	.01	.02	.00	.02
F	Camelina microcarpa (a)	-	6	-	-	-	.02	-	-
F	Chaenactis douglasii	5	-	-	-	.03	-	-	-
F	Cirsium undulatum	b35	ab32	a9	ab14	.56	.91	.69	.85
F	Collinsia parviflora (a)	a8	c138	a14	b58	.04	.53	.02	.20
F	Collomia linearis (a)	-	14	9	12	-	.05	.02	.04
F	Comandra pallida	7	9	7	13	.06	.09	.06	.05
F	Crepis acuminata	-	-	4	3	-	-	.03	.03
F	Cynoglossum officinale	-	4	-	-	-	.03	-	-
F	Draba sp. (a)	24	5	1	7	.03	.04	.00	.01
F	Epilobium brachycarpum (a)	a10	a10	a3	b46	.02	.03	.00	.36
F	Eriogonum racemosum	29	21	18	17	.21	.54	.46	.14
F	Eriogonum umbellatum	a-	a1	ab2	b16	-	.03	.06	.23
F	Erodium cicutarium (a)	a1	b38	c86	d221	.00	.89	2.17	4.75
F	Galium aparine (a)	-	-	-	4	-	-	-	.03
F	Gayophytum ramosissimum(a)	-	-	5	3	-	-	.04	.01
F	Hackelia patens	-	-	4	2	-	-	.03	.15
F	Heterotheca villosa	a1	a5	ab13	b21	.03	.40	.48	.73
F	Holosteum umbellatum (a)	a1	b20	ab8	a3	.00	.09	.01	.00
F	Lactuca serriola (a)	-	1	-	1	-	.00	-	.00

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Lithophragma sp.	-	-	-	3	-	-	-	.01
F	Lithospermum ruderales	a-	a-	b11	a-	.15	-	.33	-
F	Lomatium sp.	-	1	-	-	-	.00	-	-
F	Lomatium triternatum	-	-	-	8	-	-	-	.07
F	Lupinus argenteus	a13	b45	a17	a6	.75	2.53	.60	.66
F	Microsteris gracilis (a)	a-	b29	a6	ab22	-	.06	.02	.05
F	Oenothera pallida	3	7	4	-	.00	.06	.03	.00
F	Penstemon humilis	b42	ab29	a17	a18	.87	.48	.73	.48
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)	a60	b211	b217	a95	.20	2.04	1.33	.26
F	Sisymbrium altissimum (a)	-	-	-	1	-	-	-	.03
F	Taraxacum officinale	-	5	2	3	-	.01	.03	.15
F	Tragopogon dubius (a)	14	7	-	3	.08	.06	-	.04
F	Viguiera multiflora	b20	a6	a4	a-	.16	.06	.18	-
F	Zigadenus paniculatus	3	7	2	8	.01	.10	.06	.09
Total for Annual Forbs		398	795	671	839	2.16	6.22	7.07	13.88
Total for Perennial Forbs		190	237	154	204	3.13	6.19	4.57	4.49
Total for Forbs		588	1032	825	1043	5.30	12.41	11.65	18.38

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	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	20	31	21	21	1.53	1.84	1.36	.90
B	Artemisia tridentata vaseyana	74	73	56	54	21.76	18.50	10.86	9.89
B	Chrysothamnus depressus	3	3	3	8	-	-	-	.21
B	Chrysothamnus nauseosus albicaulis	1	3	0	1	-	.06	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	5	10	7	10	.53	.19	.62	.06
B	Eriogonum heracleoides	1	1	0	3	-	.00	-	.03
B	Gutierrezia sarothrae	38	42	28	30	1.24	1.41	.25	1.41
B	Mahonia repens	4	2	1	0	-	-	-	-
B	Opuntia sp.	17	13	16	14	.54	.16	.27	.30
B	Prunus virginiana	1	0	0	0	-	-	-	-
B	Purshia tridentata	4	3	6	9	.56	.53	.41	1.32
B	Symphoricarpos oreophilus	38	46	48	44	3.80	6.99	4.78	5.48
B	Tetradymia canescens	14	14	15	15	.21	.46	.62	.19
Total for Browse		220	241	201	209	30.20	30.17	19.19	19.82

CANOPY COVER, LINE INTERCEPT--

Management unit 07, Study no: 10

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	2.61	5.30
Artemisia tridentata vaseyana	12.56	10.89
Chrysothamnus depressus	.18	.30
Chrysothamnus nauseosus albicaulis	.35	.28
Chrysothamnus viscidiflorus viscidiflorus	.55	.68
Gutierrezia sarothrae	.36	.61
Opuntia sp.	.16	.15
Purshia tridentata	.76	.96
Symphoricarpos oreophilus	7.81	8.28
Tetradymia canescens	.85	.91

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 07, Study no: 10

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.3	2.5	4.0
Artemisia tridentata vaseyana	1.4	1.7	1.8

BASIC COVER--

Management unit 07, Study no: 10

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	41.93	46.54	43.02	49.08
Rock	22.34	19.41	21.83	22.85
Pavement	4.72	4.82	4.77	3.70
Litter	43.82	38.67	29.56	24.18
Cryptogams	.26	.32	.30	.37
Bare Ground	6.30	13.25	13.17	9.12

SOIL ANALYSIS DATA --

Management unit 07, Study no: 10, Study Name: Elder Hollow

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
14.1	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	'11
Rabbit	1	4	10	1
Elk	27	3	-	2
Deer	45	39	56	14
Cattle	-	-	1	1

Days use per acre (ha)		
'01	'06	'11
-	-	-
8 (20)	9 (22)	1 (2)
102 (253)	133 (327)	34 (84)
6 (14)	3 (7)	5 (13)

BROWSE CHARACTERISTICS--

Management unit 07, Study no: 10

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier alnifolia</i>									
96	520	8	92	-	-	35	54	0	22/29
01	840	7	93	-	-	45	33	2	23/30
06	460	9	91	-	-	9	87	0	27/31
11	500	0	100	-	-	28	68	0	30/38
<i>Artemisia tridentata vaseyana</i>									
96	2540	6	74	20	-	50	28	3	20/44
01	2140	2	60	38	-	50	17	11	22/39
06	1520	5	58	37	20	37	24	39	22/40
11	1680	21	45	33	20	33	7	12	24/42
<i>Chrysothamnus depressus</i>									
96	100	0	100	0	-	0	0	0	7/17
01	100	0	100	0	-	40	0	0	5/16
06	60	0	100	0	-	0	0	0	7/18
11	220	0	91	9	-	0	9	9	7/13
<i>Chrysothamnus nauseosus albicaulis</i>									
96	20	0	100	-	-	0	0	0	-/-
01	60	33	67	-	-	0	0	0	50/53
06	0	0	0	-	-	0	0	0	-/-
11	20	0	100	-	-	0	0	0	55/81
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	160	25	75	0	-	0	0	0	11/19
01	340	0	100	0	-	18	18	0	8/75
06	260	0	92	8	-	31	0	0	11/21
11	380	11	84	5	-	0	0	0	9/16
<i>Eriogonum heracleoides</i>									
96	20	0	100	-	-	0	0	0	-/-
01	20	0	100	-	-	0	0	0	8/15
06	0	0	0	-	-	0	0	0	-/-
11	100	0	100	-	-	100	0	0	8/5
<i>Gutierrezia sarothrae</i>									
96	4100	17	83	0	40	0	0	0	8/12
01	3100	4	96	0	-	0	0	0	7/8
06	1140	12	86	2	40	5	0	2	7/8
11	1180	44	56	0	-	0	0	0	8/11
<i>Mahonia repens</i>									
96	100	0	100	-	-	0	0	0	4/4
01	180	0	100	-	-	0	0	0	2/3
06	40	0	100	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	4/6

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Opuntia</i> sp.										
96	560	4	93	4	-	0	0	7	4/12	
01	340	18	82	0	-	0	0	0	4/8	
06	400	20	70	10	-	0	0	10	4/14	
11	340	12	88	0	-	6	0	0	4/15	
<i>Prunus virginiana</i>										
96	20	0	100	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Purshia tridentata</i>										
96	80	0	100	-	-	0	100	0	10/51	
01	60	0	100	-	-	33	67	0	9/50	
06	220	0	100	-	-	18	73	0	9/32	
11	300	0	100	-	-	47	33	0	14/44	
<i>Symphoricarpos oreophilus</i>										
96	1260	17	81	2	20	10	0	2	21/30	
01	1200	12	87	2	20	7	2	0	22/33	
06	1600	9	89	3	20	9	1	0	24/35	
11	1380	6	94	0	-	30	0	0	23/38	
<i>Tetradymia canescens</i>										
96	480	25	67	8	-	0	0	4	8/18	
01	440	5	91	5	-	14	0	0	9/14	
06	480	8	79	13	-	8	0	4	11/21	
11	460	4	91	4	-	17	0	4	11/19	

SUMMARY WILDLIFE MANAGEMENT UNIT 7 - KAMAS

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Six interagency range trend studies were sampled in Unit 7 during the summer of 2011.

Three studies [Pinyon Canyon (7-2), Above Samak (7-4), and Cedar Hollow (7-6)] are categorized as high potential deer winter range sites, and sample mountain brush communities. All of these studies are also considered to be elk winter range. The three other studies [Foothill Drive (7-3), Above Woodland (7-9), and Elder Hollow (7-10)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush. All of these studies are also considered to be elk winter range.

Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains (Division 5). The Northern Mountains had a historic annual mean precipitation of 19.16 inches from 1895 to 2011. The mean annual PDSI of the Northern Mountains displays a cycle of several wet years followed by several drought years, over the course of study years in the unit. Over the course of the study wetter than normal years in the Northern Mountains included 1982-1986, 1993, 1995-1999, 2005, and 2011. Drought years included 1987-1992, 2000-2003 and 2007 (Figure 1 and Figure 2) (Time Series Data 2012).

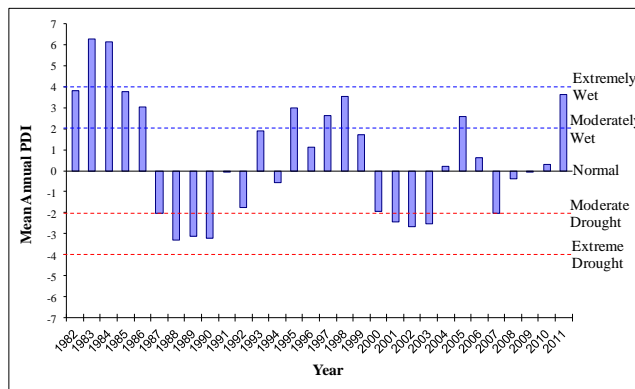


Figure 1. The 30 year mean annual Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

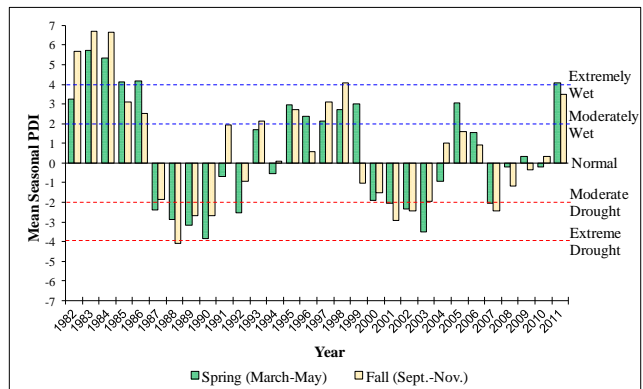


Figure 2. The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for the Northern Mountains (Division 5). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥ 4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤ -4.0 = Extreme Drought (Time Series Data 2012).

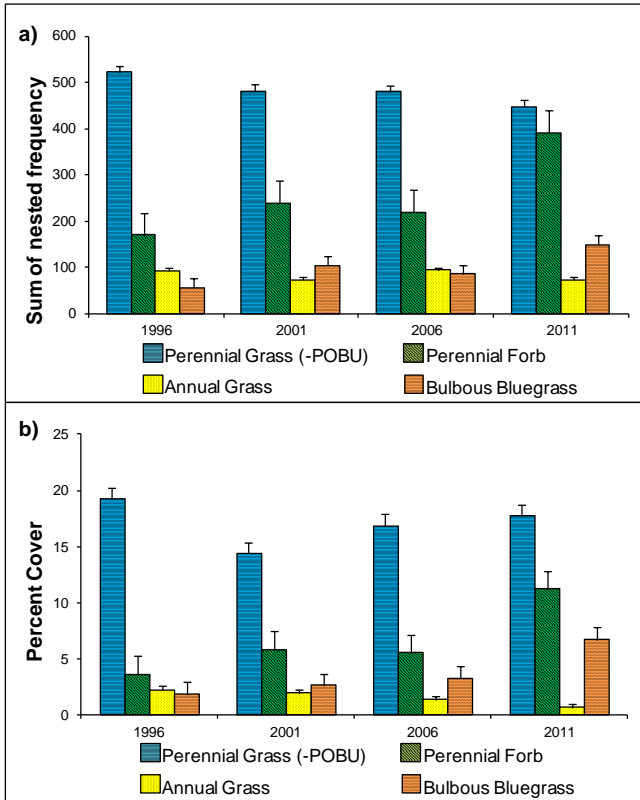


Figure 3. a) High potential sites mean perennial grass (-POBU), perennial forb, and annual grass sum of nested frequency by year for WMU 7, Kamas. b) High potential sites mean perennial grass (-POBU), perennial forb, and annual grass cover by year for WMU 7.

The 1961-1990 mean annual precipitation was 18-20 in. on the Foothill Drive study; 20-24 in. on the Pinyon Canyon, Above Samak, Above Woodland, and Elder Hollow studies; and 24-28 in. on the Cedar Hollow study (PRISM Climate Group 2011).

Mountain Brush Communities (High Potential)

Browse: The high potential site cumulative median browse trend for the unit has decreased over the course of the study due to a decrease in 2006 (Figure 8a).

The three high potential studies are within communities of mixed mountain brush species. Mountain big sagebrush is the dominant species on the Above Samak and Cedar Hollow studies, but is also common on the Pinyon Canyon study. The mean density and of mountain big sagebrush decreased significantly in 2006 and remained at reduced levels in 2011 (Figure 4a). Mean cover of mountain big sagebrush was similar in 1996, 2006, and 2011, but was significantly higher in 2001 (Figure 4b). The mean decadence of mountain big sagebrush steadily from moderate levels in 1996 to high levels in 2006, then decreased to moderate levels again in 2011 (Figure 4c). Saskatoon serviceberry (*Amelanchier alnifolia*) is the dominant browse species on the Pinyon Canyon study, but is also common on the other two high potential studies. Mean density was similar in 1996 and 2011, but was significantly higher in 2001 and significantly lower in 2006 (Figure 4a). Mean cover has been fairly low throughout the study years. Mean cover remained similar from 1996 to 2006; with a significant increase in 2011 (Figure 4b). Mean decadence of serviceberry steadily increased from low in 1996 to high in 2006, then decreased to low levels again in 2011 (Figure 4c). True mountain mahogany (*Cercocarpus montanus*) was prevalent on the Pinyon Canyon study, and antelope bitterbrush (*Purshia*

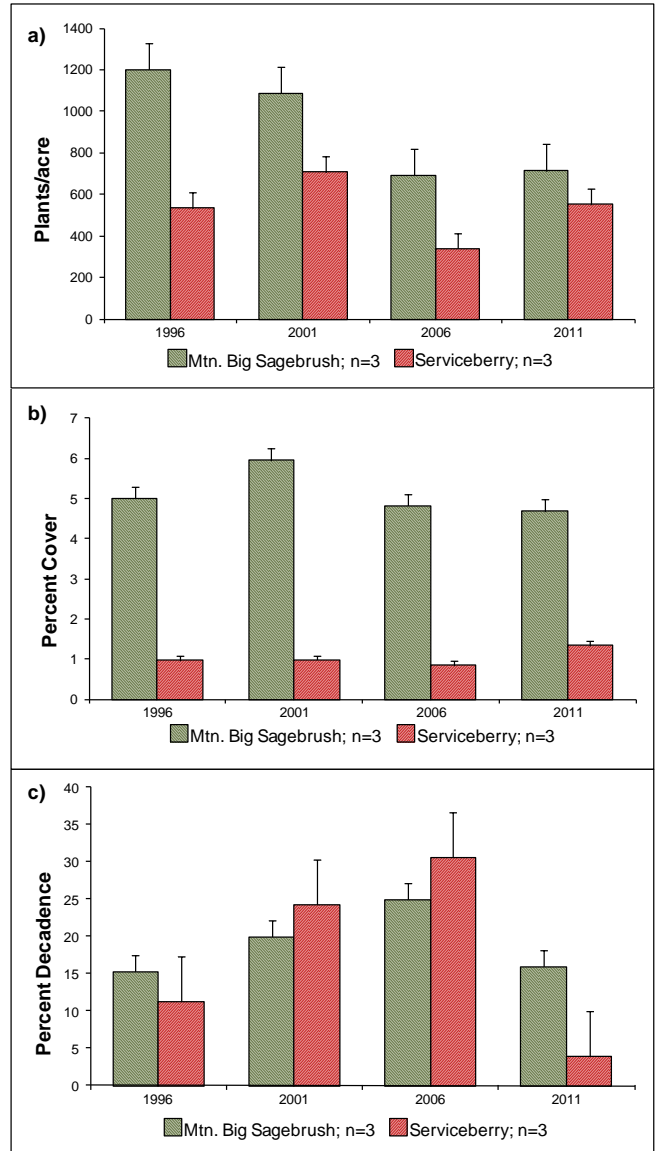


Figure 4. a) High potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Saskatoon serviceberry (*Amelanchier alnifolia*) by year for WMU 7, Kamas. b) High potential sites mean cover of mountain big sagebrush and Saskatoon serviceberry by year for WMU 7. c) High potential sites mean decadence of mountain big sagebrush and Saskatoon serviceberry by year for WMU 7.

tridentata) occurs on all three high potential studies at low density. For more information on these species, refer to the associated studies discussion section.

Herbaceous Understory: The high potential median cumulative grass trend for the unit have remained relatively stable with a slight increase in 1996 (Figure 8a). Perennial grass species are generally diverse and abundant on these studies. The annual grass species cheatgrass (*Bromus tectorum*) is common on the Pinyon Canyon study, but is less prevalent on the other two studies. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) is common on the Cedar Hollow study, but is less common on the other two studies. The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, has steadily decreased since 1996, but still remain the dominant herbaceous component (Figure 3a). The mean cover of perennial grasses decreased significantly in 2001, but has steadily increased since that time. Mean cover of perennial grasses was similar in 1996 and 2011 (Figure 3b). The mean sum of nested frequency of annual grasses has fluctuated, but has remained relatively low since 1996 (Figure 3a). However, mean cover of annual grasses has decreased since 2001 (Figure 3b).

The high potential median cumulative forb trend for the unit has increased over the course of the study. Trend had an increase in 1990, decreased in 1996, but increased again in 2001 and 2011 (Figure 8a). Perennial forbs have been diverse and abundant within the sampled communities, though perennial forbs provide less cover than perennial grasses on the sites. The mean sum of nested frequency and cover of perennial forbs remained similar from 1996 to 2006, then increased significantly in 2011 (Figure 3a and Figure 3b).

Browse Utilization & Animal Presence: Utilization of preferred browse species has been moderate to heavy on all of the high potential studies in the unit. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of browse species is a primary concern for the high potential studies on this unit.

Pellet group transect data indicates that elk predominately occupy these high potential studies. The mean abundance of elk pellet groups on the unit has increased from moderately high abundance in 2001 to high abundance in 2011. These trends are primarily driven by elk use on the Pinyon Canyon study, which receives very heavy use from elk. Mean abundance of deer pellet groups was moderate in 2001, decreasing to low abundance in 2006 and 2011. Livestock sign has been sampled in low abundance on the studies since 2001 (Figure 9a).

Deer Desirable Components Index (DCI): The mean high potential deer DCI remained similar from 1996 to 2006, and then increased slightly in 2011. Perennial grass cover and perennial forb cover have increased since 1996. Rankings have ranged from fair to good since 1996 (Table 1 and Figure 7).

Discussion: Despite decreases in the mountain big sagebrush populations on these high potential studies, the browse component of the high potential studies has remained relatively healthy. It appears that much of the decline in mountain big sagebrush is due to competition with the other mountain browse species found on these sites. Competition with a robust perennial herbaceous understory may also limit mountain big sagebrush recruitment on the studies. This appears to be the case on the Above Samak study, with increases of the perennial grass smooth brome (*Bromus inermis*). Weedy annual grass species were sampled on all the studies, but were not overly abundant and do not appear to be detrimental to the health of these communities. The exotic weedy grass species bulbous bluegrass is common on the Cedar Hollow study and has also increased on the Above Samak study. These weedy grass species can form dense mats of cover that compete with seedling and young sagebrush plants, which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	13.7	12.7	9.3	27.5	-1.6	6.5	0.0	68.1	Fair-Good
01	15.8	10.5	4.0	27.2	-1.4	9.2	0.0	65.3	Fair
06	14.3	8.8	4.8	29.3	-1.0	9.2	0.0	65.4	Fair
11	14.1	11.7	6.9	29.9	-0.5	10.0	0.0	72.1	Good

Table 1. High potential scale mean deer DCI scores and rankings (n=3) by year for WMU 7, Kamas. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

Mountain Big Sagebrush Communities (Mid-Level Potential)

Browse: The mid-level potential site cumulative median browse trend increased from 1984 to 1996, but has steadily decreased since that time and has returned to 1984 levels (Figure 8b). Mountain big sagebrush is the dominant browse species on all of the mid-level potential studies. The mean density of mountain big sagebrush was similar from 1996 to 2001, but decreased significantly in 2006 and remained at lower levels in 2011 (Figure 6a). Mean cover of mountain big sagebrush also decreased

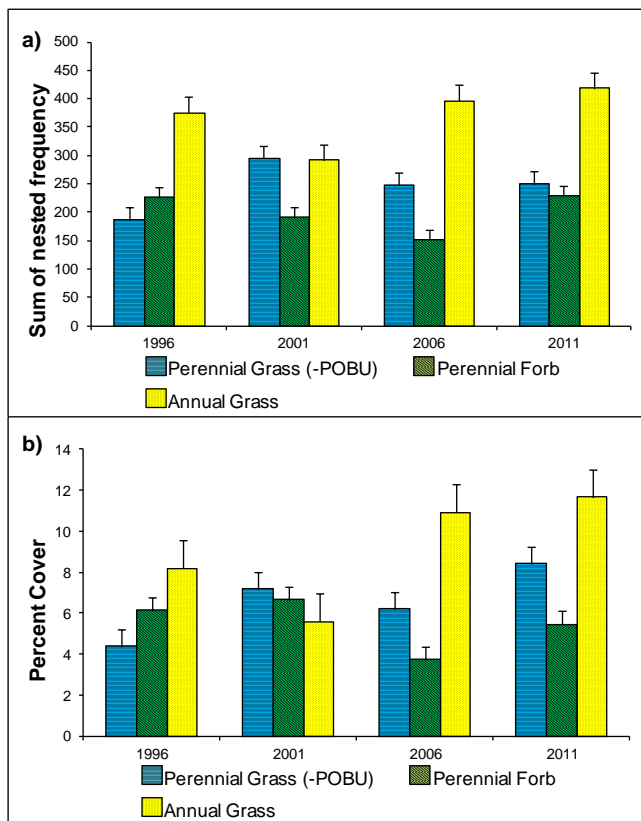


Figure 5. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, and annual grass sum of nested frequency by year for WMU 7, Kamas. b) Mid-level potential sites mean perennial grass (-POBU), perennial forb, and annual grass cover by year for WMU 7.

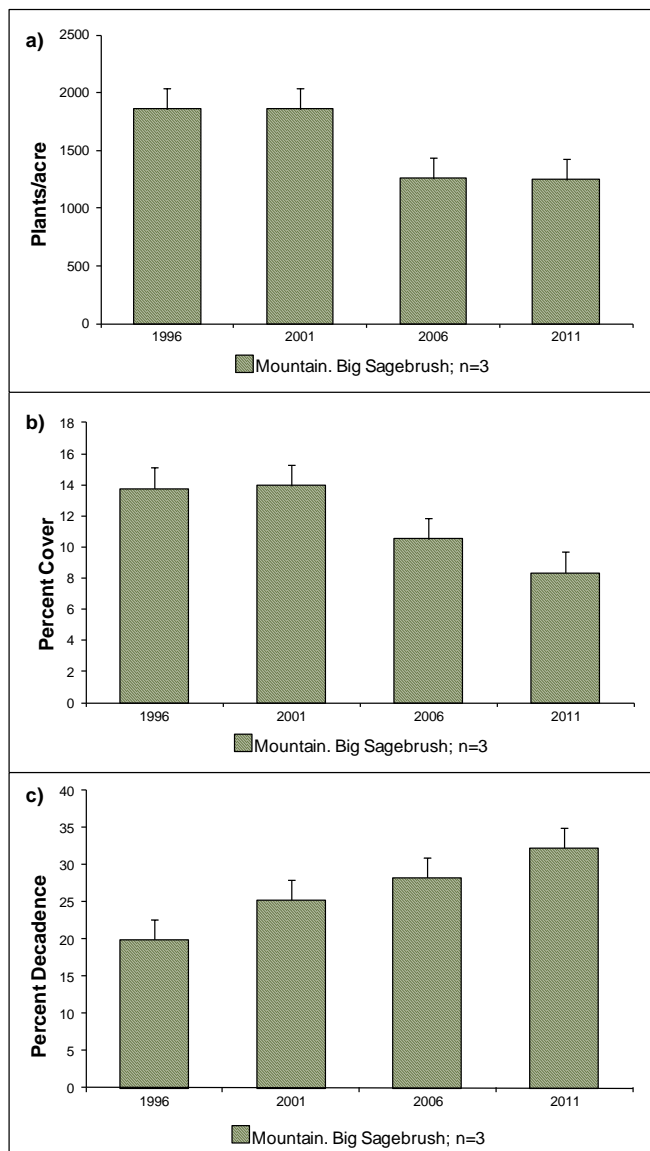


Figure 6. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) by year for WMU 7, Kamas. b) Mid-level potential sites mean cover of mountain big sagebrush by year for WMU 7. c) Mid-level potential sites mean decadence of mountain big sagebrush by year for WMU 7.

significantly in 2006; with further decreases in cover in 2011 (Figure 6b). Mean decadence of big sagebrush has steadily increased since 1996 (Figure 6c). Saskatoon serviceberry and antelope bitterbrush are also common on all three mid-level potential studies, but occur at lower density and cover than mountain big sagebrush.

Herbaceous Understory: The mid-level potential median cumulative grass trend for the unit has decreased since the outset of the study. Trend was down in 1990, decreasing slightly in 1996, and was down again in 2006 before a slight increase in 2011 (Figure 8b). Perennial grasses comprise the majority of the herbaceous understory on most of these studies. Grasses within these communities are generally fairly diverse, but composition is poor. The annual grass species cheatgrass and Japanese chess (*Bromus japonicus*) are common and often dominate the herbaceous component. The weedy species bulbous bluegrass occurs on all three mid-level potential studies, but is rare and was not included in this summary. Mean sum of nested frequency of perennial grasses was similar in 2006 and 2011, but was significantly higher in 2001 and significantly lower in 1996 (Figure 5a). Despite the decrease in the mean sum of nested frequency in 2006, the mean cover of perennial grasses remained similar in 2006 and increased significantly in 2011 (Figure 5b). Mean sum of nested frequency and cover of annual grasses decreased significantly in 2001, but increased significantly again in 2006 and has remained similar since that time (Figure 5a and Figure 5b).

The mid-level potential median cumulative forb trend has increased slightly over the course of the study, with the main increase occurring in 1990 (Figure 8b). Perennial forbs are also diverse and abundant, and provide similar cover to perennial grasses within the sampled communities. The mean sum of nested frequency of perennial forbs steadily decreased from 1996 to 2006, then increased significantly in 2011 (Figure 5a). Mean cover of perennial forbs remained similar in 1996 and 2001, decreased significantly in 2006, and increased significantly again in 2011 (Figure 5b).

Browse Utilization & Animal Presence: Mountain big sagebrush plants on the Foothill Drive and Above Woodland studies have displayed mostly light to moderate use throughout the study years. Utilization of sagebrush was heavy on the Foothill Drive study when it was established in 1984, but has been lighter in subsequent sample years. Sagebrush utilization on the Elder Hollow study has been moderate to heavy since 1996. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of mountain big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group transect data indicates that deer predominantly occupy these study areas. The mean abundance of deer pellet groups sampled on the unit was very high in 2001 and 2006, but decreased to moderate abundance in 2011. Mean abundance of elk pellet groups increased from low abundance in 2001 to moderate abundance in 2006, but decreased to low abundance again in 2011. Use by both wildlife species may have been lower in 2011 due to the severe winter of 2010-2011. The mean abundance of livestock sign has been low on the studies (Figure 9b).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has increased slightly in 2001 due to increased preferred browse and perennial grass cover, but has been similar in the other sample years. The DCI rankings have ranged from poor to fair since 1996 (Table 2 and Figure 7).

Discussion: The decline of mountain big sagebrush populations on these important winter ranges gives reason for concern. While there have been several periods of drought over the course of the study years (Figure 1 and Figure 2), lack of precipitation does not appear to be the primary cause of the decline. The abundance of weedy annual species is a likely cause of sagebrush decline on these studies. These weedy species can form dense mats of cover that compete with seedling and young sagebrush plants which limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event. Annual grass species are prevalent on all three studies, but are the dominant grass species on the Foothill Drive and Elder Hollow studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.1	9.6	4.8	8.7	-6.1	8.1	0.0	44.2	Poor
01	22.4	8.4	3.1	14.3	-4.2	8.8	-0.7	52.2	Fair
06	18.1	8.2	3.2	12.4	-8.2	7.4	0.0	41.2	Poor
11	16.3	8.2	3.9	14.9	-8.7	9.7	0.0	44.2	Poor

Table 2. Mid-level potential scale mean deer DCI scores and rankings (n=3) by year for WMU 7, Kamas. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

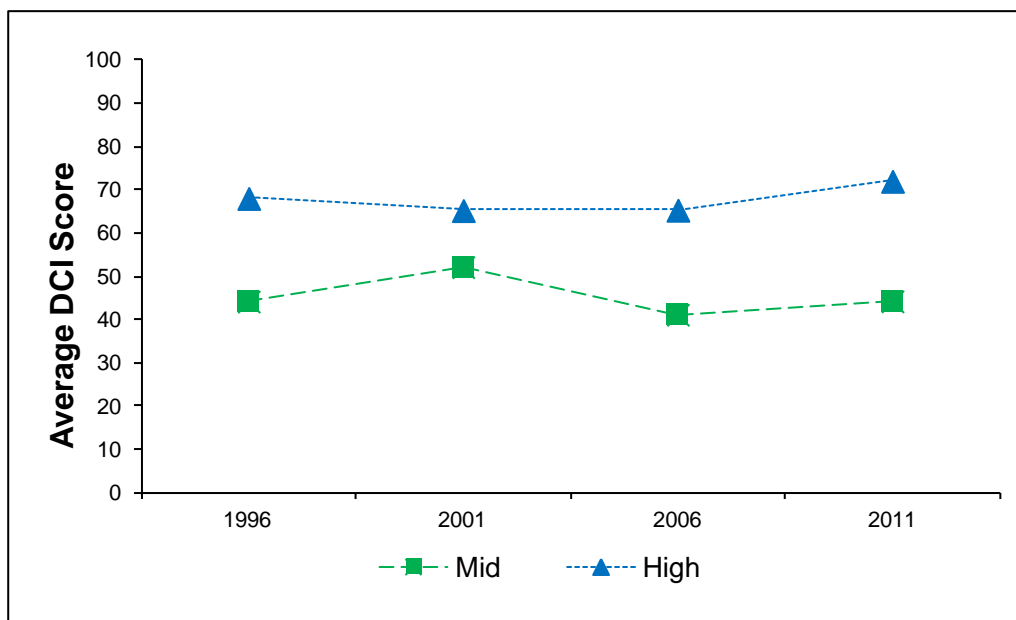


Figure 7. Mean mid-level (n=3) and high (n=3) potential scale deer DCI scores by year for WMU 7, Kamas. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

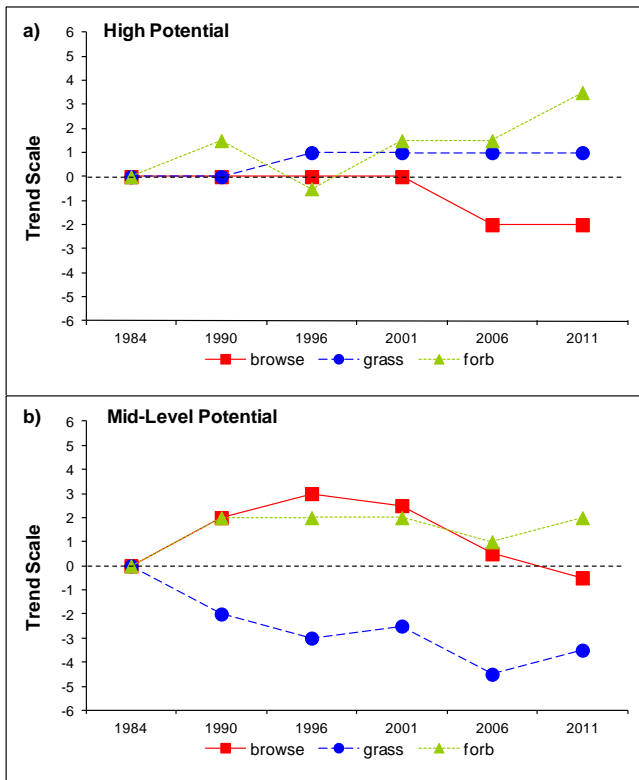


Figure 8. a) High potential sites cumulative median browse, grass and forb trends by year for WMU 7, Kamas. b) Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 7.

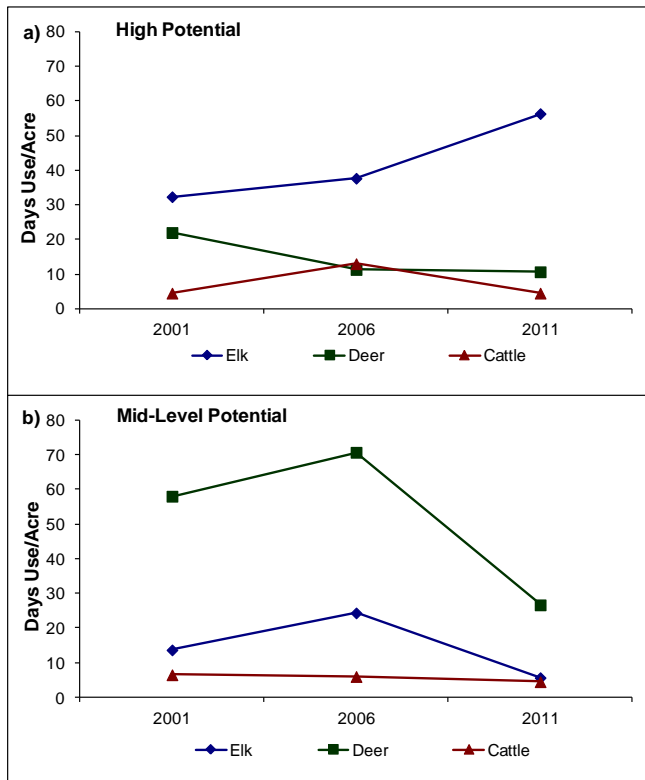


Figure 9. a) High potential sites mean animals days use/acre (n=3) by year for WMU 7, Kamas. b) Mid-level potential sites mean animal days use/acre (n=3) by year for WMU 7.

CAVE FLAT - TREND STUDY NO. 15-10-11

Vegetation Type: Wyoming Big Sagebrush-Grass

Range Type: Crucial Deer Winter, Crucial Bison Year-Long

NRCS Ecological Site Description: [Semi-desert Shallow Sandy Loam \(Shadscale\), R035XY230UT](#)

Land Ownership: DWR

Elevation: 5,800 ft (1,768 m)

Aspect: southwest

Slope: 0%-3%

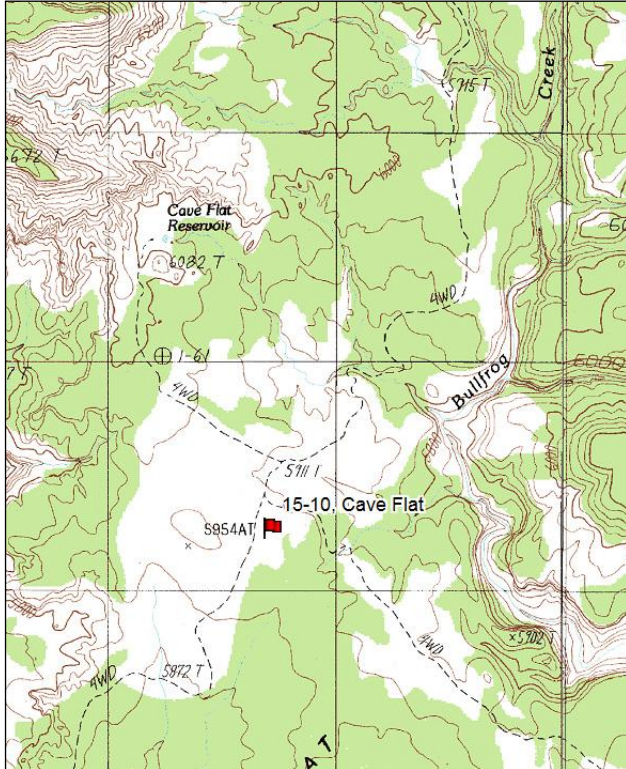
Transect bearing: 195 degrees magnetic.

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

Directions:

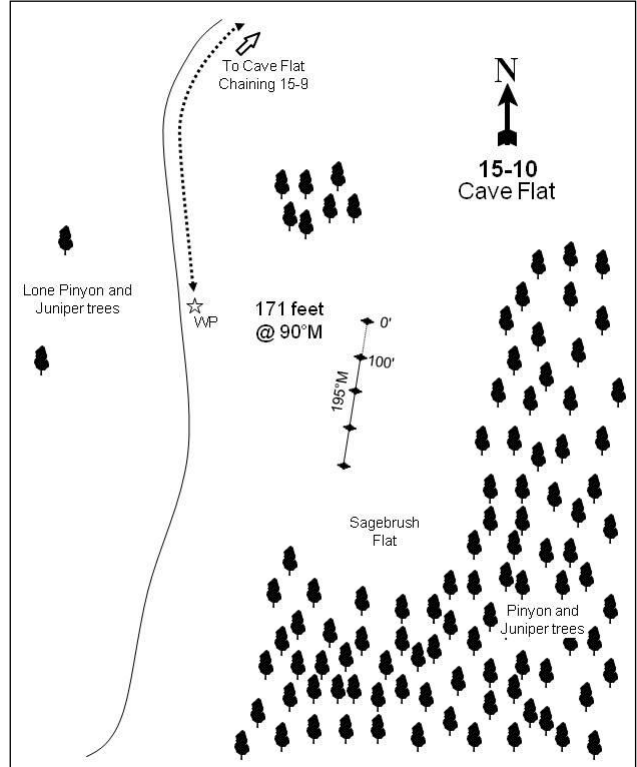
From Cave Flat Chaining (transect 15-9), continue south along Bullfrog Creek for 2.15 miles to a faint fork. Stay right. Go 0.7 miles to another faint intersection and stay right. Continue 0.15 miles into the large sage flat to the witness post on the left side of the road (a 2-foot tall piece of angle iron). The 0-foot baseline stake, a 2-foot tall fencepost, tagged #7126, is 171 feet bearing 90°M from the witness post. The transect runs southwest from there.

Map Name: Cave Flat



Township: 33S, Range: 9E, Section: unsurveyed

Diagrammatic Sketch:



GPS: NAD 83, UTM 509690 E 4198225 N

CAVE FLAT - TREND STUDY NO. 15-10

Site Information

Site Description: The study is located in a remote area on Cave Flat. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) flat, which is surrounded by a low elevation pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland. A road runs through the middle of the flat, but is rarely traveled. The area is inaccessible by vehicle when Bullfrog Creek washes out the road at the turn to Bullfrog. The area is considered to be crucial deer winter range, as well as year-long range for bison. Pellet groups were sampled in low abundance for deer in 1999, but very high abundance in 2011. Cattle/bison sign was sampled in moderate abundance in 1999, but there was no sign sampled in 2011 (Table - Pellet Group Data).

Browse: Wyoming big sagebrush is the predominant browse species, and provides the majority of the cover (Table - Browse Trends). The sagebrush population is comprised of a moderately dense stand of mostly mature plants. Utilization was moderate to heavy in 1987 and 2011, but was light in the other sample years. Decadence was fairly high in 1994, but has been more moderate in the other sample years. Poor vigor was very high when the study was established in 1987, but has been more moderate in the other sample years. Recruitment of young sagebrush plants has generally been good, but was poor in 2011. The increaser species broom snakeweed (*Gutierrezia sarothrae*) is common on the site, but decreased substantially in 2011 (Table - Browse Characteristics).

Herbaceous Understory: Grasses are fairly diverse on the site, but are not particularly abundant. The warm season grasses blue grama (*Bouteloua gracilis*) and galleta (*Hilaria jamesii*) provide the majority of the grass cover. The annual species cheatgrass (*Bromus tectorum*) was abundant in 1999, but has been less common in other sample years. Forbs are not common on the site (Table - Herbaceous Trends).

Soil: The soil is in the Travessilla-Rock outcrop complex, which occurs on mesas and uplands. Parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. These soils are characterized as shallow, well drained, and highly permeable (Soil Survey Staff 2011). Soils at the site are a reddish sandy loam with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). Bare ground cover is high with only moderate amounts of vegetation and litter cover providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2011.

Trend Assessments

Browse:

- **1987 to 1994 - stable (0):** Differences in density may be related to the larger sample area used in 1994; therefore, trend was determined using other parameters. Decadence of Wyoming big sagebrush increased from 16% to 30%, but poor vigor decreased from 75% to 16%. Recruitment of young sagebrush plants decreased from 46% to 17%, but is still considered to be good.
- **1994 to 1999 - slightly up (+1):** The density of Wyoming big sagebrush increased 19% from 3,940 plants/acre to 4,680 plants/acre, though cover remained the same at 13%. Decadence decreased to 9%, and poor vigor decreased to 5%. Broom snakeweed increased substantially in density, but cover decreased from 3% to 2%.
- **1999 to 2011 - down (-2):** Wyoming big sagebrush density decreased by 29% to 3,300 plants/acre, but cover increased to 19%. Decadence increased to 16%, and poor vigor increased to 10%. Recruitment of young sagebrush plants decreased to just 2% of the population. There was a substantial decrease in the density of broom snakeweed, and cover decreased to less than 1%.

Grass:

- **1987 to 1994 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 13%.

- **1994 to 1999 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, but cheatgrass increased significantly in nested frequency. Cover of cheatgrass increased from less than 1% to 5%.
- **1999 to 2011 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 19%, and cover decreased from 6% to 5%. However, there was also a significant decrease in the nested frequency of cheatgrass, and cover decreased to less than 1%.

Forb:

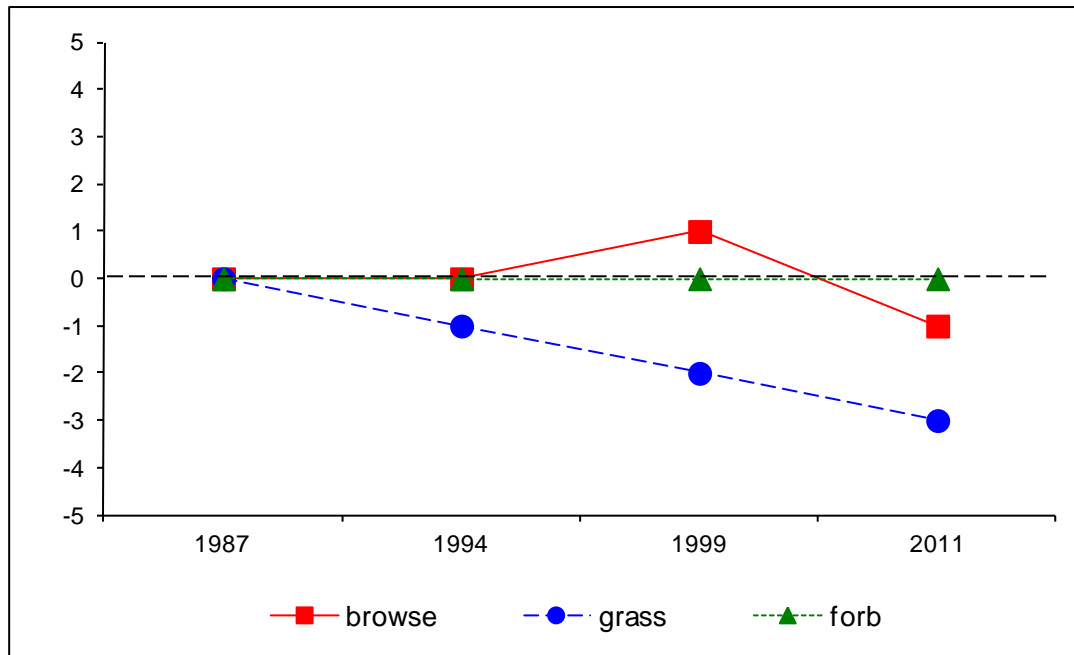
- **1987 to 1994 - stable (0):** Perennial forbs are rare on the site.
- **1994 to 1999 - stable (0):** Perennial forbs are rare on the site.
- **1999 to 2011 - stable (0):** Perennial forbs are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 15, study no: 10

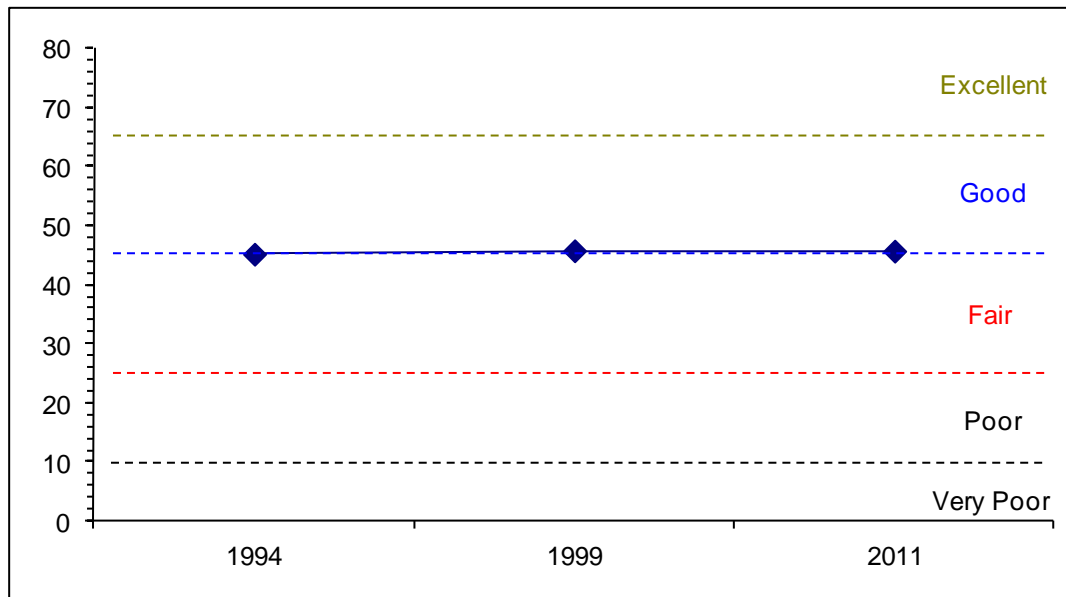
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
94	15.9	6.0	8.5	15.3	-0.6	0.1	0.0	45.2	Fair-Good
99	16.1	12.3	9.5	12.3	-4.4	0.0	0.0	45.8	Fair-Good
11	24.2	10.2	1.0	8.9	-0.3	1.8	0.0	45.7	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 15 Study no: 10



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
 Management unit 15, Study no: 10



HERBACEOUS TRENDS--
 Management unit 15, Study no: 10

Type	Species	Nested Frequency				Average Cover %		
		'87	'94	'99	'11	'94	'99	'11
G	<i>Agropyron cristatum</i>	-	2	-	-	.00	-	-
G	<i>Aristida purpurea</i>	-	5	-	-	.03	-	-
G	<i>Bouteloua gracilis</i>	c160	ab89	bc116	a60	4.40	3.56	1.01
G	<i>Bromus tectorum</i> (a)	-	b158	c264	a42	.43	4.57	.24
G	<i>Hilaria jamesii</i>	107	100	88	108	2.53	2.23	3.23
G	<i>Oryzopsis hymenoides</i>	14	13	13	7	.23	.08	.05
G	<i>Sitanion hystrix</i>	14	22	35	18	.13	.25	.13
G	<i>Sporobolus cryptandrus</i>	a-	b27	a3	ab13	.28	.01	.03
G	<i>Vulpia octoflora</i> (a)	-	c206	b163	a75	.38	1.27	.18
Total for Annual Grasses		0	364	427	117	0.82	5.84	0.42
Total for Perennial Grasses		295	258	255	206	7.63	6.13	4.46
Total for Grasses		295	622	682	323	8.45	11.98	4.89
F	<i>Astragalus</i> sp.	a-	a5	a2	b26	.01	.01	.85
F	<i>Cordylanthus</i> sp. (a)	-	-	-	3	-	-	.00
F	<i>Erodium cicutarium</i> (a)	-	6	-	-	.02	-	-
F	<i>Fritillaria atropurpurea</i>	-	3	-	-	.00	-	-
F	<i>Gilia</i> sp. (a)	-	a-	a-	b13	-	-	.03
F	<i>Lygodesmia</i> sp.	-	8	-	-	.02	-	-
F	<i>Phlox longifolia</i>	-	-	-	3	-	-	.00
F	<i>Plantago patagonica</i> (a)	a84	b147	c212	a84	.75	2.04	.19
F	<i>Sphaeralcea coccinea</i>	ab10	b11	a1	ab6	.03	.00	.02
Total for Annual Forbs		84	153	212	100	0.77	2.04	0.23
Total for Perennial Forbs		10	27	3	35	0.07	0.01	0.88

Type	Species	Nested Frequency				Average Cover %		
		'87	'94	'99	'11	'94	'99	'11
	Total for Forbs	94	180	215	135	0.84	2.06	1.11

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

BROWSE TRENDS--

Management unit 15, Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'94	'99	'11	'94	'99	'11
B	Artemisia tridentata wyomingensis	78	78	75	12.73	12.86	19.32
B	Atriplex canescens	0	1	0			
B	Atriplex confertifolia	2	0	0			
B	Chrysothamnus nauseosus	0	0	0			
B	Chrysothamnus viscidiflorus	0	1	0			
B	Coleogyne ramosissima	0	4	0			
B	Eriogonum microthecum	3	0	1			
B	Gutierrezia sarothrae	79	78	45	3.23	1.61	.40
B	Juniperus osteosperma	0	1	3	.03	.18	1.36
B	Opuntia sp.	13	25	33	1.08	1.14	2.91
	Total for Browse	175	188	157	17.07	15.80	23.99

CANOPY COVER, LINE INTERCEPT--

Management unit 15, Study no: 10

Species	Percent Cover '11
Artemisia tridentata wyomingensis	22.36
Gutierrezia sarothrae	.41
Juniperus osteosperma	1.76
Opuntia sp.	2.50

BASIC COVER--

Management unit 15, Study no: 10

Cover Type	Average Cover %			
	'87	'94	'99	'11
Vegetation	4.00	24.37	24.81	29.12
Rock	0	.06	.00	0
Pavement	0	.14	.28	.33
Litter	29.50	15.71	23.39	20.20
Cryptogams	0	.38	.04	.44
Bare Ground	66.50	51.41	48.55	62.07

PELLET GROUP DATA--

Management unit 15, Study no: 10

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'99	'11	'99	'11
Rabbit	24	36	7	-	-
Deer	6	18	52	4 (10)	92 (227)
Cattle/Bison	3	9	-	36 (89)	-

BROWSE CHARACTERISTICS--

Management unit 15, Study no: 10

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia tridentata wyomingensis</i>									
87	7065	46	38	16	-	36	38	75	22/26
94	3940	17	53	30	1320	3	0	16	17/29
99	4680	19	71	9	80	29	10	5	19/33
11	3300	2	82	16	60	39	54	10	18/30
<i>Atriplex canescens</i>									
87	0	0	0	0	-	0	0	0	-/-
94	0	0	0	0	-	0	0	0	18/22
99	20	0	0	100	-	0	100	0	24/24
11	0	0	0	0	-	0	0	0	39/50
<i>Atriplex confertifolia</i>									
87	0	0	0	-	-	0	0	0	-/-
94	40	0	100	-	-	0	50	0	11/15
99	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus nauseosus</i>									
87	0	0	0	-	-	0	0	0	-/-
94	0	0	0	-	20	0	0	0	-/-
99	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus viscidiflorus</i>									
87	0	0	0	0	-	0	0	0	-/-
94	0	0	0	0	-	0	0	0	-/-
99	20	0	0	100	-	0	0	100	7/7
11	0	0	0	0	-	0	0	0	7/7
<i>Coleogyne ramosissima</i>									
87	0	0	0	-	-	0	0	0	-/-
94	0	0	0	-	-	0	0	0	-/-
99	80	100	0	-	-	0	25	0	19/29
11	0	0	0	-	-	0	0	0	-/-

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Eriogonum microthecum</i>									
87	0	0	0	-	-	0	0	0	-/-
94	60	67	33	-	20	0	0	0	-/-
99	0	0	0	-	-	0	0	0	-/-
11	20	0	100	-	-	0	100	0	2/3
<i>Gutierrezia sarothrae</i>									
87	4333	17	74	9	-	0	0	3	8/8
94	6740	13	84	2	2160	0	0	1	8/11
99	10000	16	83	1	120	0	0	1	5/7
11	1500	4	96	0	80	0	0	0	8/9
<i>Juniperus osteosperma</i>									
87	0	0	0	-	-	0	0	0	-/-
94	0	0	0	-	-	0	0	0	-/-
99	20	100	0	-	-	0	0	0	-/-
11	60	67	33	-	-	0	0	0	-/-
<i>Opuntia sp.</i>									
87	133	0	100	0	-	0	0	0	6/10
94	260	15	69	15	20	0	0	23	6/34
99	760	21	55	24	20	3	0	26	5/25
11	1080	0	100	0	-	0	0	35	6/27

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