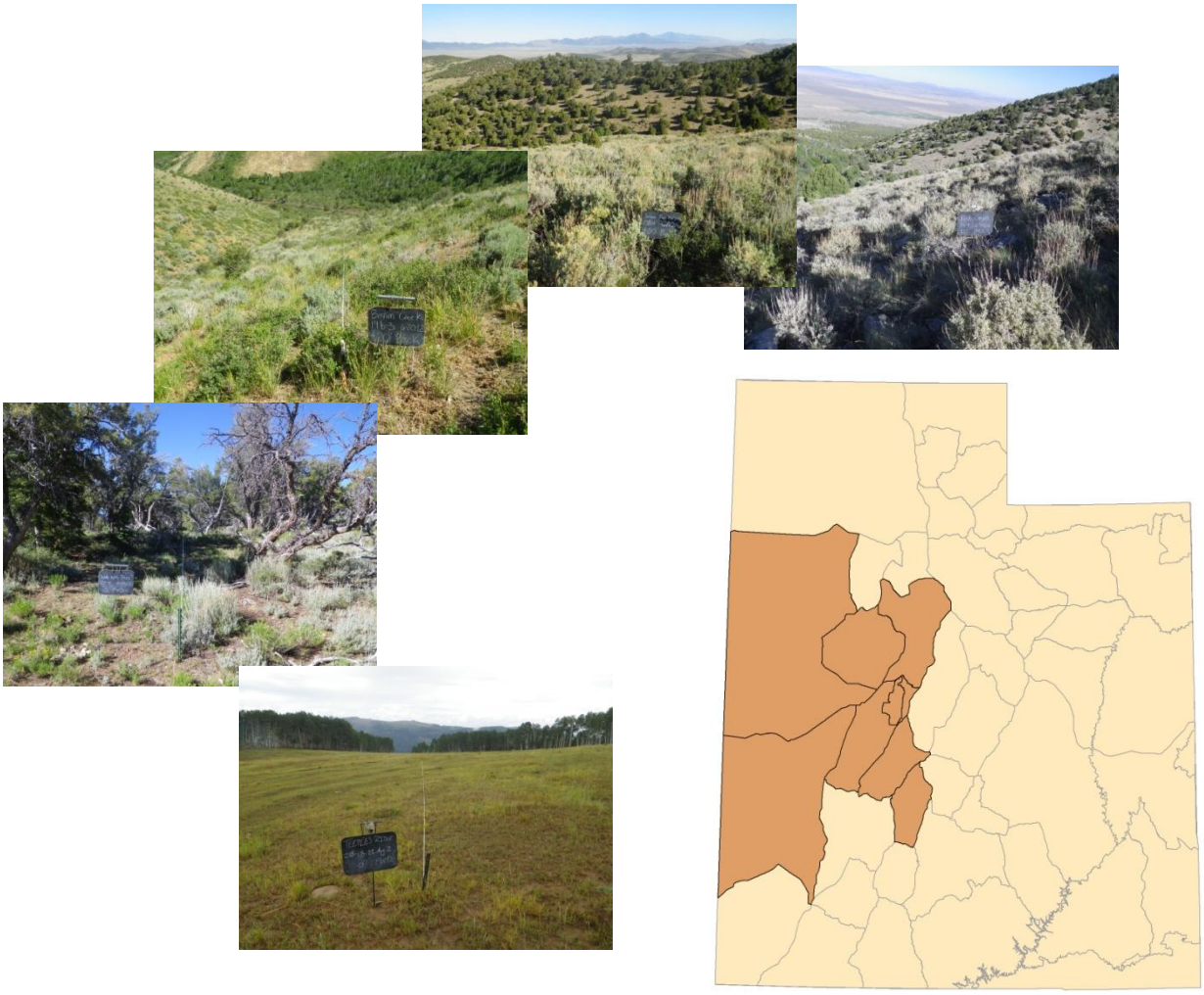
UTAH BIG GAME RANGE TREND STUDIES 2012 VOLUME II

Central & Southern Regions



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REPORT FOR FEDERAL AID PROJECT W-82-R-57

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

Utah Big Game Range Trend Studies
2012 Volume II
Central & Southern Regions

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Performance Report for Federal Aid Project W-82-R-57

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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-57

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 2012 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.

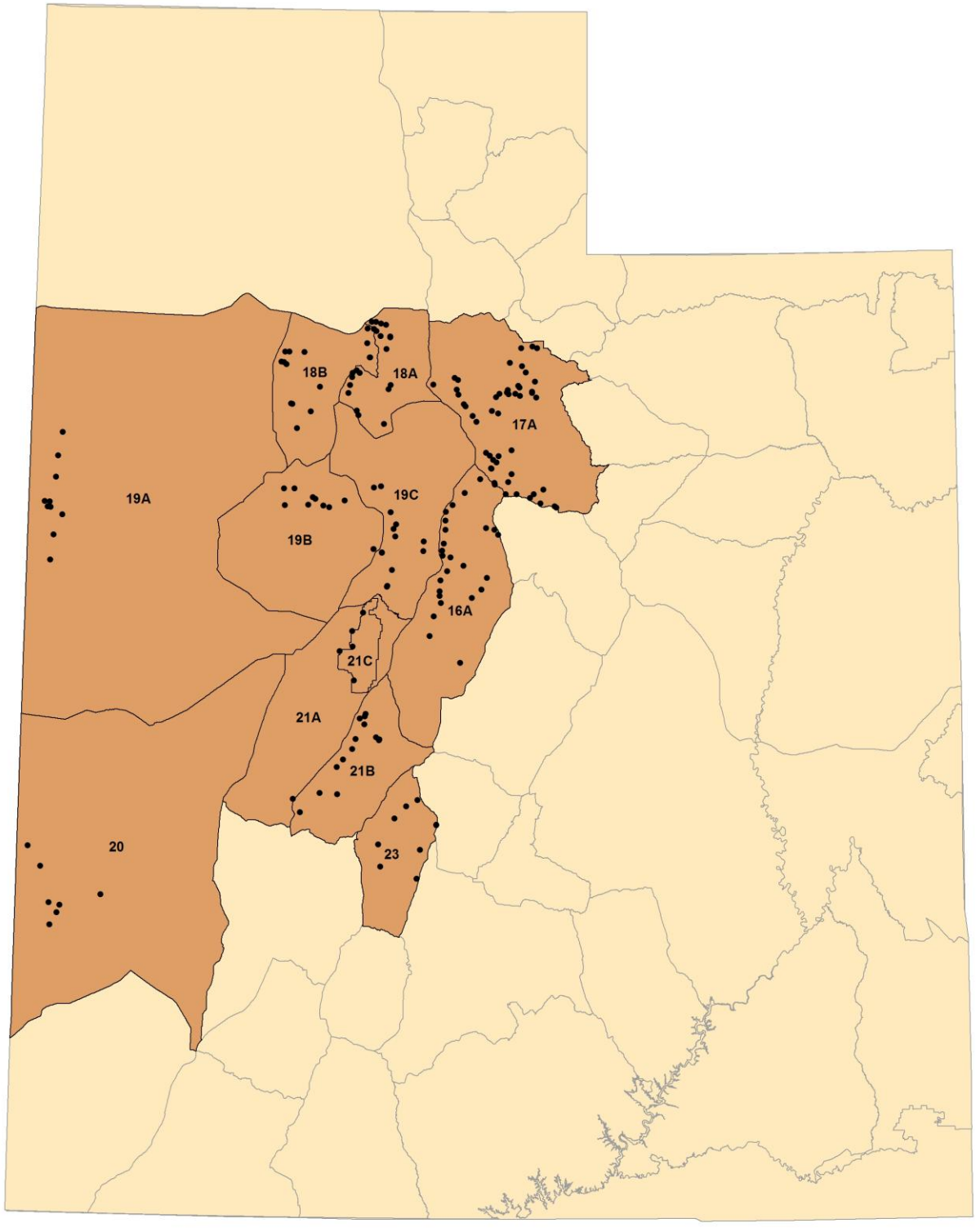
The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies which add to the value of this interagency report:

Bureau of Land Management
Salt Lake Field Office
Fillmore Field Office
Richfield Field Office

U.S. Forest Service
Uinta National Forest
Fishlake National Forest

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

Utah Mangement Units
Surveyed 2012



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 m^2 quadrat is centered every 5 feet along the same side of the belt, starting at the 5 foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species. 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.

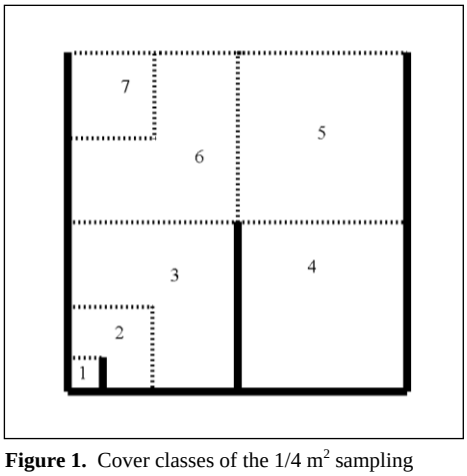


Figure 1. Cover classes of the 1/4 m^2 sampling quadrat.

Total canopy cover of shrubs or trees is also estimated using the line- intercept method ([1]U.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).

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.

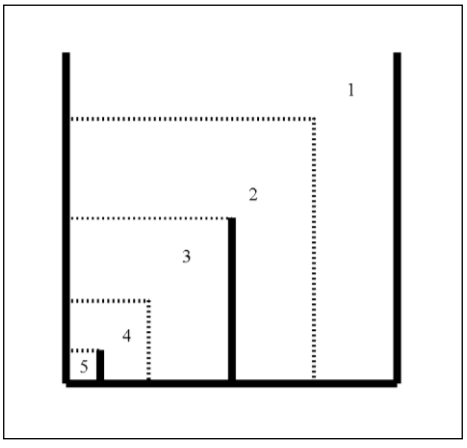


Figure 2. Nested frequency sub-quadrats of the 1/4 m^2 sampling quadrat.

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 ([2]U.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	$_{b}$135	$_{ab}$106	$_{ab}$100	$_{ab}$112	$_{a}$81	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	$_{b}$61	$_{a}$3	$_{a}$19	$_{a}$3	$_{a}$-	.03	.18	.01	-
G	Oryzopsis hymenoides	-	3	3	3	8	.00	.00	.03	.07
G	Poa bulbosa	$_{b}$220	$_{b}$256	$_{b}$250	$_{a}$129	$_{a}$136	7.14	8.01	2.43	2.86
G	Poa fendleriana	$_{a}$-	$_{b}$16	$_{d}$53	$_{cd}$55	$_{bc}$24	.06	.38	1.24	.33
G	Sitanion hystrix	6	1	-	-	-	.00	-	-	-
G	Stipa comata	$_{b}$48	$_{a}$14	$_{bc}$24	$_{bc}$30	$_{a}$21	.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	$_{b}$40	$_{bc}$17	$_{ab}$25	$_{b}$37	$_{a}$9	.10	.42	.99	.10
F	Calochortus nuttallii	8	-	-	1	-	-	-	.00	-
F	Castilleja chromosa	$_{b}$38	$_{a}$4	$_{a}$-	$_{a}$-	$_{a}$-	.01	-	-	-
F	Castilleja linariaefolia	-	2	1	-	-	.01	.03	-	-
F	Comandra pallida	-	-	-	3	-	-	-	.01	-
F	Cordylanthus sp. (a)	-	-	-	5	5	-	-	.16	.01
F	Crepis acuminata	$_{b}$14	$_{a}$6	$_{a}$-	$_{a}$-	$_{a}$-	.03	-	-	-
F	Erigeron flagellaris	-	-	3	-	1	-	.15	-	.00
F	Erigeron pumilus	$_{b}$111	$_{a}$21	$_{a}$43	$_{a}$20	$_{a}$12	.07	.51	.53	.08
F	Eriogonum racemosum	$_{b}$63	$_{a}$30	$_{a}$34	$_{a}$25	$_{a}$28	.14	.30	.35	.21
F	Hymenoxys acaulis	3	-	3	1	-	-	.00	.03	-
F	Lomatium triternatum	$_{b}$31	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
F	Lupinus argenteus	$_{d}$162	$_{c}$57	$_{b}$20	$_{a}$-	$_{a}$-	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	$_{c}$67	$_{bc}$53	$_{ab}$31	$_{a}$7	$_{a}$17	.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 1/4m^2 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	Amelanchier utahensis	18	18	16	20	2.25	3.74	6.50	5.30
B	Artemisia tridentata vaseyana	86	82	85	85	16.28	9.40	10.65	9.94
B	Chrysothamnus depressus	12	26	23	23	.66	.72	1.46	.87
B	Chrysothamnus viscidiflorus viscidiflorus	86	81	72	72	3.62	4.96	5.00	6.14
B	Coryphantha vivipara arizonica	0	2	5	5	-	.00	.00	.00
B	Eriogonum microthecum	10	16	10	9	.01	.53	.12	.12
B	Gutierrezia sarothrae	0	4	8	4	.01	.04	.15	.03
B	Juniperus osteosperma	0	0	0	0	-	-	-	.15
B	Opuntia sp.	36	35	41	45	.32	.56	1.12	1.33
B	Pinus edulis	0	16	14	10	2.92	3.53	7.21	8.53
B	Purshia tridentata	0	1	1	1	-	.00	.00	.00
B	Quercus gambelii	0	3	3	2	.76	.63	1.48	.76
B	Symphoricarpos oreophilus	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 1/4m^2 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
Amelanchier utahensis	.80	7.25	9.48
Artemisia tridentata vaseyana	-	13.21	13.93
Chrysothamnus depressus	-	1.04	.58
Chrysothamnus viscidiflorus viscidiflorus	-	4.73	7.25
Eriogonum microthecum	-	.11	.06
Opuntia sp.	-	.65	.71
Pinus edulis	3.59	11.86	13.43
Quercus gambelii	-	1.23	1.43
Symphoricarpos oreophilus	-	-	.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
Amelanchier utahensis	1.8	1.7
Artemisia tridentata vaseyana	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		
	'99	'04	'09
Pinus edulis	201	175	213

Average diameter (in)		
'99	'04	'09
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)
Artemisia tridentata vaseyana									
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			%0M	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, $100ft^2$ circular plots which are placed through the study area. These are usually two parallel transects of 25 plots on each side of the 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			
	'94	'99	'04	'09
Rabbit	44	6	6	34
Elk	28	26	11	3
Deer	14	28	15	9
Cattle	-	2	-	1

Days use per acre (ha)		
'99	'04	'09
-	-	-
70 (173)	27 (68)	4 (10)
32 (79)	16 (40)	25 (63)
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.

WILDLIFE MANAGEMENT UNIT 19 - WEST DESERT

Boundary Description

Tooele, Utah, Juab, and Millard counties - Boundary begins at the Utah-Nevada state line and I-80 in Wendover; east on I-80 to the Dugway road at Rowley Junction; south on this road to the Pony Express Road: east on this road to SR-36; north on SR-36 to SR-73; east on SR-73 to I-15; south on I-15 to US-6 at Santaquin, west and southwest on US-6 to its junction with US-50 near Delta; west on US-50 and 6 to the Utah-Nevada state line; north along this state line to I-80 at Wendover.

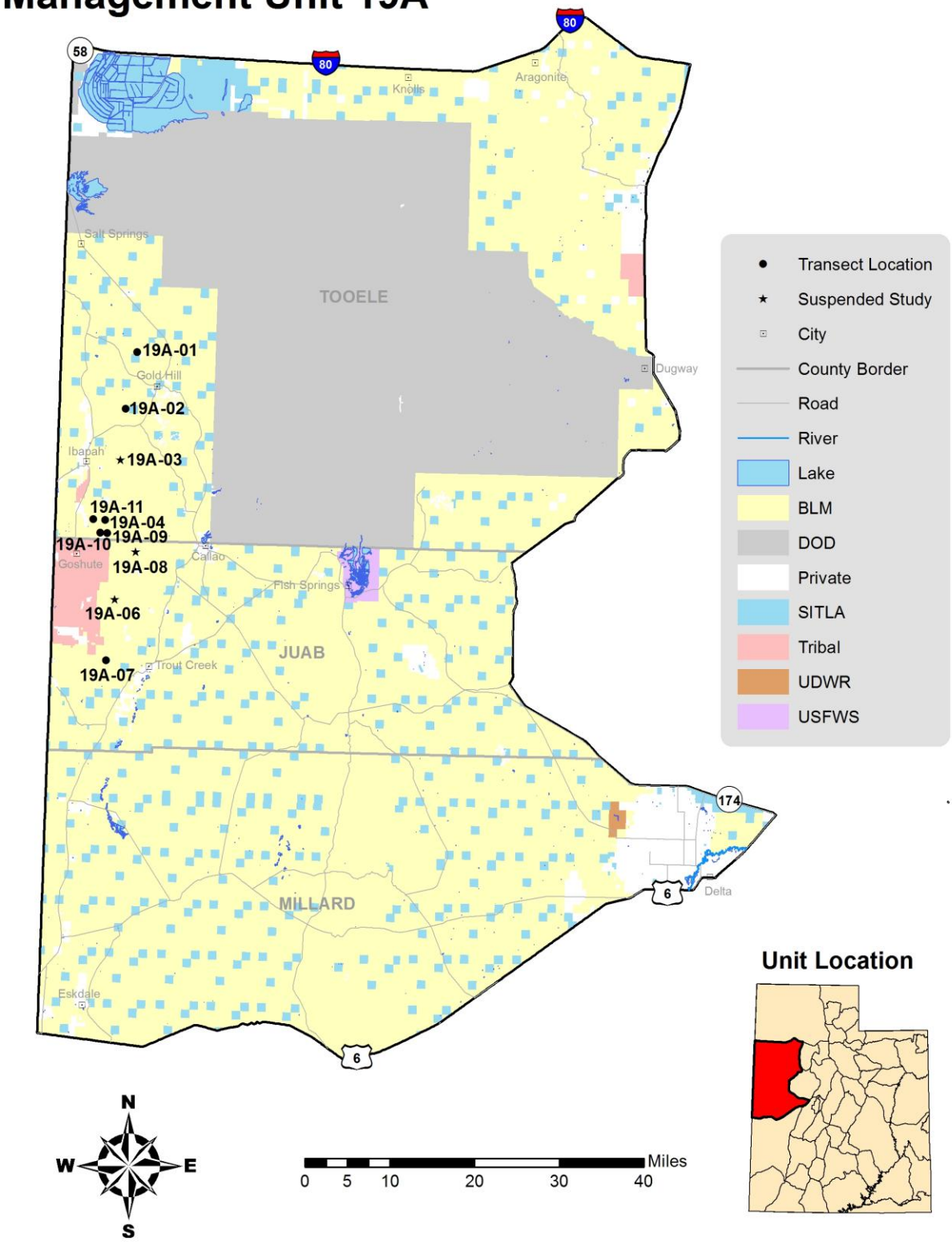
Management Unit Description

Management Unit 19 is subdivided into three smaller subunits, Deep Creek (19A), Vernon (19B), and Tintic (19C). Of the total land area within Unit 19, the majority is categorized as either transitional or winter range. Winter, transitional, and summer ranges make up 61%, 23%, and 16% of the area, respectively. The vast majority of the land within Unit 19 is managed by the Bureau of Land Management.

Population and Habitat Management Strategies

The Vernon Subunit (19B) is currently managed under the limited entry hunting status. Other portions of unit 19 are open to general season hunting for deer. Some factors that may limit success in reaching management objectives include drought conditions, crop depredation, habitat loss, and predation by cougars. To minimize these limiting factors, the following habitat management strategies will be used: 1) monitor the permanent range trend studies throughout the unit, 2) maintain and/or enhance forage production through direct range improvements throughout the unit, and 3) work with private and federal agencies to maintain and protect critical summer ranges from future losses and degradation (Hersey and McLaughlin 2006).

Management Unit 19A



WILDLIFE MANAGEMENT SUBUNIT - 19A - WEST DESERT, DESERT MOUNTAIN RANGES

Boundary Description

Tooele, Utah, Juab, and Millard counties - Boundary begins at the Utah-Nevada state line and I-80 in Wendover; east on I-80 to the Dugway Road at Rowley Junction; south on this road to the Pony Express Road; southwest on this road to the Dugway Valley Road; south on this road to SR-174; southeast on SR-174 to US- 6 to its junction with Highway US-50; west on US-50 and 6 to the Utah-Nevada state line; north along the Utah-Nevada state line to I-80 at Wendover and beginning point.

Management Unit Description

With few exceptions, deer summer range on the Deep Creek Mountains is generally above 7,500 feet in elevation. Quality summer range and water distribution are the limiting factors for the deer population. There are approximately 65,654 acres of winter range in the unit. A majority of the winter range (72%) is located on Bureau of Land Management (BLM) administered land. Very little winter range is located on private land or on the Goshute Indian Reservation. Some winter range is also located on Division of Wildlife Resources and State Trust Lands. Winter range surrounds the Deep Creek Mountains and ranges in elevation from 7,500 feet down to 5,800 feet. Some transitional range exists, most of which is located on BLM lands.

Range Trend Studies

Seven interagency range trend studies were sampled in Subunit 19A during the summer of 2012. A total of Eleven studies have been established within Subunit 19A since 1983. Six studies were established in 1983: Trail Gulch (19A-1), Ochre Mountain (19A-2), Sevy Mountain (19A-3), Durse Canyon (19A-4), Chokecherry Springs (19A-5), Granite Creek (19A-6); two studies were established in 1989: Wood Canyon (19A-7) and The Basin (19A-8); two studies were established in 2002: Rocky Canyon (19A-19) and Rocky Spring (19A-10); and one study was established in 2007: Ibapah Harrow (19A-11).

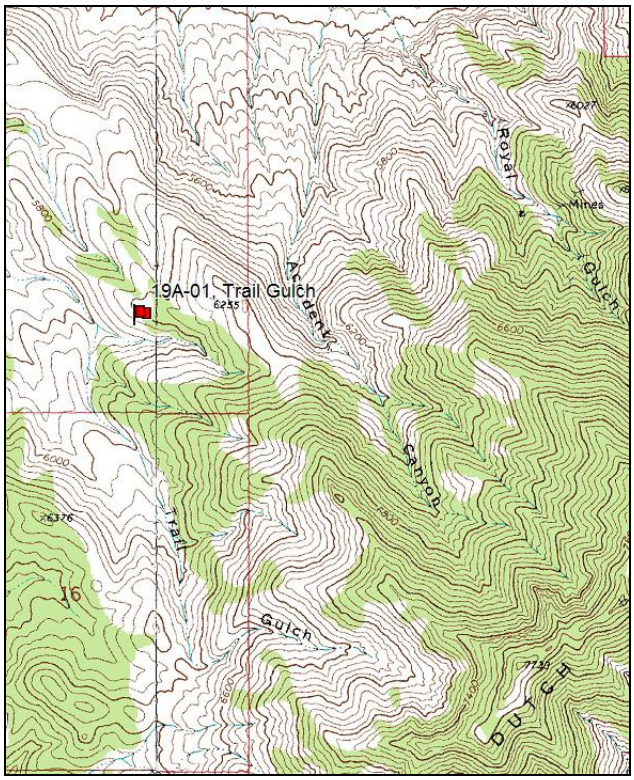
In 2002, four studies (Sevy Mountain, Chokecherry Springs, Granite Creek, and The Basin) were suspended. Sevy Canyon, Granite Creek, and The Basin all lie within BLM wilderness study areas and were not accessible. The study at Chokecherry Spring is located on Tribal lands within Nevada. These studies 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.

TRAIL GULCH - TREND STUDY NO. 19A-1-12

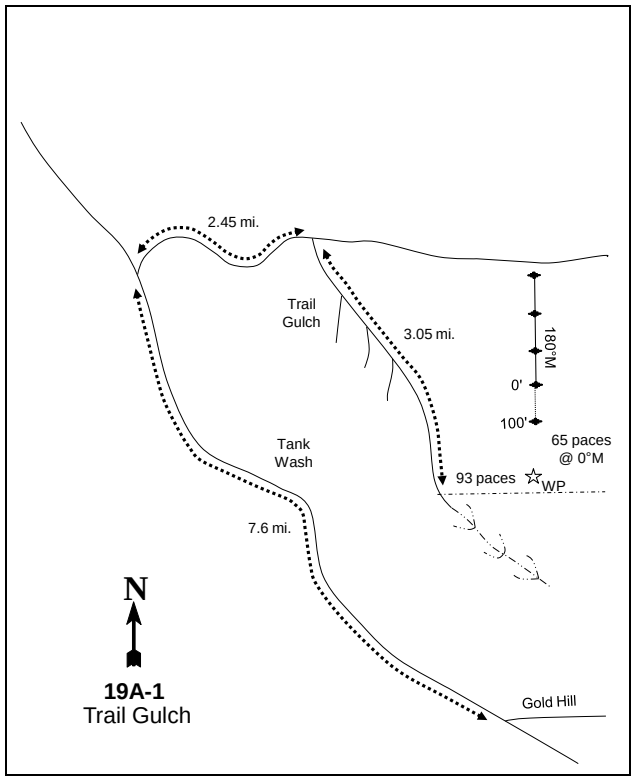
Vegetation Type: Pinyon and Juniper
Range Type: Crucial Deer Winter,
NRCS Ecological Site Description: Upland Shallow Loam (Utah Juniper-Singleleaf Pinyon), R028AY324UT
Land Ownership: BLM
Elevation: 5,900 ft. (1,790 m)
Aspect: South
Slope: 30-45%
Transect bearing: 180° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: No rebar (to rocky)

Directions: Beginning at Gold Hill, proceed northwesterly toward Gold Hill Pass and Tank Wash for 7.6 miles to a road to the north. Turn right and proceed northerly for 2.45 miles to a dirt road to the southeast up Trail Gulch. Proceed up Trail Gulch for 3.05 miles staying to the left (straight) at all intersections. Stop where the road ends and two drainages come together. From the intersection of the streambeds, walk 93 paces easterly, along the left drainage to a green "T" fencepost on the north side of the streambed. From the fencepost, walk 65 paces north to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake has a red browse tag, number 3970.

Map Name: Ochre Mountain



Diagrammatic Sketch:



Township: 7S Range: 18W Section: 9

GPS: NAD 83, UTM 12S 255223 E 4457093 N

TRAIL GULCH - TREND STUDY NO. 19A-1

Site Information

Site Description: The study monitors crucial deer winter range on the north end of the Deep Creek Mountains. The area is administered by the Bureau of Land Management as part of the Dutch Mountain allotment. The site is dry, rocky, and occupied by a sparse stand of Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) and black sagebrush (*Artemisia nova*) in association with scattered Utah juniper (*Juniperus osteosperma*). In 1983, utilization of browse was reportedly intense, although relatively few deer pellet groups were observed. Several broods of chukars were observed in the area in 1983. In 1989 and 1997, utilization by livestock and wildlife was noted as infrequent. Deer pellet groups were sampled in moderate abundance in 2002, but have been sampled in low abundance since 2007. Elk pellet groups have been sampled in very low abundance since 2002. A low number of sheep pellet groups were sampled in 2012 (Table - Pellet Group Data). Despite the low number of pellet groups, it appears sheep use the site heavily. A bedding area with a high number of sheep pellets was noted in 2012 just at the top of the ridge near the 400' stake. A dead sheep was found on the site in 2012.

Browse: Stansbury cliffrose, Nevada ephedra (*Ephedra nevadensis*), and black sagebrush are the key species on the site, and have provided the majority of the understory shrub cover (Table - Browse Trends). The cliffrose stand is comprised of a scattered population of large, mature plants. Recruitment of young cliffrose plants has been generally good over the course of the study. Decadence of cliffrose has been high in many sample years, and poor vigor has steadily increased in the population since 1997. Utilization of cliffrose has been moderate to heavy throughout the sample years. The Nevada ephedra stand is comprised of a moderately dense stand of decadent and mature plants. There have been years of high recruitment of young plants, but recruitment has generally been poor. Decadence and poor vigor have been high in the population throughout most of the study years. Utilization has been very heavy in many of the sample years. Black sagebrush occurs as a moderately dense population of mostly mature plants. Recruitment of young black sagebrush plants has been poor over the course of the study. Decadence and poor vigor have been moderately high in the black sagebrush population in many of the sample years. Utilization of black sagebrush has been mostly moderate, with a few years of heavy use. Other browse sampled include small populations of shadscale (*Atriplex confertifolia*), California brickellia (*Brickellia californica*), broom snakeweed (*Gutierrizia sarothrae*), narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), and littleleaf horsebrush (*Tetradymia glabrata*). Broom snakeweed was the abundant at the outset of the study, but has decreased throughout the study years and is rare on the site (Table - Browse Characteristics). Single-leaf pinyon (*Pinus monophylla*) and Utah juniper are scattered across the landscape in moderate density (Table - Point-Quarter Tree Data).

Herbaceous Understory: The grass component is not abundant, and composed of a mixture of native perennial species and the annual grass species cheatgrass (*Bromus tectorum*). Bluebunch wheatgrass (*Agropyron spicatum*) is the most abundant perennial grass. Other less abundant grasses that have been sampled include galleta (*Hilaria jamesii*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and sand dropseed (*Sporobolus cryptandrus*). Cheatgrass is the most prevalent grass in nested frequency on the site and typically provides as much cover as the perennial species combined. The forb component is sparse with very few forbs sampled on the site (Table - Herbaceous Trends).

Soil: The soil is in the Amtoft series, which occur on mountainsides and hillsides. These soils are formed from colluvium and/or residuum derived from limestone, and are characterized as shallow and somewhat excessively drained (Soil Survey Staff 2011). Rocks are angular shaped and uniformly dark grey in color. The soil texture is a clay loam with a neutral reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover has been low to moderate over the sample years, with a mixture of vegetation, litter, rock, and pavement

providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as slight since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - up (+2):** The key species, black sagebrush, Stansbury cliffrose, and Nevada ephedra, increased in density. The recruitment of young was stable at 0%for black sagebrush, increased to 50% for Stansbury cliffrose, and increased to 31% for Nevada ephedra. However, they also have increased in decadence of all three species.
- **1989 to 1997 - slightly up (+1):** Differences in density may be attributed to the larger sample area used in 1997; therefore, trend was determined using other parameters. Recruitment of young plants decreased in cliffrose and ephedra, but remained good in both populations. Decadence decreased in all three species from very high rates to more moderate levels.
- **1997 to 2002 - slightly down (-1):** The density of ephedra decreased 20%, from 820 plants/acre to 660 plants/acre, and cover decreased from 2% to less than 1%. The recruitment of young ephedra plants decreased to 3%. Decadence in ephedra increased from 7% to 42%, and poor vigor increased from 0% to 45% of the population. Black sagebrush density increased 67% from 840 plants/acre to 1,400 plants/acre, but cover decreased from 5% to 4%. Decadence of black sagebrush increased from 19% to 29%. Cliffrose density increased 12% from 340 plants/acre to 380 plants/acre, and cover increased from 3% to 4%. The recruitment of young cliffrose plants decreased from 18% to 5% of the population.
- **2002 to 2007 - slightly down (-1):** Density of ephedra increased 9% to 720 plants/acre, but cover remained less than 1%. The recruitment of young ephedra plants decreased to 0% of the population. Decadence of ephedra increased to 69%, and poor vigor stayed high at 39%. Black sagebrush density decreased 30% to 980 plants/acre, and cover remained similar at 4%. Cliffrose density decreased 5% to 360 plants/acre, but cover remained similar to 4%. The recruitment of young cliffrose plants decreased to 0% of the population. Decadence of cliffrose increased from 16% to 33%, and poor vigor increased from 11% to 17% of the population.
- **2007 to 2012 - stable (0):** Ephedra density remained similar at 700 plants/acre, and cover remained less than 1%. Recruitment of young ephedra plants increased to 11%. Decadence of ephedra decreased to 49%, but poor vigor increased to 54% of the population. Black sagebrush density increased 61% to 1,580 plants/acre, and cover increased to 5%. Decadence of black sagebrush decreased to 20%. However, cliffrose density decreased 22% to 280 plants/acre, and cover decreased to 3%. Recruitment of young cliffrose plants increased to 14% of the population. Decadence of cliffrose increased to 43%, and poor vigor increased to 21%.

Grass:

- **1983 to 1989 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 36%, but perennial grasses remained fairly rare.
- **1989 to 1997 - slightly up (+1):** The perennial grass sum of nested frequency increased 14%, with a significant increase in the nested frequency of bluebunch wheatgrass. Annual grasses were measured in the study for the first time. Cheatgrass was the dominant grass, with an average cover of 7%.
- **1997 to 2002 - stable (0):** The sum of nested frequency of perennial grasses decreased 14%, but cover increased from 4% to 5%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 7% to 5%.
- **2002 to 2007 - stable (0):** Perennial grass sum of nested frequency remained similar, but cover decreased to 4%. Cheatgrass nested frequency remained similar, but cover decreased to 4%.
- **2007 to 2012 - stable (0):** Perennial grass sum of nested frequency and cover remained similar. Cheatgrass nested frequency remained similar, but cover decreased slightly to 3%.

Forb:

- **1983 to 1989 - stable (0):** Forb species are rare on the site.
- **1989 to 1997 - stable (0):** Forb species are rare on the site.
- **1997 to 2002 - stable (0):** Forb species are rare on the site.
- **2002 to 2007 - stable (0):** Forb species are rare on the site.
- **2007 to 2012 - stable (0):** Forb species are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19A, 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
97	13.3	9.7	4.8	8.2	-5.4	0.2	0.0	**30.9**	Fair
02	11.8	7.7	1.5	9.9	-4.0	0.1	0.0	**27.0**	Poor-Fair
07	10.8	5.0	0.5	8.2	-2.8	0.5	0.0	**22.2**	Poor
12	11.4	6.3	2.7	7.6	-2.6	0.0	0.0	**25.4**	Poor-Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron spicatum	$_{a}$43	$_{a}$47	$_{b}$97	$_{b}$82	$_{b}$112	$_{ab}$75	3.09	4.33	3.88	3.24
G	Bromus tectorum (a)	-	-	$_{b}$248	$_{a}$196	$_{a}$195	$_{a}$168	7.17	5.39	3.75	3.43
G	Hilaria jamesii	$_{c}$37	$_{bc}$33	$_{ab}$13	$_{a}$5	$_{a}$2	$_{a}$8	.36	.09	.06	.07
G	Oryzopsis hymenoides	5	6	6	1	2	8	.21	.15	.06	.04
G	Poa secunda	$_{a}$3	$_{ab}$14	$_{ab}$15	$_{ab}$19	$_{ab}$13	$_{b}$30	.40	.29	.08	.43
G	Sitanion hystrix	-	-	6	7	-	-	.03	.07	-	-
G	Sporobolus cryptandrus	$_{a}$-	$_{b}$20	$_{a}$-	$_{a}$4	$_{a}$-	$_{a}$1	-	.00	-	.00
Total for Annual Grasses		0	0	248	196	195	168	7.17	5.39	3.75	3.43
Total for Perennial Grasses		88	120	137	118	129	122	4.11	4.95	4.08	3.79
Total for Grasses		88	120	385	314	324	290	11.29	10.35	7.83	7.23
F	Astragalus utahensis	-	-	3	-	-	2	.00	-	-	.00
F	Cirsium neomexicanum	$_{a}$6	$_{b}$19	$_{a}$1	$_{a}$1	$_{a}$2	$_{a}$2	.00	.00	.15	.01
F	Collinsia parviflora (a)	-	-	-	-	4	-	-	-	.01	-
F	Cymopterus sp.	-	-	-	-	1	-	-	-	.03	-
F	Descurainia pinnata (a)	-	-	-	4	5	-	-	.01	.01	-
F	Draba sp. (a)	-	-	-	1	-	-	-	.00	-	-
F	Erodium cicutarium (a)	-	-	$_{a}$-	$_{a}$3	$_{b}$18	$_{a}$-	-	.00	.16	-
F	Lappula occidentalis (a)	-	-	-	1	3	3	-	.00	.01	.03
F	Lomatium sp.	-	-	1	3	-	-	.00	.00	-	-
F	Lygodesmia grandiflora	3	-	-	-	-	-	-	-	-	-
F	Machaeranthera spp	1	-	-	-	-	-	-	-	-	-
F	Phlox longifolia	-	3	10	6	6	-	.04	.01	.01	-
F	Sphaeralcea coccinea	2	10	-	3	5	2	-	.00	.06	.00
F	Streptanthus cordatus	-	-	-	2	-	-	-	.00	-	-

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Unknown forb-perennial	-	-	8	-	3	-	.06	-	.00	-
F	Zigadenus paniculatus	-	-	-	4	-	-	-	.01	-	-
Total for Annual Forbs		0	0	0	9	30	3	0	0.02	0.19	0.03
Total for Perennial Forbs		12	32	23	19	17	6	0.12	0.04	0.25	0.01
Total for Forbs		12	32	23	28	47	9	0.12	0.06	0.44	0.05

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

BROWSE TRENDS--
Management unit 19A, Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia nova	21	25	21	24	5.40	3.59	3.61	4.89
B	Atriplex confertifolia	5	3	4	4	.53	.03	.21	.30
B	Brickellia californica	5	2	4	5	.03	-	.00	-
B	Chrysothamnus viscidiflorus stenophyllus	10	5	6	7	.15	.38	.38	.30
B	Cowania mexicana stansburiana	15	15	14	11	2.54	4.02	3.59	2.71
B	Echinocereus sp.	0	1	0	1	-	-	-	-
B	Ephedra nevadensis	12	17	12	12	1.78	.97	.59	.73
B	Gutierrezia sarothrae	19	7	1	0	.60	.00	-	-
B	Juniperus osteosperma	8	5	8	7	11.46	10.00	8.23	11.32
B	Opuntia sp.	2	3	1	1	-	.00	-	.00
B	Pinus monophylla	1	3	2	5	-	.15	.56	1.87
B	Tetradymia glabrata	12	4	9	9	1.09	-	.30	.41
Total for Browse		110	90	82	86	23.60	19.16	17.50	22.55

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 1

Species	Percent Cover		
	'02	'07	'12
Artemisia nova	4.16	3.33	4.63
Brickellia californica	.08	.21	.13
Chrysothamnus viscidiflorus stenophyllus	.65	.08	.43
Cowania mexicana stansburiana	7.38	7.76	6.40
Ephedra nevadensis	2.26	.56	.30
Juniperus osteosperma	13.10	15.23	13.98
Opuntia sp.	-	-	.08
Pinus monophylla	2.11	2.04	4.48
Tetradymia glabrata	.10	.75	.51

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19A, Study no: 1

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia nova	0.9	1.0	0.2
Cowania mexicana stansburiana	1.8	2.3	0.1

POINT-QUARTER TREE DATA--
Management unit 19A, Study no: 1

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	53	76	61
Pinus monophylla	<18	34	52

Average diameter (in)		
'02	'07	'12
8.7	7.7	9.1
4.1	3.0	3.8

BASIC COVER--
Management unit 19A, Study no: 1

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	.25	4.00	35.30	28.60	25.70	28.38
Rock	27.00	30.00	27.53	32.42	31.78	32.76
Pavement	20.25	21.50	16.47	18.55	19.24	23.02
Litter	39.50	33.50	30.37	27.46	30.22	28.78
Cryptogams	.25	1.50	1.66	2.11	.71	.81
Bare Ground	12.75	9.50	3.34	13.38	6.87	16.89

SOIL ANALYSIS DATA --

Management unit 19A, Study no: 1, Trail Gulch

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.9	7.1	38.0	32.4	29.6	2.4	7.7	76.8	0.7

PELLET GROUP DATA--
Management unit 19A, Study no: 1

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	8	9	25	1
Elk	-	-	-	-
Deer	-	2	6	2
Sheep	-	-	-	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	1 (3)	2 (5)
22 (55)	5 (13)	4 (10)
-	-	1 (3)

BROWSE CHARACTERISTICS--
Management unit 19A, 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)
Artemisia nova									
83	**332**	10	80	10	-	60	30	20	13/25
89	**499**	0	47	53	33	53	0	0	12/29
97	**840**	2	79	19	-	19	0	7	13/29
02	**1400**	1	70	29	-	51	13	6	10/21
07	**980**	2	69	29	-	29	57	22	14/28
12	**1580**	0	80	20	-	43	0	20	13/25
Atriplex confertifolia									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**120**	0	67	33	20	0	0	0	8/11
02	**60**	0	33	67	-	0	0	33	6/12
07	**80**	0	75	25	-	0	25	25	12/22
12	**100**	0	100	0	-	0	0	0	5/9
Brickellia californica									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**160**	13	88	-	60	0	0	0	12/14
02	**40**	0	100	-	-	0	0	0	10/15
07	**160**	0	100	-	-	38	0	0	9/19
12	**200**	0	100	-	-	0	0	0	8/13
Chrysothamnus viscidiflorus stenophyllus									
83	**133**	0	100	0	-	0	0	0	8/10
89	**165**	0	40	60	-	0	0	0	4/6
97	**220**	0	82	18	-	0	0	9	10/16
02	**100**	0	80	20	-	0	0	0	11/24
07	**120**	0	100	0	-	0	0	0	13/21
12	**160**	0	38	63	-	13	13	75	9/16
Cowania mexicana stansburiana									
83	**199**	17	83	0	-	33	17	0	44/67
89	**332**	50	10	40	-	10	0	0	55/71
97	**340**	18	65	18	20	12	0	6	38/60
02	**380**	5	79	16	-	42	37	11	44/63
07	**360**	0	67	33	-	17	28	17	45/64
12	**280**	14	43	43	-	64	0	21	42/66

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Echinocereus sp.									
83	**33**	0	100	-	-	0	0	0	3/5
89	**33**	100	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	0	4/5
07	**0**	0	0	-	-	0	0	0	3/8
12	**20**	0	100	-	-	0	0	0	4/6
Ephedra nevadensis									
83	**298**	0	67	33	-	0	100	100	18/33
89	**532**	31	25	44	-	56	0	0	15/24
97	**820**	20	73	7	-	34	0	0	20/29
02	**660**	3	55	42	-	27	39	45	18/32
07	**720**	0	31	69	-	11	75	39	17/33
12	**700**	11	40	49	-	6	77	54	13/22
Gutierrezia sarothrae									
83	**2532**	8	92	0	-	0	0	0	8/8
89	**2698**	11	58	31	166	0	0	0	5/7
97	**640**	6	94	0	20	0	0	0	7/12
02	**180**	0	22	78	-	0	0	67	8/12
07	**20**	0	100	0	-	0	0	0	6/12
12	**0**	0	0	0	-	0	0	0	6/7
Juniperus osteosperma									
83	**0**	0	0	0	-	0	0	0	-/-
89	**99**	67	33	0	-	0	0	0	118/197
97	**160**	25	63	13	-	0	0	0	-/-
02	**100**	0	100	0	-	0	0	0	-/-
07	**160**	38	50	13	20	0	0	0	-/-
12	**140**	29	71	0	-	0	0	0	-/-
Opuntia sp.									
83	**33**	0	100	0	-	0	0	100	4/18
89	**66**	50	0	50	-	0	0	50	-/-
97	**40**	0	100	0	-	0	0	0	7/13
02	**80**	0	100	0	-	0	0	0	4/12
07	**20**	0	0	100	-	0	0	100	4/8
12	**20**	0	100	0	-	0	0	0	4/8
Pinus monophylla									
83	**33**	100	0	-	-	0	0	0	-/-
89	**66**	100	0	-	-	0	0	0	-/-
97	**20**	0	100	-	-	0	0	0	-/-
02	**60**	67	33	-	20	0	0	0	-/-
07	**40**	50	50	-	20	0	0	0	-/-
12	**100**	80	20	-	20	0	0	0	-/-

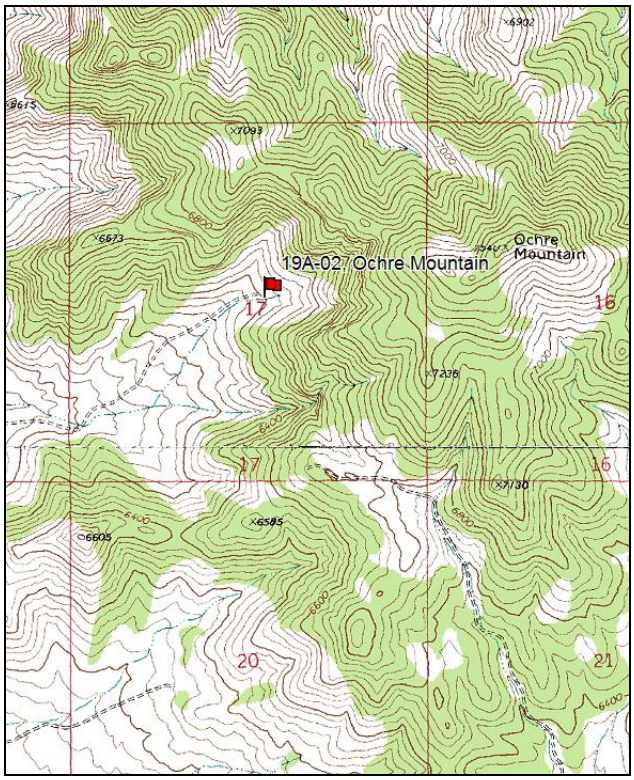
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Tetradymia glabrata									
83	**66**	0	100	0	-	0	0	0	26/38
89	**199**	33	0	67	-	0	0	33	-/-
97	**340**	6	53	41	-	0	0	12	23/21
02	**120**	0	0	100	-	0	0	100	22/14
07	**220**	0	27	73	-	18	9	73	11/20
12	**180**	0	56	44	-	0	0	100	16/24

OCHRE MOUNTAIN - TREND STUDY NO. 19A-2-12

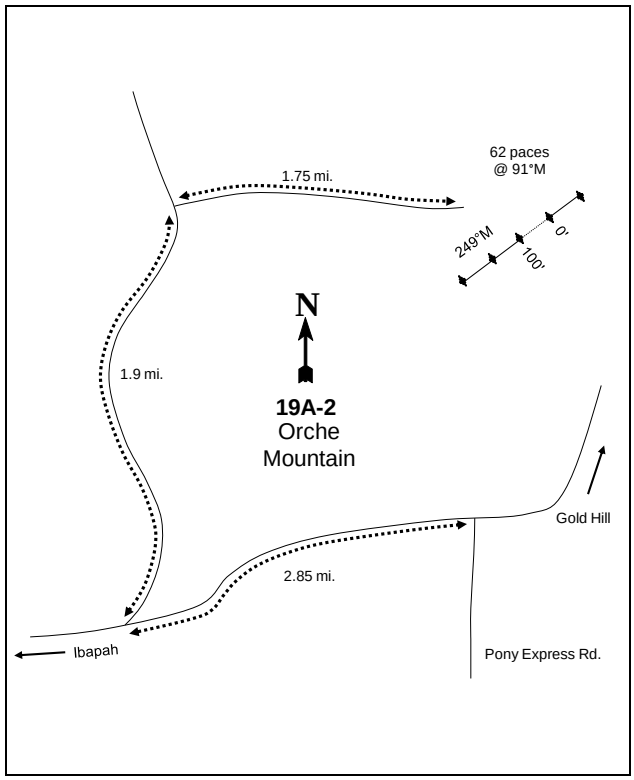
Vegetation Type: Basin Big Sagebrush
Range Type: Crucial Deer Winter,
NRCS Ecological Site Description: Upland Gravelly Loam (Wyoming Big Sagebrush), R028AY307UT
Land Ownership: BLM
Elevation: 6,400 ft. (1,940 m)
Aspect: West
Slope: 15-20%
Transect bearing: 249° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions: From Gold Hill, proceed southwest toward Pony Express Road. From the intersection at Pony Express Road, continue on main road (east) towards Ibapah for another 2.85 miles to an intersection going north (right). Take the road going north for 1.91 miles to a road going east (right). Turn right and go 1.75 miles to a small box canyon. Stop and walk 62 paces at 91 degrees true to a green steel "T" fencepost with a red browse tag, number 3931, attached. This marks the 0-foot stake of the baseline. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.

Map Name: Ochre Mountain



Diagrammatic Sketch:



Township: 8S Range: 18W Section: 17

GPS: NAD 83, UTM 12S 253042 E 4446321 N

OCHRE MOUNTAIN - TREND STUDY NO. 19A-2

Site Information

Site Description: The study samples crucial deer winter range on the west side of Ochre Mountain. The area is administered by the Bureau of Land Management (BLM) as part of the Ochre allotment. The study samples a basin big sagebrush (*Artemisia tridentata* spp. *tridentata*) and grass community. The area is surrounded by steep, rocky singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) hillsides, which also contain some Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Deer pellet groups were sampled in moderately high abundance in 2002, but have been sampled in low abundance since 2007. Elk pellet groups have been sampled in low to moderate abundance since 2002. Cattle sign was sampled in low abundance in 2002 and 2007, but in high abundance in 2012. Horse pellet groups have been sampled in low abundance since 2002 (Table - Pellet Group Data). In 2002, there was sign of wild horses and several rub trees severely damaged by big game. Prior to 2002, big game, wild horse and livestock use was noted to be light to moderate.

Browse: Nearly all of the browse cover on the site is provided by basin big sagebrush (Table - Browse Trends). The basin big sagebrush stand is comprised of a moderately dense population of large, mature and decadent plants. Recruitment of young basin big sagebrush plants has been poor over the course of the study. Decadence and poor vigor have been high in the big sagebrush population throughout the sample years. Utilization of basin big sagebrush has been mostly light with some moderate use. The population showed signs of sagebrush defoliator moth (*Aroga websteri*) damage in 2007, and were also infested by aphids and ants. Infestation by ants was noted to be high in 2012 as well. Other shrubs sampled in low density include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) and black sagebrush (*Artemisia nova*) (Table - Browse Characteristics).

Herbaceous Understory: Diversity of grasses is low, and composition is poor. Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) are the only common perennial species. Bluebunch wheatgrass provides the majority of the perennial grass cover. Cheatgrass (*Bromus tectorum*) is prevalent on the site and has dominated the herbaceous component in cover in many of the sample years. Perennial forb species are rare with the exception of Bonneville pea (*Lathyrus brachycalyx*), which provides nearly all of the forb cover on the site (Table - Herbaceous Trends).

Soil: The soil is classified as a Spager gravelly loam, which occurs on fan remnants. These soils are formed from alluvium derived from limestone, and are characterized as shallow over a calcium carbonate cemented hardpan and somewhat excessively drained (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of vegetation and litter cover providing protective ground cover (Table - Basic Cover). Past soil erosion is evident by exposed rock, pavement, and the presence of pedestalled plants. The soil erosion condition was classified as slight in 2007, but was stable in 2012.

Trend Assessments

Browse:

- **1983 to 1989 - slightly down (-1):** The density of basin big sagebrush remained the same at 1,332 plants/acre. The recruitment of young plants increased from 0% of the population to 10%. However, decadence increased from 30% to 70%, and plants exhibiting poor vigor increased from 10% to 55% of the population.
- **1989 to 1997 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. The recruitment of young basin big sagebrush plants decreased to 6% of the population. Decadence of big sagebrush decreased to 33%, and plants classified as showing poor vigor decreased to 18% of the population.

- **1997 to 2002 - down (-2):** Density of basin big sagebrush decreased 33% from 2,720 plants/acre to 1,820 plants/acre, though cover remained similar at 16%. There was no new recruitment of young basin big sagebrush plants sampled. Decadence of big sagebrush increased to 51%, and poor vigor increased to 26% of the population. A high proportion of the big sagebrush population showed insect damage.
- **2002 to 2007 - down (-2):** Density of basin big sagebrush decreased 40% to 1,100 plants/acre, and cover decreased to 14%. Decadence of big sagebrush decreased to 42%, but plants classified with poor vigor increased to 36% of the population. Insect use was evident; and many of the plants had use by ants and aphids, with some noticeable use by the sagebrush defoliator moth
- **2007 to 2012 - stable (0):** The density of basin big sagebrush remained similar at 1,120 plants/acre, but cover decreased slightly to 13%. Decadence of basing big sagebrush remained high at 36%, and poor vigor was high at 32%. Many plants were noted to be infested by ants.

Grass:
- **1983 to 1989 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 13%.
- **1989 to 1997 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 17%.
- **1997 to 2002 - stable (0):** The sum of nested frequency of perennial grasses decreased 17%, but cover increased from 9% to 12%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 11% to 8%.
- **2002 to 2007 - slightly down (-1):** The sum of nested frequency of perennial grasses remained similar, and cover increased slightly to 14%. The sum of nested frequency for cheatgrass increased significantly, and cover increased to 13%.
- **2007 to 2012 - stable (0):** The perennial grass sum of nested frequency increased 12%, but cover remained similar. The nested frequency of cheatgrass remained similar, but cover increased to 24%.

Forb:
- **1983 to 1989 - up (+2):** The sum of nested frequency of perennial forbs increased 60%. Trends for the forb component are driven primarily by changes in the Bonneville pea population. Other forb species are rare.
- **1989 to 1997 - slightly down (-1):** The sum of the nested frequency of perennial forbs decreased 14%.
- **1997 to 2002 - up (+2):** The sum of the nested frequency of perennial forbs increased 20%, and cover increased from 6% to 8%.
- **2002 to 2007 - stable (0):** The perennial forb sum of nested frequency remained similar, but cover increased to 12%.
- **2007 to 2012 - down (-2):** The sum of nested frequency of perennial forbs decreased 46%, and cover decreased to 3%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19A, 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
97	20.9	5.2	2.9	18.9	-8.2	10.0	0.0	**49.7**	Poor-Fair
02	20.8	-0.3	0.0	24.5	-5.7	10.0	0.0	**49.3**	Poor-Fair
07	18.1	2.3	4.5	27.6	-9.4	10.0	0.0	**53.1**	Fair
12	17.5	4.2	1.9	27.5	-17.7	6.1	0.0	**39.5**	Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	-	-	4	-	-	-	.18	-	-	-
G	Agropyron spicatum	$_{a}$119	$_{ab}$117	$_{c}$189	$_{bc}$159	$_{c}$177	$_{c}$175	7.63	11.31	12.28	10.55
G	Bromus tectorum (a)	-	-	$_{b}$329	$_{a}$270	$_{b}$311	$_{b}$317	10.92	7.61	12.58	23.64
G	Poa fendleriana	$_{b}$37	$_{a}$14	$_{a}$-	$_{a}$3	$_{a}$9	$_{a}$5	-	.00	.18	.18
G	Poa secunda	$_{b}$153	$_{ab}$138	$_{ab}$121	$_{a}$98	$_{a}$83	$_{ab}$122	1.63	.91	1.34	3.00
Total for Annual Grasses		0	0	329	270	311	317	10.92	7.61	12.58	23.64
Total for Perennial Grasses		309	269	314	260	269	302	9.44	12.23	13.81	13.74
Total for Grasses		309	269	643	530	580	619	20.36	19.85	26.40	37.39
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$19	$_{ab}$7	$_{ab}$8	-	.14	.04	.06
F	Arabis sp.	-	6	5	1	3	-	.01	.00	.03	-
F	Astragalus sp.	-	-	-	-	3	-	-	-	.03	-
F	Castilleja chromosa	-	2	1	-	-	-	.03	-	-	-
F	Cirsium sp.	-	-	-	-	-	-	.03	-	-	-
F	Crepis acuminata	-	-	3	2	8	-	.03	.01	.36	-
F	Delphinium nuttallianum	-	-	-	3	-	-	-	.00	-	-
F	Descurainia pinnata (a)	-	-	7	4	10	1	.02	.03	.05	.00
F	Erigeron pumilus	-	8	3	-	-	-	.00	-	-	-
F	Hackelia patens	-	-	2	-	-	-	.00	-	-	-
F	Lactuca serriola (a)	-	-	-	4	-	-	-	.03	-	-
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$41	$_{b}$56	$_{a}$4	-	.79	.28	.04
F	Lathyrus brachycalyx	$_{ab}$145	$_{c}$193	$_{bc}$182	$_{c}$196	$_{c}$206	$_{a}$116	5.74	8.05	11.60	2.95
F	Lomatium sp.	-	-	-	3	-	2	-	.00	-	.00
F	Machaeranthera canescens	-	1	1	-	-	-	.03	-	-	-
F	Oenothera sp.	-	8	-	-	-	-	-	-	-	-
F	Phlox longifolia	$_{a}$4	$_{bc}$25	$_{abc}$13	$_{c}$28	$_{abc}$15	$_{ab}$6	.06	.14	.11	.01
F	Sisymbrium altissimum (a)	-	-	$_{a}$12	$_{ab}$14	$_{b}$32	$_{ab}$14	.08	.35	.89	.22
F	Unknown forb-perennial	3	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	19	63	98	19	0.10	1.21	1.23	0.27
Total for Perennial Forbs		152	243	210	252	242	132	5.96	8.36	12.17	3.03
Total for Forbs		152	243	229	315	340	151	6.06	9.57	13.40	3.31

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

BROWSE TRENDS--
Management unit 19A, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia nova	5	6	7	7	.33	.36	.46	.59
B	Artemisia tridentata tridentata	64	50	38	41	16.40	16.31	14.03	13.44
B	Chrysothamnus viscidiflorus stenophyllus	18	14	14	16	.30	.71	1.28	1.22
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	1	0	-	-	-	-
Total for Browse		87	70	60	64	17.04	17.38	15.78	15.26

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 2

Species	Percent Cover		
	'02	'07	'12
Artemisia nova	.33	.38	.53
Artemisia tridentata tridentata	13.25	17.56	19.43
Chrysothamnus viscidiflorus stenophyllus	.31	1.43	1.18
Juniperus osteosperma	-	-	.18

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19A, Study no: 2

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata tridentata	1.7	1.0	1.1

BASIC COVER--
Management unit 19A, Study no: 2

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	2.00	12.00	39.64	45.36	51.31	56.87
Rock	6.75	11.50	5.11	8.21	3.76	6.69
Pavement	14.50	11.00	8.30	12.71	6.20	7.49
Litter	69.75	62.00	53.55	49.91	40.81	41.25
Cryptogams	1.75	1.25	1.38	1.75	.13	.65
Bare Ground	5.25	2.25	2.58	4.92	2.32	4.70

SOIL ANALYSIS DATA --

Management unit 19A, Study no: 2, Ochre Mountain

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.2	7.1	50.0	32.4	17.6	3.4	7.6	150.4	1.0

PELLET GROUP DATA--
Management unit 19A, Study no: 2

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	1	2	5	-
Horse	1	1	1	1
Elk	-	5	10	6
Deer	5	18	5	2
Cattle	5	3	1	5

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	5 (12)	-
15 (36)	29 (73)	12 (30)
44 (107)	1 (3)	7 (18)
3 (9)	4 (11)	33 (81)

BROWSE CHARACTERISTICS--
Management unit 19A, Study no: 2

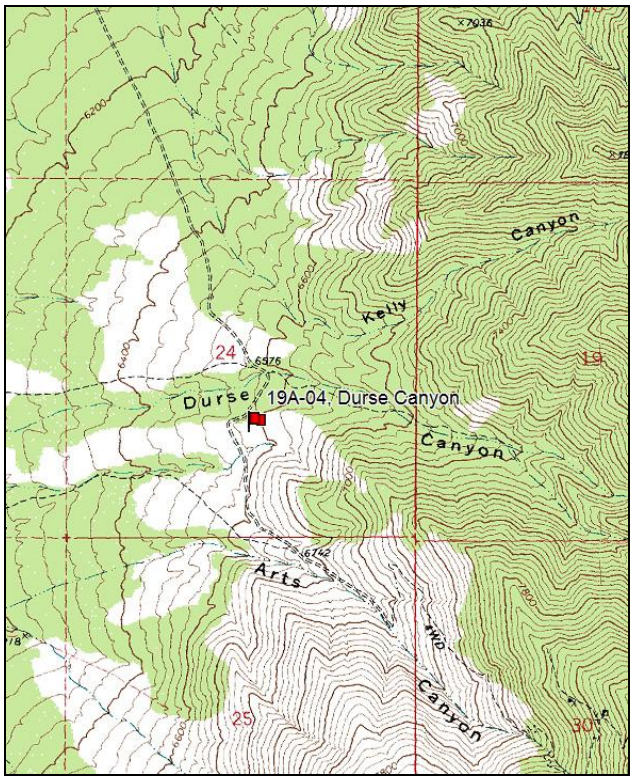
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia nova									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**220**	0	82	18	-	0	0	18	9/17
02	**260**	0	54	46	-	54	15	0	14/23
07	**360**	11	33	56	-	0	0	22	12/25
12	**280**	0	64	36	-	0	0	0	9/16
Artemisia tridentata tridentata									
83	**1332**	0	70	30	-	45	5	10	43/45
89	**1332**	10	20	70	-	50	5	55	35/39
97	**2720**	6	61	33	20	15	4	18	34/47
02	**1820**	0	49	51	-	15	12	26	36/46
07	**1100**	9	49	42	20	16	0	36	39/59
12	**1120**	4	61	36	-	25	0	32	34/53
Chrysothamnus viscidiflorus stenophyllus									
83	**399**	0	100	0	-	0	0	0	19/20
89	**133**	0	0	100	-	0	0	50	-/-
97	**460**	0	91	9	-	0	0	9	18/24
02	**340**	0	94	6	-	0	0	0	15/23
07	**300**	13	80	7	-	0	0	0	16/29
12	**380**	5	89	5	-	0	0	37	15/32
Chrysothamnus viscidiflorus viscidiflorus									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**20**	0	100	-	-	0	0	0	14/28
12	**0**	0	0	-	-	0	0	0	-/-

DURSE CANYON - TREND STUDY NO. 19A-4-12

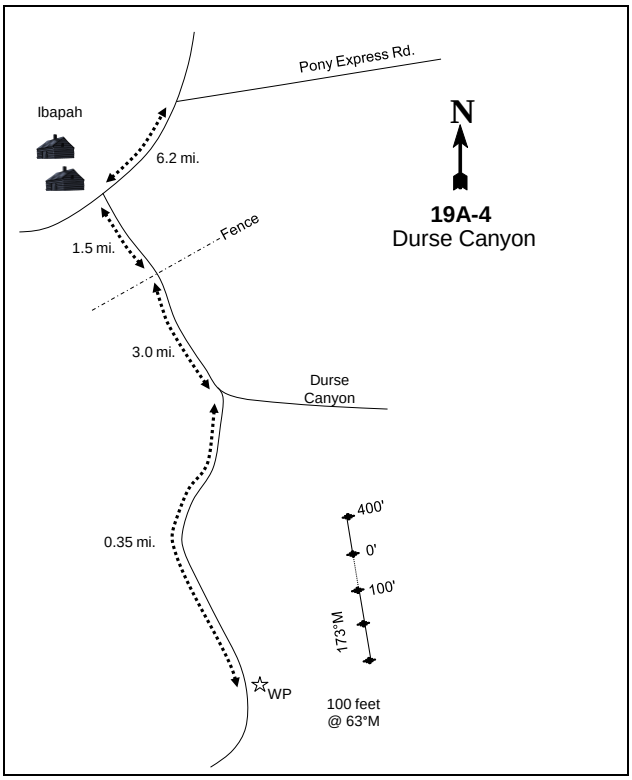
Vegetation Type: Cliffrose
Range Type: Crucial Elk Winter
NRCS Ecological Site Description: Upland Stony Loam (Singleleaf Pinyon-Utah Juniper), R028AY338UT
Land Ownership: BLM
Elevation: 6,600 ft. (2,017 m)
Aspect: West
Slope: 10%
Transect bearing: 173° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft)

Directions: From the intersection of the Pony Express Road to Gold Hill, and the oiled road to Ibapah and Goshute, proceed southwest towards Goshute for 6.2 miles to a dirt road to the east. Turn left and proceed southeast for 4.55 miles, turn right and go 0.15 miles to another fork. Continue 0.2 miles farther to a red steel "T" fencepost on the left (east) side of the road. From the fencepost, the 0-foot baseline stake is located 100 feet away at 63 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag number 3971 is attached to the 0-foot baseline stake.

Map Name: Goshute



Diagrammatic Sketch:



Township: 10S Range: 19W Section: 24

GPS: NAD 83, UTM 12S 249133 E 4425145 N

DURSE CANYON - TREND STUDY NO. 19A-4

Site Information

Site Description: The study is located on near the mouth of Durse Canyon on the west slope of the Deep Creek Mountains. The area is administered by the Bureau of Land Management (BLM) as part of the Ibapah allotment. The area is on a west facing bench occupied by a dense Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) community, which contains strong elements of Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and black sagebrush (*A. nova*). The Durse Canyon browse production-utilization transect is located in this area. Deer pellet groups were sampled in moderate abundance in 2002, but low abundance in 2012. Elk pellet groups have been sampled in low abundance since 2002 (Table - Pellet Group Data).

Browse: Browse composition is visually dominated by a vigorous and productive population of Stansbury cliffrose. Stansbury cliffrose provides the majority of the browse cover on the site (Table - Browse Trends). The cliffrose stand is comprised of a dense population of large, mature plants. Recruitment of young cliffrose plants has been good over the course of the study. Decadence has been low and vigor generally good, though plants displaying poor vigor increased substantially in 2012. Utilization of cliffrose has been mostly light over the course of the study years. The mountain big sagebrush and black sagebrush populations were combined in the past and reported as mostly mountain big sagebrush. After 1997, the two species were separated by morphological characteristics (plant size, leaf size, and leaf glands). Both sagebrush species occur in fairly low densities of mostly mature plants. Both sagebrush species have had high decadence or poor vigor over the course of the study. Utilization of the sagebrush species has been mostly light (Table - Browse Characteristics). Density of Utah juniper and singleleaf pinyon has remained relatively similar since 1997 (Table - Point-Quarter Tree Data), but cover has increased with canopies beginning to close (Table - Browse Trends). Photographs show few trees in the initial years of the study.

Herbaceous Understory: Due to the abundance of the browse component, the herbaceous understory is somewhat limited. Only a few grass species occur on the site. Sandberg bluegrass (*Poa secunda*) provides nearly all of the grass cover. Other perennial grass species sampled include bluebunch wheatgrass (*Agropyron spicatum*) and bottlebrush squirreltail (*Sitanion hystrix*). Cheatgrass (*Bromus tectorum*) was moderately abundant in 1997, but has been rare since 2002. Forbs are more diverse than grasses, but provide less cover. Perennial forbs showed a large reduction in frequency with the drought conditions in 2002. Longleaf phlox (*Phlox longifolia*), rock goldenrod (*Petradoria pumila*), lobeleaf groundsel (*Senecio multilobatus*), and Utah sweetvetch (*Astragalus utahensis*) are the most abundant forb species (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant gravelly loam, which occurs on fan remnants. These soils are formed from alluvium derived from limestone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). Bare ground cover has been low to moderate over the sample years, with vegetation and litter providing the majority of the protective ground cover. Rock and pavement also provide a large amount of ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2002, but was moderate in 2012.

Trend Assessments

Browse:

- **1983 to 1989 - slightly up (+1):** Density of cliffrose increased 23% from 998 plants/acre to 1,232 plants/acre. Mountain big sagebrush density remained similar at 2,598 plants/acre. Decadence of sagebrush increased from 26% to 55% of the population.
- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Recruitment of young cliffrose plants

decreased from 51% to 33%, but is still considered to be very good. Decadence of mountain big sagebrush remained high at 42%, and poor vigor increased from 12% to 40% of the population.

- **1997 to 2002 - slightly up (+1):** Cliffrose density remained similar at 820 plants/acre, but cover increased from 8% to 12%. Density of mountain big sagebrush increased 27% from 1,100 plants/acre to 1,400 plants/acre, and cover increased from 4% to 7%. Decadence of mountain big sagebrush increased to 50%, but poor vigor decreased slightly to 29%. Black sagebrush density increased 93% from 1,100 plants/acre to 2,120 plants/acre, but cover remained around 2%. Decadence of black sagebrush increased from 16% to 28%, and poor vigor increased from 5% to 21%.
- **2002 to 2012 - slightly down (-1):** Density of cliffrose decreased 20% to 660 plants/acre, though cover remained similar at 12%. Density of mountain big sagebrush decreased 16% to 1,180 plants/acre, but cover decreased to 1%. Decadence of mountain big sagebrush decreased to 29%, and poor vigor remained at 29%. Density of black sagebrush decreased 60% to 840 plants/acre, though cover remained similar at around 2%. Decadence of black sagebrush decreased to 10%, but poor vigor increased to 33% of the population. Juniper, pinyon, and cliffrose have increased in cover so much as to close interspaces, making it difficult to walk through the site.

Grass:

- **1983 to 1989 - up (+2):** Perennial grass sum of nested frequency increased two-fold.
- **1989 to 1997 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1997 to 2002 - slightly up (+1):** Perennial grass sum of nested frequency remained similar, but cheatgrass decreased significantly in nested frequency. Cover of cheatgrass decreased from 4% to less than 1%.
- **2002 to 2012 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 16%.

Forb:

- **1983 to 1989 - down (-2):** The sum of nested frequency of perennial forbs decreased 43%.
- **1989 to 1997 - up (+2):** The perennial forb sum of nested frequency increased two-fold.
- **1997 to 2002 - down (-2):** The sum of nested frequency of perennial forbs decreased 66%, and cover decreased from 4% to 1%. Perennial forbs became rare on the site.
- **2002 to 2012 - stable (0):** Perennial forb sum of nested frequency increased slightly, but forb species remain rare on the site. Perennial forb cover remained near 1%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19A, 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
97	19.4	10.5	15.0	10.8	-2.8	7.8	0.0	**60.7**	Fair
02	28.6	6.3	7.1	11.6	-0.2	1.8	0.0	**55.2**	Fair
12	21.7	11.7	7.5	13.5	-0.5	1.9	0.0	**55.8**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'12	'97	'02	'12
G	Agropyron spicatum	a3	ab13	b25	ab15	ab5	.20	.10	.01
G	Bromus tectorum (a)	-	-	c235	a27	b62	3.73	.24	.61
G	Poa fendleriana	a-	b17	a1	a-	a-	.03	-	-
G	Poa pratensis	2	9	-	-	-	-	-	-
G	Poa secunda	a77	b188	b194	b213	b205	4.24	5.47	6.68
G	Sitanion hystrix	b42	b46	b36	ab24	a3	.91	.21	.03
Total for Annual Grasses		0	0	235	27	62	3.73	0.24	0.61
Total for Perennial Grasses		124	273	256	252	213	5.39	5.79	6.73
Total for Grasses		124	273	491	279	275	9.13	6.03	7.34
F	Alyssum alyssoides (a)	-	-	b12	a-	ab3	.05	-	.00
F	Antennaria sp.	-	1	-	-	-	-	-	-
F	Arabis sp.	b19	ab6	ab6	a-	a-	.40	-	.03
F	Asclepias labriformis	4	-	5	-	-	.09	-	-
F	Astragalus sp.	-	-	1	-	-	.00	-	-
F	Astragalus utahensis	a13	a3	c58	a9	b32	1.55	.03	.55
F	Camelina microcarpa (a)	-	-	b15	a-	a-	.26	-	-
F	Castilleja sp.	-	-	4	-	-	.03	-	-
F	Collinsia parviflora (a)	-	-	b17	a-	ab5	.06	-	.01
F	Cryptantha sp.	c48	bc37	a19	a6	ab24	.06	.01	.10
F	Descurainia pinnata (a)	-	1	2	-	-	.01	-	-
F	Epilobium brachycarpum (a)	-	-	4	-	-	.01	-	-
F	Ipomopsis aggregata	b9	b11	ab9	a-	-	.02	-	-
F	Lathyrus brachycalyx	-	1	-	6	1	-	.01	.00
F	Linum lewisii	1	1	-	-	-	-	-	-
F	Lithospermum ruderale	a1	b13	a-	a-	a-	-	-	-
F	Lygodesmia spinosa	10	4	-	4	1	-	.01	.03
F	Machaeranthera canescens	ab6	a-	b12	a2	a-	.05	.01	-
F	Microsteris gracilis (a)	-	-	2	-	-	.00	-	-
F	Oenothera sp.	-	2	-	-	-	-	-	-
F	Petradoria pumila	a-	a1	b21	ab18	ab12	.72	.73	.16
F	Phlox longifolia	a20	a14	b65	a23	a38	.24	.08	.08
F	Ranunculus testiculatus (a)	-	-	b16	a-	a-	.06	-	-
F	Senecio multilobatus	b57	a2	a3	a10	a1	.01	.02	.00
F	Streptanthus cordatus	a-	a-	b31	a-	a-	.67	-	-
F	Unknown forb-perennial	-	8	-	-	-	-	-	-
F	Zigadenus paniculatus	1	3	-	2	4	.00	.00	.00
Total for Annual Forbs		0	1	68	0	8	0.45	0	0.01
Total for Perennial Forbs		189	107	234	80	113	3.89	0.91	0.96
Total for Forbs		189	108	302	80	121	4.34	0.91	0.98

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

BROWSE TRENDS--
Management unit 19A, Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'12	'97	'02	'12
B	Artemisia nova	20	16	15	1.96	1.50	1.79
B	Artemisia tridentata vaseyana	33	39	32	3.84	6.97	1.39
B	Chrysothamnus viscidiflorus viscidiflorus	21	11	3	.53	.61	-
B	Cowania mexicana stansburiana	33	32	28	8.11	12.01	11.80
B	Grayia spinosa	15	8	5	-	.30	.36
B	Gutierrezia sarothrae	23	22	2	.65	.35	-
B	Juniperus osteosperma	10	9	8	6.03	4.03	7.87
B	Opuntia sp.	8	8	7	.09	.15	-
B	Pinus monophylla	8	13	10	2.78	8.22	5.80
B	Purshia tridentata	0	1	0	-	-	-
Total for Browse		171	159	110	24.03	34.16	29.02

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 4

Species	Percent Cover	
	'02	'12
Artemisia nova	2.09	1.71
Artemisia tridentata vaseyana	3.43	2.01
Chrysothamnus viscidiflorus viscidiflorus	.05	-
Cowania mexicana stansburiana	12.76	18.58
Grayia spinosa	.35	.48
Gutierrezia sarothrae	1.03	.06
Juniperus osteosperma	6.38	13.00
Opuntia sp.	-	.06
Pinus monophylla	14.86	16.41

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19A, Study no: 4

Species	Average leader growth (in)	
	'02	'12
Artemisia tridentata vaseyana	-	1.4
Cowania mexicana stansburiana	1.5	1.9

POINT-QUARTER TREE DATA--
Management unit 19A, Study no: 4

Species	Trees per Acre			Average diameter (in)		
	'97	'02	'12	'97	'02	'12
Juniperus osteosperma	374	442	351	3.9	2.7	4.2
Pinus monophylla	347	286	351	4.1	2.5	3.9

BASIC COVER--
Management unit 19A, Study no: 4

Cover Type	Average Cover %				
	'83	'89	'97	'02	'12
Vegetation	1.25	6.00	35.58	38.04	35.93
Rock	5.75	4.50	5.16	7.74	11.35
Pavement	16.50	25.00	19.35	24.56	11.92
Litter	54.00	53.25	39.18	41.39	51.72
Cryptogams	1.50	3.75	1.75	3.37	.52
Bare Ground	21.00	7.50	8.62	13.97	11.88

SOIL ANALYSIS DATA --
Management unit 19A, Study no: 4, Durse Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.1	7.2	38.0	37.4	24.6	4.0	15.9	150.4	0.7

PELLET GROUP DATA--
Management unit 19A, Study no: 4

Type	Quadrat Frequency		
	'97	'02	'12
Rabbit	11	9	10
Elk	-	-	1
Deer	10	10	1

Days use per acre (ha)	
'02	'12
-	-
6 (15)	1 (2)
34 (84)	11 (28)

BROWSE CHARACTERISTICS--
Management unit 19A, 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)
Artemisia nova									
83	**132**	0	75	25	-	100	0	0	29/43
89	**33**	0	100	0	-	0	0	0	7/12
97	**1100**	38	45	16	100	2	0	5	13/20
02	**2120**	26	45	28	-	3	0	21	11/18
12	**840**	17	74	10	20	0	0	33	11/22
Artemisia tridentata vaseyana									
83	**2564**	19	55	26	99	49	10	14	25/25
89	**2598**	10	35	55	66	8	0	12	22/25
97	**1100**	22	36	42	80	9	0	40	20/27
02	**1400**	10	40	50	20	3	0	29	17/25
12	**1180**	12	59	29	20	2	0	29	14/22

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus									
83	**498**	0	80	20	-	0	0	20	12/15
89	**699**	19	33	48	99	0	0	19	8/14
97	**520**	35	62	4	20	0	0	4	9/14
02	**580**	0	86	14	-	0	0	7	8/16
12	**60**	0	100	0	-	0	0	67	9/16
Cowania mexicana stansburiana									
83	**998**	50	50	0	-	3	0	0	54/31
89	**1232**	51	46	3	233	0	0	0	79/69
97	**840**	33	64	2	160	2	0	2	66/56
02	**820**	15	68	17	-	17	2	5	67/64
12	**660**	15	76	9	-	0	0	24	66/71
Grayia spinosa									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**560**	75	25	0	40	0	0	0	15/33
02	**240**	8	58	33	-	0	0	8	17/30
12	**120**	0	83	17	-	0	0	17	15/24
Gutierrezia sarothrae									
83	**2566**	13	87	0	-	0	0	0	6/7
89	**1633**	0	100	0	-	0	0	0	7/8
97	**1520**	47	51	1	100	0	0	1	8/10
02	**1180**	2	88	10	-	0	0	3	6/6
12	**40**	0	100	0	-	0	0	0	9/10
Juniperus osteosperma									
83	**66**	50	50	-	33	0	0	0	45/18
89	**265**	63	37	-	-	0	0	0	209/89
97	**200**	70	30	-	100	0	0	0	-/-
02	**180**	44	56	-	60	0	0	0	-/-
12	**160**	50	50	-	100	0	0	0	-/-
Opuntia sp.									
83	**166**	20	80	-	-	0	0	0	7/12
89	**33**	100	0	-	33	0	0	0	-/-
97	**220**	18	82	-	-	0	0	0	6/13
02	**240**	8	92	-	-	0	0	0	5/10
12	**200**	10	90	-	-	0	0	10	5/12
Pinus monophylla									
83	**232**	57	43	0	-	0	0	0	67/71
89	**299**	78	22	0	66	0	0	0	138/98
97	**180**	67	33	0	60	0	0	0	-/-
02	**280**	43	50	7	120	0	0	14	-/-
12	**200**	40	60	0	100	0	10	10	-/-

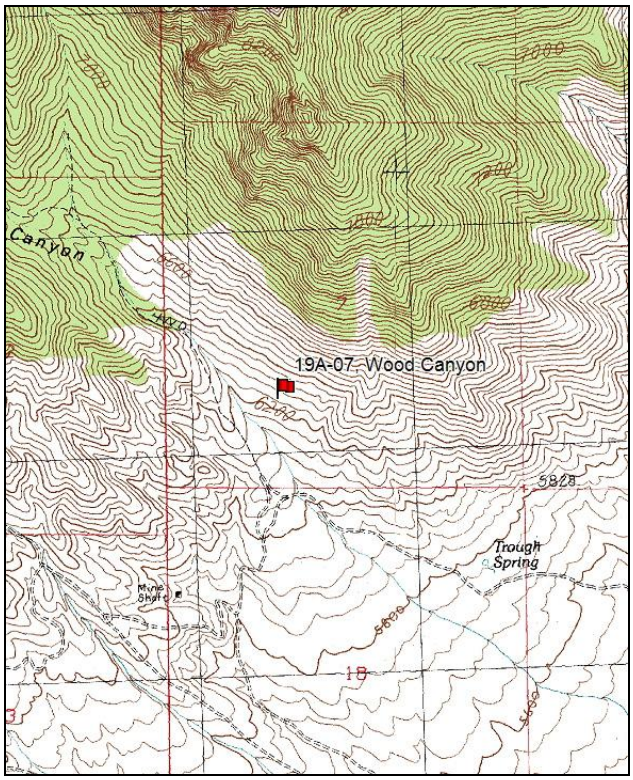
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Polygala acanthoclada									
83	**0**	0	0	0	-	0	0	0	-/-
89	**66**	0	50	50	-	0	0	0	13/8
97	**0**	0	0	0	-	0	0	0	-/-
02	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Purshia tridentata									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**0**	0	0	0	-	0	0	0	-/-
02	**20**	0	0	100	-	0	0	100	6/11
12	**0**	0	0	0	-	0	0	0	-/-
Tetradymia spinosa									
83	**33**	0	100	-	-	0	0	0	10/10
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

WOOD CANYON - TREND STUDY NO. 19A-7-12

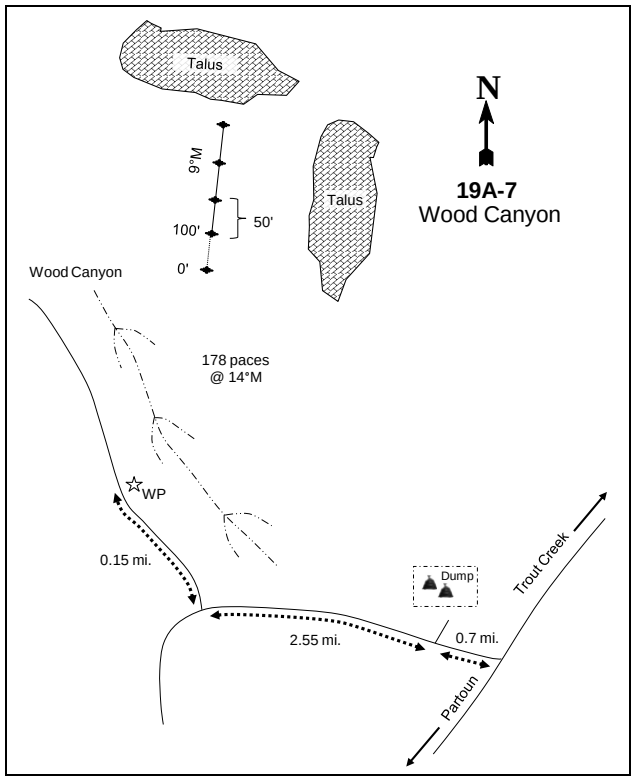
Vegetation Type: Annual/Perennial Grass
Range Type: Crucial Deer Winter/Spring
NRCS Ecological Site Description: Semidesert Shallow Loam (Black Sagebrush), R028AY236UT
Land Ownership: BLM
Elevation: 6,200 ft. (1,880 m)
Aspect: South
Slope: 30-35%
Transect bearing: 9° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is placed on the 2ft mark on belt 1, and 1ft mark on belt 2

Directions: From Trout Creek on the Gandy Road through Snake Valley, go south to the old Partoun dump (Now covered over). Turn west and continue 0.7 miles to the Trough Springs Turnoff. Take this road west for 3.25 miles to the turn-off to Wood Canyon. Turn right and go 0.15 miles to a witness post on the right side of the road. From the witness post, walk 178 paces north (14°M) to the 0-foot baseline stake which is behind a large rock. The baseline runs uphill at 9 degrees magnetic.

Map Name: Partoun



Diagrammatic Sketch:



Township: 13S Range: 18W Section: 7

GPS: NAD 83, UTM 12S 149327 E 4398447 N

WOOD CANYON - TREND STUDY NO. 19A-7

Site Information

Site Description: This study is located on the southeast end of the Deep Creek Mountains on land administered by the Bureau of Land Management (BLM) as part of the Partoun allotment. Rugged cliffs cap the ridge north of the study, and it is surrounded by miles of vast open desert to the south and east. The study was established in 1989 to monitor bighorn sheep habitat, but it mainly receives winter use by deer. Chukars were heard on the nearby ledges in 1989, 1997 and 2012. In 2007, pronghorn were spotted a half mile east of the study. A stock pond 1 mile to the east is the closest apparent water source. Deer/antelope pellet groups have been sampled in low abundance since 2002. Elk pellet groups have been sampled in low abundance since 2002. Cattle sign was sampled in low abundance since 2002. Horse pellet groups were sampled in low abundance since 2002. Grouse pellet groups were sampled in 2002 (Table - Pellet Group Data).

Browse: The browse component consists of a variety of species, but browse is not abundant on the site. Shadscale (*Atriplex confertifolia*) was common on the site at the outset of the study, but has steadily decreased in density since 1997. The shadscale population is comprised mostly of mature plants. Recruitment of young shadscale plants has been poor over most of the sample years. Decadence and poor vigor were high from 1997 to 2007, but were low in 1989 an 2012. Utilization of shadscale has been mostly light over the sample years. Nevada ephedra (*Ephedra nevadensis*) occurs in a low density population of young and mature plants scattered over the site. Decadence of ephedra has typically been low, but poor vigor has been very high since 2002. Utilization of ephedra was mostly light at the outset of the study, but has been moderate to heavy since 2002. Broom snakeweed (*Gutierrezia sarothrae*) occurs on the site in moderate density. This is a mature population that fluctuates with precipitation changes. Other low density browse species that were sampled include winterfat (*Ceratoides lanata*), summer cypress (*Kochia americana*), black sagebrush (*Artemisia nova*), cottonthorn horsebrush (*Tetradymia spinosa*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), and pricklypear cactus (*Opuntia sp.*) (Table - Browse Characteristics).

Herbaceous Understory: Perennial grass species on the site are fairly diverse, but are not particularly abundant. Galleta (*Hilaria jamesii*) is the most abundant perennial grass. Other perennials sampled include Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), sand dropseed (*Sporobolus cryptandrus*), and needle-and-thread grass (*Stipa comata*). The annual species cheatgrass (*Bromus tectorum*) is prevalent and often provides the majority of grass cover on the site. The forb component is sparse, especially perennial forb species. Storksbill (*Erodium cicutarium*), a winter annual, has been the only common forb species sampled on the site (Table - Herbaceous Trends).

Soil: The soil is a very gravelly loam with a mildly alkaline soil reaction (pH 7.4) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of rock and pavement cover providing the majority of the protective ground cover (Table - Basic Cover). Erosion has been negligible despite fair vegetation and litter cover because boulders, rocks and pavement are very abundant and armor the soil. The soil erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence of shadscale increased slightly from 18% to 23%, and poor vigor increased from 0% to 20%. Decadence of Nevada ephedra decreased from 20% to 0%. The recruitment of young ephedra plants decreased from 40% to 0% of the population.
- **1997 to 2002 - slightly down (-1):** Shadscale density decreased 19% from 1,400 plants/acre to 1,140 plants/acre, and cover decreased from 2% to less than 1%. The recruitment of young shadscale plants

increased to 30% of the population. Decadence of shadscale increased to 44%, and poor vigor increased to 35% of the population. Nevada ephedra density increased two-fold from 160 plants/acre to 320 plants/acre, and cover increased form less than 1% to just over 1%. The recruitment of young ephedra increased to 25% of the population. Decadence of ephedra increased to 13%, and poor vigor increased from 0% to 75% of the population

- **2002 to 2007 - slightly down (-1):** The shadscale density decreased 30% to 800 plants/acre, and cover remained less than 1%. The recruitment of young shadscale plants decreased to 0% of the population. Decadence of shadscale remained high at 38%, and poor vigor increased to 48% of the population. The density of Nevada ephedra remained the same at 420 plants/acre, but cover increased slightly to 2%. The recruitment of young ephedra plants increased to 31% of the population. Decadence of ephedra increased to 19%, and poor vigor remained high at 50%. The density of winterfat increased from 40 plants/acre to 260 plants/acre.
- **2007 to 2012 - slightly down (-1):** Shadscale density decreased 38% to 500 plants/acre, and cover was near 0%. Decadence of shadscale decreased to 0%, and poor vigor decreased to 4% of the population. Ephedra density increased slightly to 360 plants/acre, but cover decreased to 1%. Decadence of ephedra decreased to 6%, but poor vigor remained high at 50%. Winterfat density increased to 380 plants/acre.

Grass:

- **1989 to 1997 - up (+2):** The sum of the nested frequency of perennial grasses increased 68%, and the nested frequency of galleta and needle-and-thread increased significantly.
- **1997 to 2002 - down (-2):** The perennial grass sum of nested frequency decreased 23%, and cover decreased from 8% to 3%. However, cheatgrass nested frequency also decreased significantly, and cover decreased from 6% to 2%.
- **2002 to 2007 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 25%, and cover increased to 5%. However, cheatgrass nested frequency also increased significantly, and cover increased to 9%.
- **2007 to 2012 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, but cover increased to 9%. Cheatgrass decreased significantly in nested frequency, but cover increased to 10%.

Forb:

- **1989 to 1997 - stable (0):** Perennial forb species are rare on the site.
- **1997 to 2002 - stable (0):** Perennial forb species are rare on the site.
- **2002 to 2007 - stable (0):** Perennial forb species are rare on the site.
- **2007 to 2012 - stable (0):** Perennial forb species are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19A, 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
97	3.3	0.0	0.0	15.6	-4.6	0.2	0.0	**14.5**	Poor
02	2.3	0.0	0.0	6.0	-1.5	0.0	0.0	**6.8**	Very Poor
07	3.0	0.0	0.0	9.5	-6.5	0.0	0.0	**6.1**	Very Poor
12	2.1	0.0	0.0	18.1	-7.8	0.2	0.0	**12.7**	Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 7

Type	Species	Nested Frequency					Average Cover %			
		'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Bromus tectorum (a)	-	$_{b}$351	$_{a}$304	$_{b}$342	$_{a}$313	6.15	2.00	8.62	10.36
G	Hilaria jamesii	$_{a}$59	$_{b}$119	$_{ab}$78	$_{ab}$84	$_{c}$159	4.03	.97	1.47	7.05
G	Oryzopsis hymenoides	$_{b}$63	$_{ab}$47	$_{a}$27	$_{a}$25	$_{a}$28	1.81	.60	.39	1.14
G	Poa secunda	$_{a}$-	$_{a}$5	$_{a}$6	$_{b}$24	$_{ab}$17	.06	.04	.23	.19
G	Sitanion hystrix	$_{ab}$15	$_{ab}$17	$_{a}$2	$_{b}$28	$_{a}$3	.34	.03	1.06	.06
G	Sporobolus cryptandrus	$_{a}$-	$_{a}$3	$_{b}$24	$_{b}$37	$_{a}$1	.06	.20	.66	.00
G	Stipa comata	$_{a}$8	$_{b}$52	$_{b}$50	$_{ab}$36	$_{a}$17	1.50	1.16	.92	.61
Total for Annual Grasses		0	351	304	342	313	6.15	2.00	8.62	10.36
Total for Perennial Grasses		145	243	187	234	225	7.82	3.01	4.75	9.07
Total for Grasses		145	594	491	576	538	13.98	5.01	13.37	19.44
F	Alyssum alyssoides (a)	-	$_{a}$11	$_{a}$5	$_{b}$69	$_{a}$-	.02	.01	.33	-
F	Astragalus sp.	3	1	-	-	7	.03	-	-	.09
F	Erigeron sp.	-	7	-	-	-	.03	-	-	-
F	Erodium cicutarium (a)	-	$_{b}$83	$_{c}$239	$_{d}$296	$_{a}$51	1.17	1.92	4.83	.38
F	Gilia sp. (a)	-	-	-	3	-	-	-	.00	-
F	Halogeton glomeratus (a)	$_{b}$13	$_{ab}$3	$_{a}$-	$_{ab}$1	$_{a}$-	.00	-	.03	-
F	Lappula occidentalis (a)	-	-	-	6	-	-	-	.01	-
F	Phlox longifolia	-	-	-	2	3	-	-	.00	.00
F	Sphaeralcea grossulariifolia	9	2	-	-	7	.03	-	-	.01
F	Unknown forb-perennial	2	-	-	-	-	-	-	-	-
Total for Annual Forbs		13	97	244	375	51	1.20	1.93	5.21	0.37
Total for Perennial Forbs		14	10	0	2	17	0.09	0	0.00	0.11
Total for Forbs		27	107	244	377	68	1.29	1.93	5.22	0.49

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

BROWSE TRENDS--
Management unit 19A, Study no: 7

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia nova	0	0	0	2	-	-	-	.15
B	Atriplex confertifolia	42	33	26	20	2.31	.72	.52	.15
B	Ceratoides lanata	3	2	4	4	-	-	.15	.15
B	Chrysothamnus viscidiflorus stenophyllus	5	4	6	2	.53	.30	.33	.38
B	Echinocereus sp.	0	9	8	10	-	.01	.04	.03
B	Ephedra nevadensis	6	10	10	11	.78	1.25	1.86	1.23
B	Gutierrezia sarothrae	87	72	81	60	4.98	2.21	3.49	2.09
B	Kochia americana	0	5	1	1	.03	.03	-	-
B	Opuntia sp.	18	24	23	10	1.03	.82	.67	.30
B	Tetradymia spinosa	5	5	6	4	1.34	.21	.42	.76
Total for Browse		166	164	165	124	11.01	5.58	7.49	5.25

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 7

Species	Percent Cover		
	'02	'07	'12
Atriplex confertifolia	.81	.68	.45
Ceratoides lanata	-	.01	.03
Chrysothamnus viscidiflorus stenophyllus	.16	.30	.20
Ephedra nevadensis	1.75	1.29	1.03
Gutierrezia sarothrae	2.29	4.15	2.08
Kochia americana	.43	-	-
Opuntia sp.	.80	.31	-
Tetradymia spinosa	-	1.14	.63

BASIC COVER--
Management unit 19A, Study no: 7

Cover Type	Average Cover %				
	'89	'97	'02	'07	'12
Vegetation	7.25	29.85	13.73	27.17	26.10
Rock	23.25	29.92	34.00	31.52	35.75
Pavement	38.75	23.06	27.17	23.67	19.58
Litter	23.50	21.44	18.53	23.85	18.90
Cryptogams	0	.31	.44	.01	.03
Bare Ground	7.25	6.78	13.98	3.96	14.07

SOIL ANALYSIS DATA --

Management unit 19A, Study no: 7, Wood Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.4	7.4	50.0	31.4	18.6	1.5	9.2	233.6	0.8

PELLET GROUP DATA--
Management unit 19A, Study no: 7

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	4	4	8	4
Horse	-	1	1	1
Elk	2	-	-	-
Deer/ Antelope	9	10	6	4
Cattle	-	-	1	-
Grouse	-	-	-	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	1 (1)	2 (4)
1 (2)	3 (8)	3 (8)
14 (35)	13 (33)	5 (13)
8 (20)	6 (14)	3 (7)
17 pellet groups/acre	-	-

BROWSE CHARACTERISTICS--
Management unit 19A, 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)
Artemisia nova									
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	13/20
02	**0**	0	0	-	-	0	0	0	8/17
07	**0**	0	0	-	-	0	0	0	11/27
12	**140**	0	100	-	-	0	0	0	9/25
Atriplex confertifolia									
89	**1132**	0	82	18	-	0	0	0	10/17
97	**1400**	10	67	23	20	14	7	20	10/23
02	**1140**	30	26	44	-	4	4	35	6/15
07	**800**	0	63	38	-	3	0	48	7/19
12	**500**	4	96	0	-	4	0	4	6/15
Ceratoides lanata									
89	**99**	0	67	33	-	0	0	0	11/15
97	**60**	0	100	0	-	33	0	0	9/10
02	**40**	0	50	50	-	0	100	50	5/10
07	**260**	0	100	0	-	0	8	0	6/10
12	**380**	63	37	0	-	0	0	0	6/10
Chrysothamnus viscidiflorus stenophyllus									
89	**99**	0	100	0	-	0	0	0	8/10
97	**100**	0	80	20	-	0	0	20	48/16
02	**80**	0	50	50	-	0	25	25	7/17
07	**120**	0	83	17	-	17	0	17	8/17
12	**40**	0	50	50	-	0	0	100	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)
Coryphantha vivipara arizonica									
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	4/6
Echinocereus sp.									
89	**66**	100	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**200**	20	80	-	-	0	0	0	3/6
07	**160**	13	88	-	20	0	0	0	3/6
12	**200**	0	100	-	-	0	0	0	4/6
Ephedra nevadensis									
89	**332**	40	40	20	-	0	0	0	11/21
97	**160**	0	100	0	-	13	0	0	17/35
02	**320**	25	63	13	-	56	6	75	18/46
07	**320**	31	50	19	-	13	19	50	18/48
12	**360**	28	67	6	-	22	33	50	19/39
Gutierrezia sarothrae									
89	**4531**	18	60	23	-	0	0	12	7/6
97	**5200**	7	80	13	60	0	0	11	8/12
02	**3320**	4	67	28	-	0	.60	33	5/9
07	**4040**	3	83	14	-	.49	0	5	8/14
12	**2180**	4	95	1	20	0	0	2	7/13
Kochia americana									
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**240**	58	42	-	-	0	8	0	5/8
07	**40**	0	100	-	-	100	0	0	9/15
12	**60**	0	100	-	-	0	0	0	10/16
Opuntia sp.									
89	**599**	56	39	6	-	0	0	6	5/12
97	**460**	9	87	4	-	0	0	4	10/17
02	**500**	16	68	16	-	0	0	20	4/13
07	**520**	0	85	15	-	4	0	12	5/15
12	**220**	27	73	0	-	0	0	9	4/7
Tetradymia spinosa									
89	**66**	0	0	100	-	0	0	0	-/-
97	**100**	0	60	40	-	20	0	20	15/28
02	**100**	0	0	100	-	0	0	100	18/32
07	**120**	0	0	100	-	0	0	100	17/47
12	**80**	0	50	50	-	0	0	75	17/28

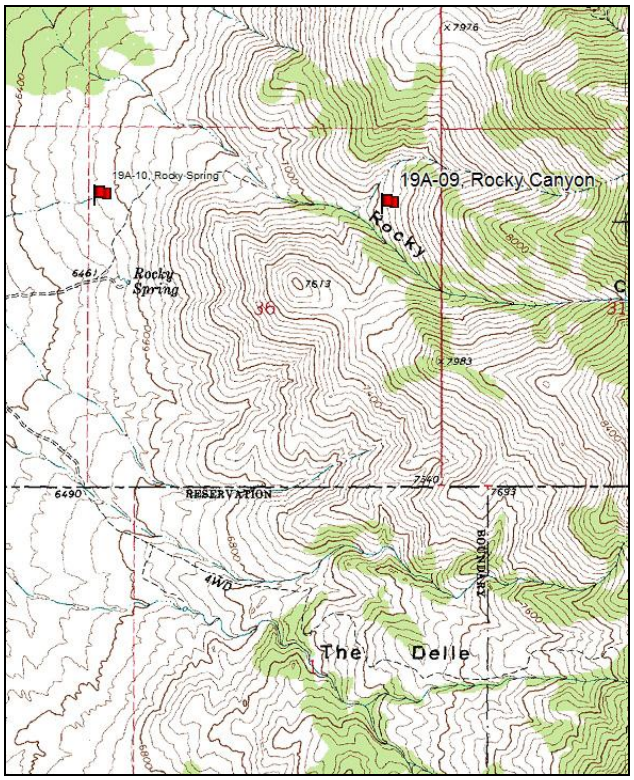
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Yucca sp.									
89	**33**	0	100	-	-	0	0	0	18/37
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	21/23
12	**0**	0	0	-	-	0	0	0	16/26

ROCKY CANYON - TREND STUDY NO. 19A-9-12

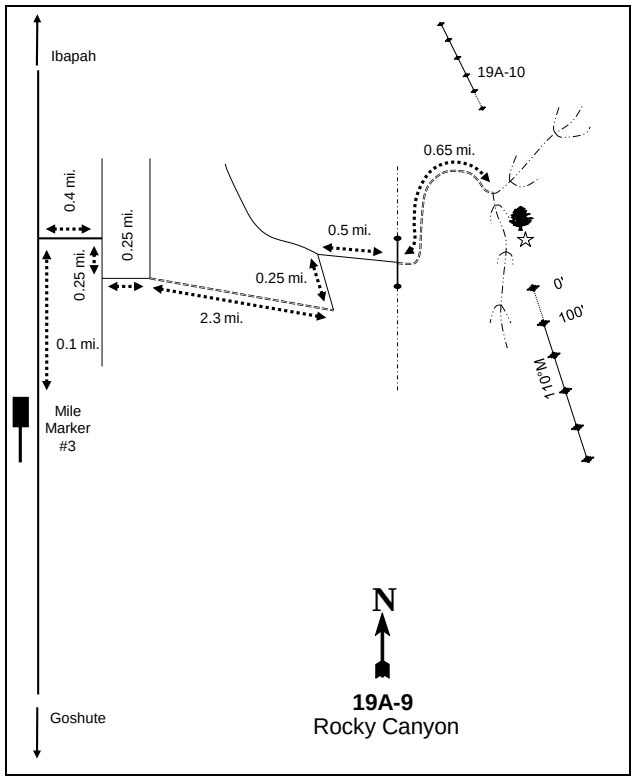
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter, Crucial Elk Summer/Fall
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: Private
Elevation: 7,200 ft. (2,187 m)
Aspect: Southwest
Slope: 34%
Transect bearing: 110° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: Rebar is on 1ft mark on belt 3

Directions: From the main road between Ibapah and Goshute, turn east onto a road that is 0.1 miles north of mile marker 3. Go for 0.4 miles to an intersection. Turn right and go 0.25 mile to another intersection. Turn left and go 2.3 miles on a 4WD road that is faint in places to another intersection. Turn right and go 0.25 miles to another intersection. Turn right and go 0.5 miles to a gate. Drive through the gate and follow the road to the left for 0.65 miles, passing a witness post on the left side of the road. The witness post is for 19A-10. At 0.65 miles (0.4 miles after the witness post) the road comes to an end. Park here and walk easterly in the drainage. The drainage will split; from here walk 200 feet eastward out of the drainage toward a lone juniper. The 0-foot stake is 20 feet east of the juniper. The 0-foot stake is marked by browse tag 413.

Map Name: Goshute



Diagrammatic Sketch:



Township: 10S Range: 19W Section: 36

GPS: NAD 83, UTM 12S 249542 E 4422646 N

ROCKY CANYON - TREND STUDY NO. 19A-9

Site Information

Site Description: The study was established to monitor crucial deer and elk range on the west side of the Deep Creek Mountains. It is located within a natural travel corridor for elk that move down onto the lower flats during winter months, and monitors a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. Elk pellet groups have been sampled in moderate abundance since 2002. An elk carcass was noted in 2007. Deer pellet groups have been sampled in low to moderate abundance since 2002. A deer carcass was noted in 2012. Cattle sign has been sampled in low abundance since 2002 (Table - Pellet Group Data). Cattle were grazing the area in 2002, especially within the canyon bottom leading up to the site.

Browse: The browse component is dominated by mountain big sagebrush, and provides the majority of the browse cover on the site (Table - Browse Trends). The mountain big sagebrush stand is comprised of a dense population of mostly mature plants. Recruitment of young mountain big sagebrush has been low over the course of the study. Decadence of mountain big sagebrush was moderately high in 2002 and 2007, but was low in 2012. Poor vigor of mountain big sagebrush was relatively high in 2007, but was low in other sample years. In 2007, the sagebrush defoliator moth (*Aroga websteri*) was sampled on 11% of the population. Utilization of mountain big sagebrush was mostly light to moderate over the course of the study. Black sagebrush (*Artemisia nova*) occurs with a moderate density of mostly mature plants. Utilization of black sagebrush was light since 2002. Some of the fluctuation in sagebrush densities may be due to possible hybridization between the two species or misidentification. Other browse sampled include Myrtle pachistima (*Pachistima myrsinites*), gray rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*), slenderbush eriogonum (*Eriogonum microthecum)*, broom snakeweed (*Gutierrezia sarothrae*), Oregon grape (*Mahonia repens*), and pediocactus (*Pediocactus simpsonii*) (Table - Browse Characteristics).

Herbaceous Understory: The grass component is not particularly diverse, but is quite abundant. Bluebunch wheatgrass (*Agropyrom spicatum*), Sandberg bluegrass (*Poa secunda*), and mutton bluegrass (*P. fendleriana*) are the prevalent perennial grasses. The weedy species bulbous bluegrass (*P. bulbosa*) is present on the site in low frequency and cover. Cheatgrass (*Bromus tectorum*) has also been sampled on the site in low frequency and cover. Perennial forb species are fairly diverse, but are not overly abundant. Silvery lupine (*Lupinus argenteus*) dominates the forb component (Table - Herbaceous Trends). Utilization of the lupine by crickets was noted in 2002.

Soil: The soil is in the Podmor-Obaqui-Rock outcrop association and is likely part of the Onaqui component, which is found on ridges and mountain sides. The parent material consists of colluvium derived from quartzite and/or residuum weathered from quartzite (Soil Survey Staff 2011). The soil texture is a loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). It is very rocky both on the surface and throughout the profile. Bare ground cover is low with high amounts of vegetation, litter, and rock providing protective ground cover (Table - Basic Cover). The erosion condition was classified as slight in 2007 and 2012.

Trend Assessments

Browse:

- **2002 to 2007 - down (-2):** The density of mountain big sagebrush decreased 42% from 5,340 plants/acre to 3,100 plants/acre, and cover from 21% to 13%. Decadence of big sagebrush increased from 21% to 35%, and poor vigor increased from 13% to 28% of the population. Black sagebrush density increased nearly three-fold from 440 plants/acre to 1,260 plants/acre, and cover increased from 1% to 2%. Decadence of black sagebrush increased from 18% to 27%, and poor vigor increased from 5% to 17% of the population. With the fluctuation in sagebrush densities from 2002 to 2007 it may be possible that there was some hybridization between the two species or misidentification that has occurred. However, overall the density and cover of sagebrush species decreased.

- **2007 to 2012 - slightly up (+1):** The density of mountain big sagebrush increased 34% to 4,160 plants/acre, and cover increased slightly to 14%. Decadence of mountain big sagebrush decreased to 11%, and poor vigor decreased to 6% of the population. Black sagebrush density decreased 50% to 880 plants/acre, and but cover increased to 3%. Decadence of black sagebrush decreased to 5%, and poor vigor decreased to 2% of the population.

Grass:

- **2002 to 2007 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 19%, and cover increased from 14% to 18%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 1% to near 0%.
- **2007 to 2012 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, and cover remained similar at 17%.

Forb:

- **2002 to 2007 - up (+2):** The sum of nested frequency of perennial forbs increased 72%, and cover increased from 5% to 6%.
- **2007 to 2012 - down (-2):** The perennial forb sum of nested frequency decreased 29%, and cover decreased to 3%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19A, study no: 9

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
02	30.0	8.8	3.0	27.9	-1.0	9.7	0.0	**78.3**	Good-Excellent
07	23.8	4.9	3.8	30.0	0.0	10.0	0.0	**72.5**	Good
12	25.2	11.9	3.5	30.0	-0.4	6.5	0.0	**76.7**	Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 9

Type	Species	Nested Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
G	Agropyron spicatum	$_{a}$108	$_{a}$124	$_{b}$159	6.46	7.21	8.16
G	Bromus tectorum (a)	$_{b}$84	$_{a}$10	$_{a}$37	1.27	.06	.48
G	Poa bulbosa	$_{a}$9	$_{ab}$17	$_{b}$31	.17	.42	.46
G	Poa fendleriana	99	115	95	2.75	2.75	2.19
G	Poa secunda	214	261	246	4.73	7.22	5.87
Total for Annual Grasses		84	10	37	1.27	0.06	0.48
Total for Perennial Grasses		430	517	531	14.11	17.62	16.69
Total for Grasses		514	527	568	15.39	17.68	17.17
F	Agoseris glauca	$_{a}$3	$_{b}$20	$_{ab}$10	.00	.08	.02
F	Astragalus sp.	-	-	1	-	-	.03
F	Balsamorhiza hookeri	-	-	1	.00	-	.03
F	Calochortus nuttallii	-	3	-	-	.01	-
F	Chaenactis douglasii	3	1	-	.03	.00	-
F	Collinsia parviflora (a)	$_{a}$91	$_{b}$166	$_{a}$110	.37	.39	.30

Type	Species	Nested Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
F	Comandra pallida	$_{a}$12	$_{b}$34	$_{b}$34	.07	.57	.66
F	Cystopteris fragilis	$_{a}$-	$_{b}$16	$_{b}$17	-	.18	.26
F	Epilobium brachycarpum (a)	4	9	12	.01	.04	.03
F	Eriogonum brevicaule	2	-	4	.01	-	.03
F	Hackelia patens	7	2	4	.05	.03	.00
F	Heterotheca villosa	-	2	-	-	.00	-
F	Holosteum umbellatum (a)	$_{a}$-	$_{b}$13	$_{ab}$6	-	.02	.01
F	Ipomopsis aggregata	-	4	4	-	.03	.03
F	Lappula occidentalis (a)	-	5	-	-	.06	-
F	Lupinus argenteus	$_{a}$94	$_{b}$137	$_{a}$85	4.01	4.74	1.98
F	Machaeranthera canescens	3	9	-	.06	.04	-
F	Microsteris gracilis (a)	2	3	11	.00	.01	.02
F	Petradoria pumila	3	5	4	.38	.15	.15
F	Phlox longifolia	$_{a}$15	$_{b}$29	$_{b}$29	.06	.24	.05
F	Senecio multilobatus	$_{a}$-	$_{b}$8	$_{a}$-	-	.17	-
F	Unknown forb-perennial	$_{b}$15	$_{a}$-	$_{a}$-	.14	-	-
Total for Annual Forbs		97	196	139	0.38	0.53	0.36
Total for Perennial Forbs		157	270	193	4.83	6.28	3.26
Total for Forbs		254	466	332	5.22	6.82	3.62

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

BROWSE TRENDS--
Management unit 19A, Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
B	Artemisia nova	5	19	21	.74	1.58	2.80
B	Artemisia tridentata vaseyana	90	80	88	20.95	12.99	14.05
B	Chrysothamnus nauseosus hololeucus	1	1	0	.03	.00	-
B	Eriogonum microthecum	4	3	3	.00	.06	.15
B	Gutierrezia sarothrae	15	18	8	.63	.30	.03
B	Juniperus osteosperma	2	1	0	-	.18	.38
B	Mahonia repens	39	37	32	.87	1.12	1.05
B	Pachistima myrsinites	8	9	8	1.36	.63	1.75
B	Pediocactus simpsonii	1	0	0	.03	.03	-
B	Pinus monophylla	1	1	2	-	.03	.03
Total for Browse		166	169	162	24.62	16.94	20.27

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 9

Species	Percent Cover		
	'02	'07	'12
Artemisia nova	2.70	1.86	2.46
Artemisia tridentata vaseyana	24.56	16.88	17.50
Chrysothamnus nauseosus hololeucus	-	.05	-
Eriogonum microthecum	-	.33	.21
Gutierrezia sarothrae	1.04	.63	.30
Juniperus osteosperma	-	1.16	-
Mahonia repens	.73	1.56	.95
Pachistima myrsinites	1.66	.66	1.00
Pinus monophylla	-	-	.08

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19A, Study no: 9

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	1.9	1.3	1.7

BASIC COVER--
Management unit 19A, Study no: 9

Cover Type	Average Cover %		
	'02	'07	'12
Vegetation	42.00	37.12	42.59
Rock	27.06	33.02	32.63
Pavement	4.01	4.00	2.65
Litter	33.46	24.81	39.40
Cryptogams	.33	.20	1.07
Bare Ground	9.78	11.03	9.76

SOIL ANALYSIS DATA --

Management unit 19A, Study no: 9, Rocky Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.7	6.4	41.3	34.7	24.0	4.7	19.0	361.6	0.7

PELLET GROUP DATA--
Management unit 19A, Study no: 9

Type	Quadrat Frequency		
	'02	'07	'12
Rabbit	3	3	-
Elk	15	12	6
Deer	6	4	1
Cattle	-	2	1

Days use per acre (ha)		
'02	'07	'12
-	-	-
25 (63)	25 (63)	21 (51)
16 (40)	21 (51)	-
4 (9)	1 (2)	2 (4)

BROWSE CHARACTERISTICS--
Management unit 19A, Study no: 9

		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									
02	**440**	5	77	18	-	0	0	5	8/18
07	**1260**	5	68	27	220	0	0	17	9/24
12	**880**	5	91	5	-	0	0	2	9/20
Artemisia tridentata vaseyana									
02	**5340**	6	72	21	-	8	3	13	21/31
07	**3100**	8	57	35	940	34	9	28	23/38
12	**4160**	7	82	11	-	22	1	6	19/31
Cercocarpus montanus									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	32/51
12	**0**	0	0	-	-	0	0	0	51/65
Chrysothamnus nauseosus hololeucus									
02	**20**	0	100	-	-	0	0	0	17/4
07	**20**	0	100	-	-	0	0	100	28/30
12	**0**	0	0	-	-	0	0	0	21/28
Chrysothamnus viscidiflorus viscidiflorus									
02	**0**	0	0	-	-	0	0	0	16/16
07	**0**	0	0	-	-	0	0	0	14/18
12	**0**	0	0	-	-	0	0	0	12/15
Eriogonum microthecum									
02	**120**	17	83	0	-	0	0	0	7/13
07	**80**	0	100	0	-	0	0	0	9/14
12	**80**	25	50	25	-	25	0	25	8/11
Gutierrezia sarothrae									
02	**640**	0	94	6	-	0	0	6	8/12
07	**600**	3	93	3	20	0	0	0	7/10
12	**280**	0	100	0	-	0	0	0	6/9
Juniperus osteosperma									
02	**40**	50	50	-	-	0	0	0	-/-
07	**20**	100	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Mahonia repens									
02	**6000**	3	90	7	-	0	0	19	3/4
07	**6300**	1	97	2	-	0	0	2	3/4
12	**4960**	1	99	0	-	4	0	14	3/4
Pachistima myrsinites									
02	**2400**	2	96	3	20	0	0	2	3/8
07	**1440**	0	100	0	-	0	0	0	6/9
12	**2180**	0	100	0	-	0	0	0	3/6

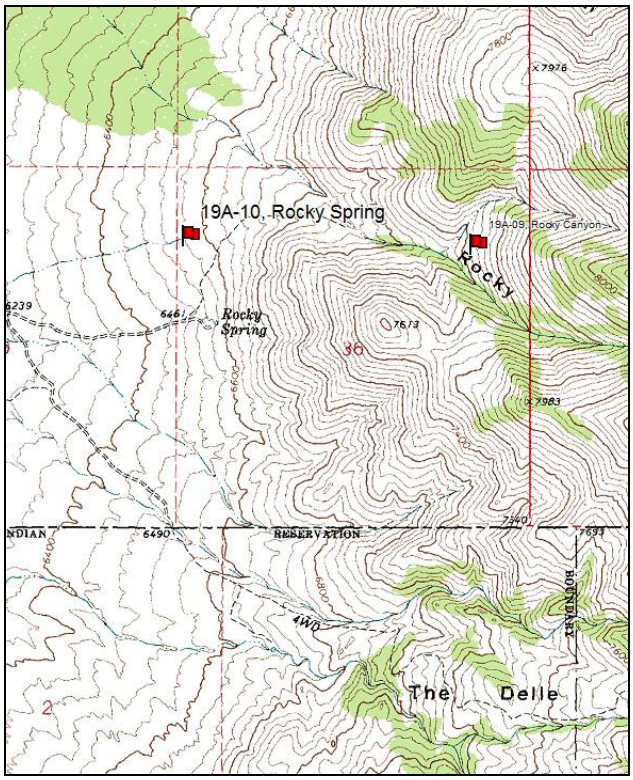
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii									
02	**20**	0	100	-	-	0	0	0	2/2
07	**0**	0	0	-	-	0	0	0	2/3
12	**0**	0	0	-	-	0	0	0	4/4
Pinus monophylla									
02	**20**	100	0	-	40	0	0	0	-/-
07	**40**	100	0	-	-	0	0	0	-/-
12	**60**	100	0	-	-	0	0	0	-/-
Prunus virginiana									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	11/8
Purshia tridentata									
02	**0**	0	0	-	-	0	0	0	29/90
07	**0**	0	0	-	-	0	0	0	29/78
12	**0**	0	0	-	-	0	0	0	40/79
Rosa woodsii									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	14/23
12	**0**	0	0	-	-	0	0	0	-/-
Sambucus racemosa									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	52/61
12	**0**	0	0	-	-	0	0	0	59/41

ROCKY SPRING - TREND STUDY NO. 19A-10-12

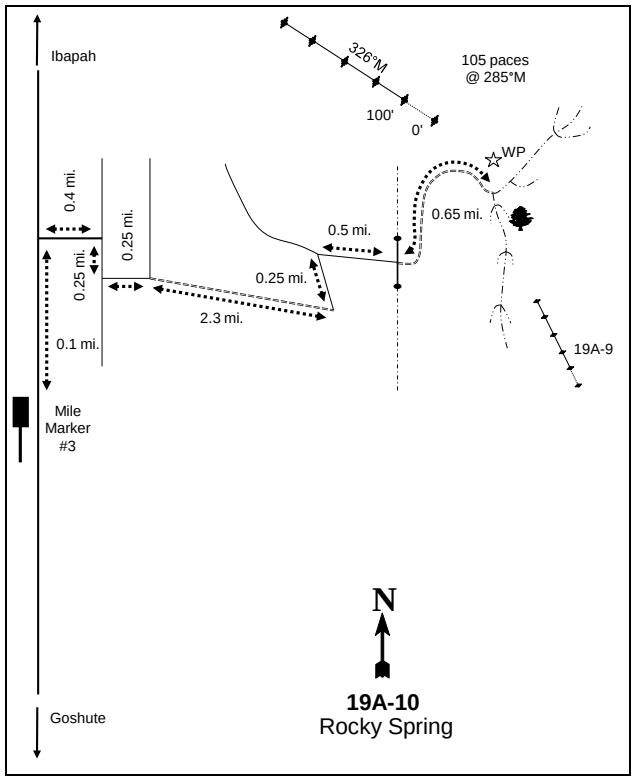
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Elk Winter
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: Private
Elevation: 6,500 ft. (1,974 m)
Aspect: Southwest
Slope: 11%
Transect bearing: 326° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: Rebar is on the 1ft mark on belt 3

Directions: From the main road between Ibapah and Goshute, turn east onto a road that is 0.1 miles north of mile marker 3. Go for 0.4 miles to an intersection. Turn right and go 0.24 miles to another intersection. Turn left and go 2.3 miles on a 4WD road that is faint in places to another intersection. Turn right and go 0.25 miles to another intersection. Turn right and go 0.5 miles to a gate. Drive through the gate and follow the road to the left for 0.65 miles to the witness post on the lefts side of the road. The 0-foot stake is 105 paces at 285 degrees magnetic and is marked with browse tag 111.

Map Name: Goshute



Diagrammatic Sketch:



Township: 10S Range: 19W Section: 36

GPS: NAD 83, UTM 12S 248241 E 4422727 N

ROCKY SPRING - TREND STUDY NO. 19A-10

Site Information

Site Description: The study was established to monitor winter big game use, primarily by elk, on the west side of the Deep Creek Mountains. It lies on an alluvial fan at the mouth of Rocky Canyon. It was thought that the study was established on Bureau of Land Management (BLM) administered property, but was placed on private land and crossed the section boundary onto BLM property. A fence was being erected in 2012 that crossed the transect. Due to this, the study will need to be moved or suspended in future surveys. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) flat that is frequented by deer and elk use during the winter. Elk pellet groups were sampled in moderate abundance in 2002 and 2007, but low abundance in 2012. Deer pellet groups were sampled in high abundance in 2002 and 2007, but low abundance in 2012. A deer carcass was found on the site in 2012. Cattle sign has been sampled in low abundance since 2002 (Table - Pellet Group Data). Cattle were present in 2007 when the study was sampled. Chukars were heard on the hillside to the east of the site in 2012.

Browse: The dominant browse is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), which provides nearly all of the browse cover on the site (Table - Browse Trends). The mountain big sagebrush stand is comprised of a moderately dense stand of mature and decadent plants. Recruitment of young big sagebrush plants was poor in 2002, but was fair in 2007 and 2012. Decadence and poor vigor are high in the sagebrush population. Utilization of sagebrush has been mostly light to moderate, with some heavy use. Other browse sampled include broom snakeweed (*Gutierrezia sarothrae*), pricklypear cactus (*Opuntia sp.*), pediocactus (*Pediocatus simpsonii*), and Woods rose (*Rosa woodsii*) (Table - Browse Characteristics). Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) are scattered throughout the area in low density (Table - Point-Quarter Tree Data).

Herbaceous Understory: Perennial grass species are not particularly diverse or abundant. Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) are the only abundant perennial grass species, and both species had a patchy distribution. Cheatgrass (*Bromus tectorum*) is common on the site and dominated the grass component in 2012. Forb species are not diverse or abundant on the site. Silvery lupine (*Lupinus argenteus*) was the only common forb species. Other forbs sampled include aster (*Aster spp.*), milkweed (*Asclepias spp.*), bastard toadflax (*Comandra pallida*), and skeleton weed (*Lygodesmia spp.*) (Table - Herbaceous Trends).

Soil: The soil is classified as a Holmes very stony sandy loam, which occurs on fan remnants. These soils are formed from alluvium derived from igneous and sedimentary rock, and are characterized as deep and well drained (Soil Survey Staff 2011). The soil is dark brown/gray in color and very rocky, both on the surface and throughout the profile. The soil has a loam texture and a slightly acidic soil reaction (pH 6.5) (Table - Soil Analysis Data). Bare ground cover is low, with high amounts of vegetation, litter, and rock providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2002 and 2012, but slight in 2007.

Trend Assessments

Browse:

- **2002 to 2007 - down (-2):** Mountain big sagebrush density decreased 22% from 2,840 plants/acre to 2,220 plants/acre, and cover decreased from 20% to 16%. Recruitment of young mountain big sagebrush plants increased from 2% to 13% of the population. Decadence decreased from 42% to 36%, but poor vigor increased from 19% to 27% of the population.
- **2007 to 2012 - up (+2):** The density of mountain big sagebrush increased 30% to 2,880 plants/acre, and cover increased to 17%. Recruitment of young big sagebrush decreased slightly to 10% of the population. Decadence of big sagebrush decreased to 27%, but poor vigor increased to 37%.

Grass:

- **2002 to 2007 - up (+2):** The sum of the nested frequency of perennial grasses increased 25%, and cover increased from 6% to 10%. Cheatgrass nested frequency decreased significantly, and cover decreased from 5% to 4%.
- **2007 to 2012 - down (-2):** The sum of nested frequency of perennial grasses decreased 28%, and cover decreased to 8%. Cheatgrass increased significantly in nested frequency, and cover increased to 29%.

Forb:

- **2002 to 2007 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, and cover increased from 5% to 6%.
- **2007 to 2012 - stable (0):** The sum of nested frequency of perennial forbs remained similar, but cover decreased to 3%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19A, 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
02	25.3	2.4	1.0	12.9	-3.8	9.3	0.0	**47.2**	Poor
07	20.6	4.5	6.4	19.9	-2.8	10.0	0.0	**58.6**	Fair
12	21.3	7.1	5.7	16.2	-20.0	6.2	0.0	**36.5**	Very Poor-Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 10

Type	Species	Nested Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
G	Agropyron spicatum	83	90	59	3.09	3.94	2.22
G	Bromus tectorum (a)	$_{b}$250	$_{a}$173	$_{c}$314	5.00	3.75	29.22
G	Festuca ovina	-	-	2	-	-	.00
G	Poa bulbosa	-	8	-	-	.18	-
G	Poa fendleriana	28	26	16	.34	.59	.16
G	Poa pratensis	$_{a}$-	$_{b}$26	$_{b}$21	-	.96	.16
G	Poa secunda	162	173	147	2.84	4.04	5.50
G	Sitanion hystrix	$_{a}$1	$_{b}$19	$_{a}$3	.15	.42	.03
G	Vulpia octoflora (a)	$_{a}$3	$_{b}$20	$_{ab}$10	.01	.04	.02
Total for Annual Grasses		253	193	324	5.01	3.79	29.25
Total for Perennial Grasses		274	342	248	6.43	10.15	8.08
Total for Grasses		527	535	572	11.45	13.96	37.33
F	Agoseris glauca	-	2	2	-	.03	.00
F	Asclepias sp.	8	4	10	.15	.15	.09
F	Aster sp.	$_{b}$21	$_{ab}$20	$_{a}$13	.54	.51	.15
F	Comandra pallida	$_{ab}$18	$_{ab}$15	$_{b}$38	.29	.31	.83
F	Cryptantha sp.	-	1	-	-	.00	-
F	Eriogonum brevicaule	3	2	-	.00	.00	-

Type	Species	Nested Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
F	Gayophytum ramosissimum(a)	-	1	3	-	.00	.00
F	Lupinus argenteus	59	68	53	2.92	3.87	1.72
F	Lygodesmia spinosa	20	13	19	.72	.72	.21
F	Senecio multilobatus	$_{a}$-	$_{b}$5	$_{ab}$4	-	.08	.03
F	Zigadenus paniculatus	-	3	5	-	.06	.06
Total for Annual Forbs		0	1	3	0	0.00	0.00
Total for Perennial Forbs		129	133	144	4.64	5.75	3.12
Total for Forbs		129	134	147	4.64	5.76	3.13

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

BROWSE TRENDS--
Management unit 19A, Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
B	Artemisia nova	3	3	0	-	.06	-
B	Artemisia tridentata vaseyana	75	71	81	20.21	15.91	16.72
B	Cercocarpus montanus	1	0	0	-	-	-
B	Gutierrezia sarothrae	14	8	5	.51	.09	.18
B	Juniperus osteosperma	1	1	1	-	-	-
B	Leptodactylon pungens	1	0	0	-	-	-
B	Opuntia sp.	12	9	8	.07	.09	.21
B	Pediocactus simpsonii	2	3	1	.06	.03	.00
B	Pinus monophylla	3	2	1	-	.03	.63
B	Rosa woodsii	4	5	5	.06	.48	.33
Total for Browse		116	102	102	20.92	16.71	18.09

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 10

Species	Percent Cover		
	'02	'07	'12
Artemisia nova	1.00	.06	-
Artemisia tridentata vaseyana	18.60	18.83	18.16
Cercocarpus ledifolius	-	.80	-
Gutierrezia sarothrae	.25	.21	.11
Opuntia sp.	-	.03	-
Pinus monophylla	.46	.85	.93
Rosa woodsii	.20	.66	1.26

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19A, Study no: 10

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	1.6	1.9	1.2

POINT-QUARTER TREE DATA--
Management unit 19A, Study no: 10

Species	Trees per Acre		Average diameter (in)	
	'07	'12	'07	'12
Juniperus osteosperma	28	32	6.9	4.0
Pinus monophylla	32	34	3.4	3.5

BASIC COVER--
Management unit 19A, Study no: 10

Cover Type	Average Cover %		
	'02	'07	'12
Vegetation	34.56	33.98	54.95
Rock	16.34	21.75	15.97
Pavement	2.91	4.01	6.18
Litter	52.09	35.54	37.34
Cryptogams	.35	.04	.15
Bare Ground	10.96	18.00	5.42

SOIL ANALYSIS DATA --

Management unit 19A, Study no: 10, Rocky Spring

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
7.0	6.5	45.3	36.7	18.0	4.6	20.4	233.6	0.8

PELLET GROUP DATA--
Management unit 19A, Study no: 10

Type	Quadrat Frequency			Days use per acre (ha)		
	'02	'07	'12	'02	'07	'12
Rabbit	6	26	3	-	-	-
Grouse	-	-	1	-	-	-
Elk	26	19	3	33 (83)	35 (86)	4 (10)
Deer	15	13	2	67 (165)	58 (144)	5 (12)
Cattle	2	-	2	4 (9)	2 (5)	7 (16)

BROWSE CHARACTERISTICS--
Management unit 19A, Study no: 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)
Artemisia nova									
02	**120**	0	83	17	-	0	0	0	-/-
07	**80**	0	100	0	-	0	0	0	8/15
12	**0**	0	0	0	-	0	0	0	-/-
Artemisia tridentata vaseyana									
02	**2840**	2	56	42	20	18	3	19	22/38
07	**2220**	13	51	36	1300	33	3	27	23/45
12	**2880**	10	63	27	80	26	22	37	21/40
Atriplex confertifolia									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	10/14
Ceratoides lanata									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	4/23
12	**0**	0	0	-	-	0	0	0	-/-
Cercocarpus ledifolius									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	156/154
Cercocarpus montanus									
02	**20**	0	100	-	-	100	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus nauseosus									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	17/17
Chrysothamnus viscidiflorus viscidiflorus									
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	8/19
12	**0**	0	0	-	-	0	0	0	10/19
Gutierrezia sarothrae									
02	**640**	0	88	13	-	16	0	6	9/14
07	**200**	0	100	0	-	0	0	0	9/11
12	**140**	0	100	0	-	0	0	0	5/8
Juniperus osteosperma									
02	**20**	100	0	-	-	0	0	0	-/-
07	**20**	100	0	-	-	0	0	0	-/-
12	**20**	100	0	-	-	0	0	0	-/-

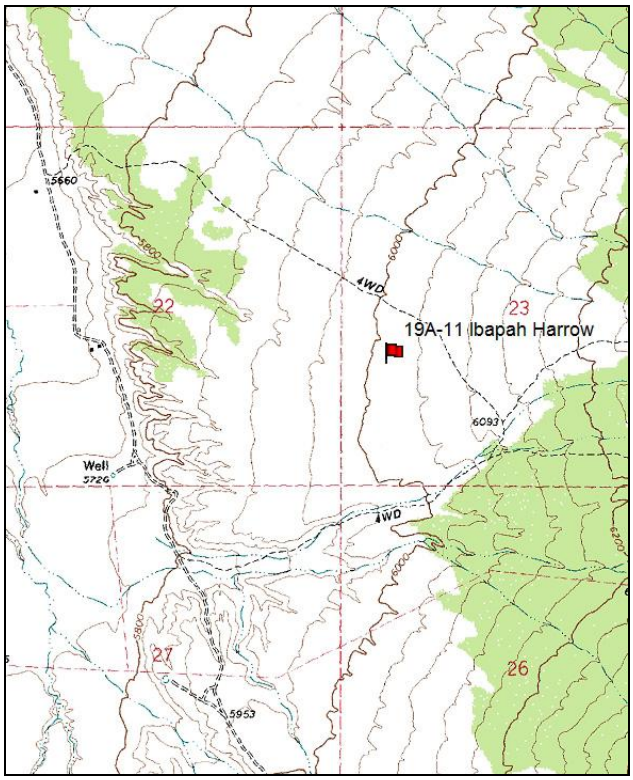
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Leptodactylon pungens									
02	**120**	0	100	-	-	0	0	0	7/11
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	4/14
Opuntia sp.									
02	**260**	15	85	-	-	0	0	0	5/9
07	**220**	9	91	-	-	18	0	18	4/12
12	**160**	0	100	-	-	0	0	13	4/7
Pediocactus simpsonii									
02	**40**	0	100	-	-	0	0	0	2/4
07	**100**	0	100	-	-	0	0	0	2/7
12	**20**	100	0	-	-	0	0	0	2/4
Pinus monophylla									
02	**60**	100	0	-	-	0	0	0	-/-
07	**40**	50	50	-	-	0	0	0	-/-
12	**20**	100	0	-	-	0	0	0	-/-
Rosa woodsii									
02	**640**	0	100	0	-	0	0	0	10/12
07	**360**	11	83	6	-	0	0	0	12/17
12	**560**	86	14	0	-	0	0	0	20/16

IBAPAH HARROW - TREND STUDY NO. 19A-11-12

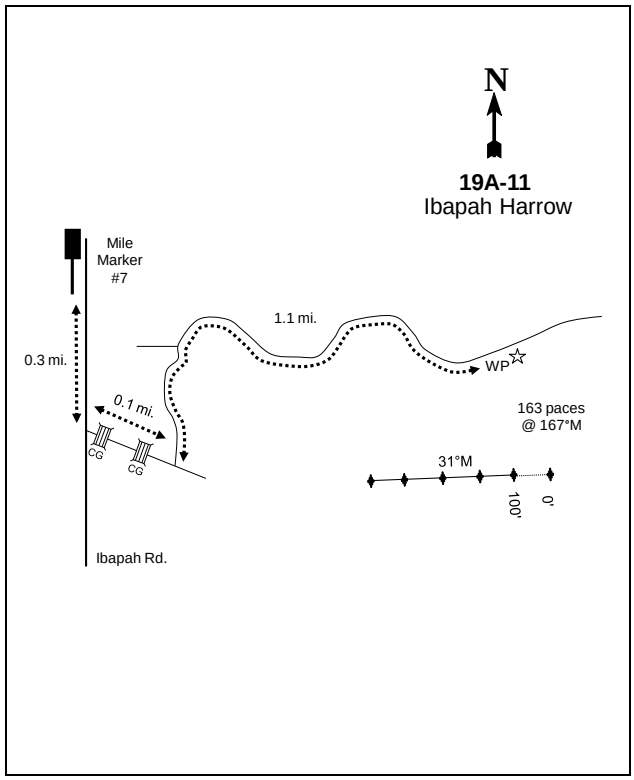
Vegetation Type: Wyoming Big Sagebrush
Range Type: Crucial Elk Winter
NRCS Ecological Site Description: Semidesert Gravelly Loam (Wyoming Big Sagebrush) North, R028AY215UT
Land Ownership: BLM
Elevation: 6,020 ft. (1,835 m)
Aspect: West
Slope: 4%
Transect bearing: 269° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: No Rebar

Directions: From Ibapah, proceed south just past mile marker 6; turn right onto a road 0.3 miles south of mile marker 7. Drive east for 1.3 miles, crossing two cattle guards along the way. Turn left and go for 0.1 miles. Turn right and go for 1.1 miles to the witness post on the right side of the road. From the witness post, walk approximately 163 paces at 167 degrees magnetic to the 0-foot stake.

Map Name: Goshute



Diagrammatic Sketch:



Township: 10S Range: 19W Section: 23

GPS: NAD 83, UTM 12S 246911 E 4425299 N

IBAPAH HARROW - TREND STUDY NO. 19A-11

Site Information

Site Description: The located on land administrated by the Bureau of Land Management (BLM) as part of the Ibapah allotment. The study was established to monitor the Ibapah Sagebrush Improvement - Year 1 project (WRI Project #730) that treated 250 acres in the area with a 2-way harrow and seeding treatment (WRI Database 2013). The In fall of 2008, a total of 134 acres were treated with a two-way Dixie harrow. During the second pass of the harrow, a seed mix of grass, forb, and browse species was broadcast seeded (Table - Seed Mix). The project area was treated in mosaic patterns across the treatment area to diversify the age class of the sagebrush plants. The objectives of the project are to improve habitat for big game and sage-grouse by decreasing the canopy cover of Wyoming big sagebrush, increase the diversity of the age-class and size-class of sagebrush plants, decrease the risk of wildfire, and reduce the spread of cheatgrass (WRI Database 2013). It receives winter big game use primarily by elk. Pellet groups of elk and deer have been sampled in low abundance since 2007. A herd of elk were seen and an elk carcass found on the site at the time of sampling in 2012. Cattle sign was sampled in low abundance in 2012 and noted to be present in 2007 (Table - Pellet Group Data).

Browse: The dominant browse is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), which provides nearly all of the browse cover (Table - Browse Trends). Prior to the treatment, the sagebrush stand was comprised of a dense population of mostly mature and decadent plants. Recruitment of young sagebrush plants was low, and poor vigor was high. Utilization of sagebrush was light to moderate. Following the treatment the sagebrush stand was still relatively dense, but comprised of mostly smaller mature and young plants. Decadence and poor vigor in the population were reduced substantially. Utilization of sagebrush was mostly light. Other sampled browse species were narrowleaf low rabbitbrush (*Chrysothamnus viscidflorus* ssp. *stenophyllus*) and broom snakeweed (*Gutierrezia sarothrae*) (Table - Browse Characteristics).

Herbaceous Understory: Prior to the treatment, perennial grasses were rare and provided limited forage. Following the treatment, perennial grasses increased with several seeded species sampled for the first time. The seeded species crested wheatgrass (*Agropyron cristatum*) and the native, low growing perennial Sandberg bluegrass (*Poa secunda*) provide the majority of the perennial grass cover. Other perennial grasses sampled include Indian ricegrass (*Oryzopsis hymenoides*), intermediate wheatgrass (*Agropyron intermedium*), western wheatgrass (*A. smithii*), and bluebunch wheatgrass (*A. spicatum*). All of these species were seeded on the site, but several occurred prior to the treatment. The annual species cheatgrass (*Bromus tectorum*) was present on the site prior to the treatment, but dominated the grass component in cover following the treatment. The forb component is sparse, but several seeded species were sampled in low frequency and cover following the treatment. These included blue flax (*Linum perenne*), alfalfa (*Medicago sativa*), and small burnet (*Sanguisorba minor*) (Table - Herbaceous trends).

Soil: The soil is classified as a Hiko Peak gravelly loam, which occurs on fan remnant. These soils are formed from mixed alluvium, and are characterized as very deep and well-drained (Soil Survey Staff 2011). The soil has a loam texture and a mildly alkaline soil reaction (pH 7.5). The soil is light tan in color, with moderately abundant white rock on the surface and throughout the profile. Bare ground cover is high on the site, though vegetation and litter provide a large amount of protective ground cover (Basic Cover). The soil erosion condition has been classified as slight since 2007.

Trend Assessments

Browse:

- **2007 to 2012 - down (-2):** Density of Wyoming big sagebrush decreased 35% from 6,220 plants/acre to 4,040 plants/acre, and cover decreased from 20% to 6%. However, the health of the population

improved. Recruitment of young sagebrush plants increased from 4% to 29% of the population. Decadence decreased from 55% to 7%, and poor vigor decreased from 28% to 5% of the population.

Grass:

- **2007 to 2012 - slightly down (-1):** The perennial grass sum of nested frequency increased 26%, and cover increased from 7% to 15%. However, cheatgrass increased significantly in nested frequency, and cover increased from 1% to 20%.

Forb:

- **2007 to 2012 - stable (0):** Perennial forb species are very rare on the site. Several seeded forb species were sampled following the treatment at low frequency and cover.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19A, 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
07	24.9	-1.5	2.0	14.8	-1.0	1.2	0.0	**40.5**	Fair
12	7.2	12.9	14.5	30.0	-15.1	1.4	0.0	**50.9**	Good

SEED MIX --
Management unit 19A, study no: 11

Project Name: Ibapah Sagebrush Improvement - Year 1 WRI Database #: 730			
Application: Broadcast		Acres:	200
Seed type		lbs in mix	lbs/acre
F	Alfalfa 'Ladak'	200	1.00
F	Alfalfa 'Spredor 4'	200	1.00
F	Blue Flax 'Appar'	200	1.00
F	Sainfoin 'Eski'	400	2.00
F	Small Burnet 'Delar'	400	2.00
F	Western Yarrow	20	0.10
G	Crested Wheatgrass 'Douglas'	200	1.00
G	Crested Wheatgrass 'Hycrest'	190	0.95
G	Indian Ricegrass 'Rimrock'	200	1.00
G	Pubescent Wheatgrass	200	1.00
G	Russian Wildrye	200	1.00
G	Sandberg Bluegrass	100	0.50
G	Snake River Wheatgrass 'Secar'	200	1.00
G	Western Wheatgrass 'Arriba'	200	1.00
Total Pounds:		2910	14.55
PLS Pounds:			13.22

Trend Summary

HERBACEOUS TRENDS--
Management unit 19A, Study no: 11

Type	Species	Nested Frequency '07	Nested Frequency '12	Average Cover % '07	Average Cover % '12
G	Agropyron cristatum	$_{a}$8	$_{b}$152	.40	6.70
G	Agropyron intermedium	-	2	-	.00
G	Agropyron smithii	-	4	-	.63
G	Agropyron spicatum	5	6	.00	.36
G	Bromus tectorum (a)	$_{a}$267	$_{b}$357	1.31	20.13
G	Oryzopsis hymenoides	$_{a}$3	$_{b}$15	.03	1.07
G	Poa fendleriana	5	3	.03	.03
G	Poa secunda	$_{b}$303	$_{a}$226	6.94	6.35
Total for Annual Grasses		267	357	1.31	20.13
Total for Perennial Grasses		324	408	7.41	15.17
Total for Grasses		591	765	8.73	35.30
F	Arabis sp.	3	-	.00	-
F	Calochortus nuttallii	4	-	.02	-
F	Castilleja flava	$_{b}$16	$_{a}$2	.16	.01
F	Castilleja linariaefolia	1	-	.03	-
F	Cryptantha sp.	-	3	-	.00
F	Cymopterus sp.	2	-	.00	-
F	Erigeron pumilus	6	4	.07	.15
F	Linum perenne	$_{a}$-	$_{b}$10	-	.13
F	Medicago sativa	-	7	-	.01
F	Phlox hoodii	21	12	.21	.16
F	Phlox longifolia	34	51	.09	.22
F	Ranunculus testiculatus (a)	$_{b}$27	$_{a}$-	.06	-
F	Sanguisorba minor	-	3	-	.00
F	Tragopogon dubius (a)	1	-	.03	-
F	Zigadenus paniculatus	1	-	.03	-
Total for Annual Forbs		28	0	0.09	0
Total for Perennial Forbs		88	92	0.62	0.70
Total for Forbs		116	92	0.72	0.70

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

BROWSE TRENDS--
Management unit 19A, Study no: 11

Type	Species	Strip Frequency '07	Strip Frequency '12	Average Cover % '07	Average Cover % '12
B	Artemisia tridentata wyomingensis	92	87	19.94	5.79
B	Chrysothamnus viscidiflorus stenophyllus	37	21	1.93	.37
B	Gutierrezia sarothrae	-	-	.03	.15
Total for Browse		129	108	21.91	6.31

CANOPY COVER, LINE INTERCEPT--
Management unit 19A, Study no: 11

Species	Percent Cover '07	Percent Cover '12
Artemisia tridentata wyomingensis	22.91	4.81
Chrysothamnus viscidiflorus stenophyllus	2.18	.51

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19A, Study no: 11

Species	Average leader growth (in) '07	Average leader growth (in) '12
Artemisia tridentata wyomingensis	0.8	1.2

BASIC COVER--
Management unit 19A, Study no: 11

Cover Type	Average Cover % '07	Average Cover % '12
Vegetation	32.28	43.94
Rock	.88	.25
Pavement	2.48	.77
Litter	26.07	46.53
Cryptogams	6.70	.16
Bare Ground	40.35	28.73

SOIL ANALYSIS DATA --

Management unit 19A, Study no: 11, Ibapah Harrow

Effective rooting depth (in)	pH	Loam %sand	Loam %silt	Loam %clay	%OM	PPM P	PPM K	ds/m
-	7.5	27.4	26.6	46.0	1.5	9.2	249.6	0.5

PELLET GROUP DATA--
Management unit 19A, Study no: 11

Type	Quadrat Frequency '07	'12	Days use per acre (ha) '07	'12
Rabbit	18	1	-	-
Elk	5	6	17 (41)	4 (10)
Deer	4	1	1 (2)	5 (12)
Cattle	-	-	-	1 (2)

BROWSE CHARACTERISTICS--
Management unit 19A, Study no: 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)
Artemisia tridentata wyomingensis									
07	**6220**	4	41	55	380	36	0	28	19/31
12	**4040**	29	64	7	100	7	3	5	13/19
Cercocarpus ledifolius									
07	**0**	0	0	-	-	0	0	0	39/54
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus viscidiflorus stenophyllus									
07	**1160**	2	53	45	-	2	0	19	11/16
12	**540**	7	78	15	20	0	0	59	11/18
Gutierrezia sarothrae									
07	**0**	0	0	-	-	0	0	0	7/6
12	**0**	0	0	-	-	0	0	0	7/12

SUMMARY
WILDLIFE MANAGEMENT UNIT 19A - WEST DESERT, DEEP CREEK

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which inlude **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). 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. Fifteen interagency range trend studies were sampled in Unit 21 during the summer of 2012.

Four studies [Ochre Mountain (19A-2), Durse Canyon (19A-4), Rocky Canyon (19A-9), and Rocky Spring (19A-10)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush or Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Three studies [Trail Gulch (19A-1), Wood Canyon (19A-7), and Ibapah Harrow (19A-11)] are categorized as low-potential sites for deer winter range, and sample Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), Stansbury cliffrose, or desert shrub communities.

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 Western division (Division 3). The Western division had a historic annual mean precipitation of 8.66 inches from 1895 to 2012. The mean annual PDSI of the Western division displays a pattern of drought years with a few periods of wet years over the course of study years (Figure 1 and Figure 2) (Time Series Data 2013).

The 1961-1990 mean annual precipitation was 12-14 in. on the Trail Gulch, Ochre Mountain, Wood Canyon,

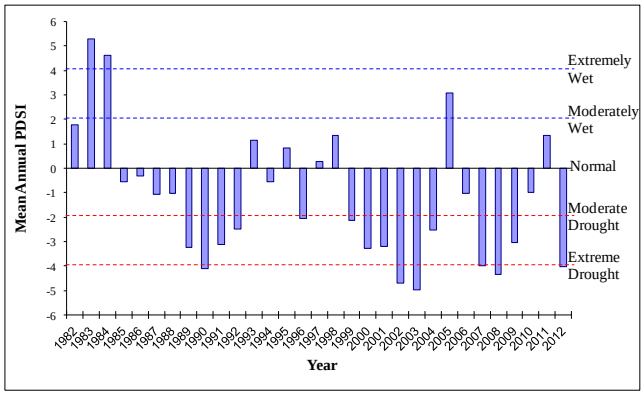


Figure 1. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the Western division (Division 1). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

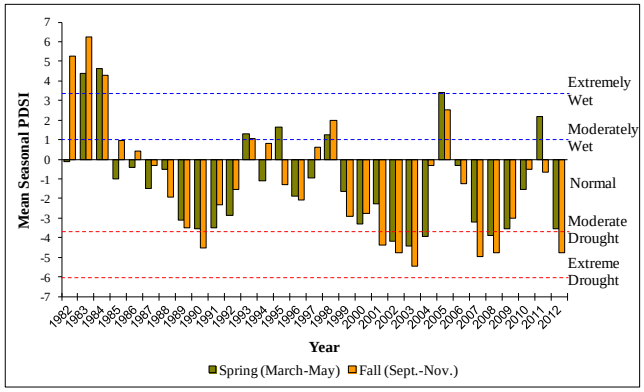


Figure 2. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the Western division (Division 1). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

and Ibapah Harrow studies; 16-18 in. on the Durse Canyon and Rocky Spring studies; and 18-20 in. on the Rocky Canyon study (PRISM Climate Group 2011).

Mid-Level Potential Deer Range

Browse: The mid-level potential site cumulative median browse trend generally decreased over the course of the sample years. There were slight increases in the 1997 and 2012 sample years (Figure 7a). Mountain big sagebrush is a dominant sagebrush species on most of the study sites, but black sagebrush is also a minor component on these mid-level potential studies. The mean density of mountain big sagebrush increased significantly in 2002, and has since remained relatively steady (Figure 4a). The mean cover of mountain big sagebrush increased signficantly in 2002, but decreased significanlty in 2012 (Figure 4b). The mean decadence of mountain big sagebrush has steadily decreased since 1997 (Figure 4c). The mean density of black sagebrush increased significantly in 2002, but has since gradually decreased (Figure 4a). The mean cover of black sagebrush has been low over the duration of the sample years (Figure 4b). The mean decadence of black sagebrush increased significantly in 2002, but decreased significantly in 2012 returning to 1997 levels (Figure 4c). Although the sagebrush defoliator moth (*Aroga websteri*) was reported to be on a few of the studies in 2007, the moth's negative impact seemed to not impact the unit's sagebrush populations.

Herbaceous Understory: The mid-level potential median cumulative grass trend has generally increased over the duration of the sample year; however, there was a slight decreased in median

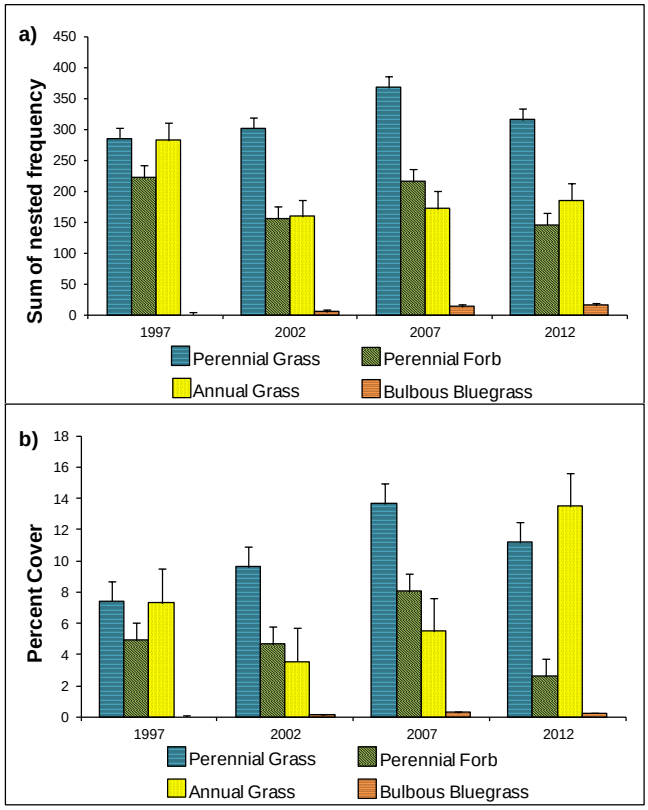


Figure 3. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass sum of nested frequency by year for WMU 19A, West Desert, Deep Creek. **b)** Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 19A.

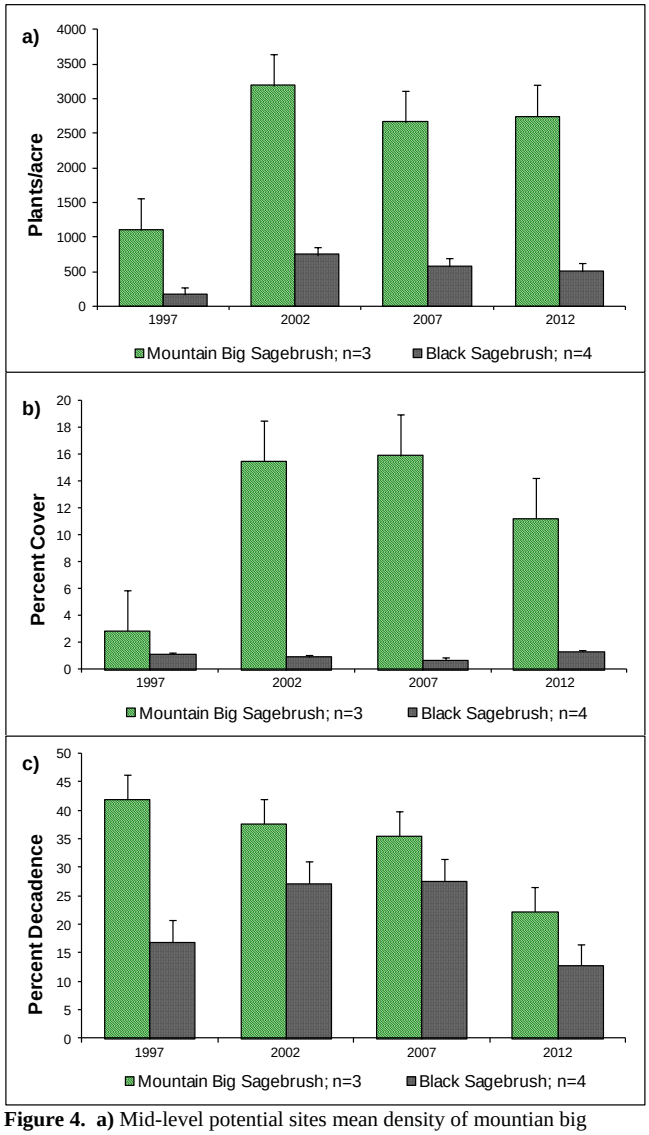


Figure 4. a) Mid-level potential sites mean density of mountian big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and black sagebrush (*Artemisia nova*) by year for WMU 19A, West Desert, Deep Creek. **b)** Mid-level potential sites mean cover of mountian big sagebrush and black sagebrush by year for WMU 19A. **c)** Mid-level potential mean decadence of mountian big sagebrush and black sagebrush by year for WMU 19A.

cumulative trend in 2012 (Figure 7a). The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased significantly in 2007, but then decreased significantly in 2012 to 2002 levels (Figure 3a). The mean cover of perennial grass species followed the same pattern as the mean sum of nested frequency, but mean cover did not decrease significantly in 2012 (Figure 3b). Annual grass species including cheatgrass (*Bromus tectorum*) are found on many of the sites; however, cheatgrass is most abundant on the Rocky Spring study, and drives much of the trend of annual grasses within the unit. The mean sum of nested frequency of annual grasses decreased significantly in 2002, and has since steadily increased over the duration of the sample years (Figure 3a). However, mean cover of cheatgrass increased significantly in 2012, and was nearly twice as high in mean cover in 1997 (Figure 3b). The weedy perennial species bulbous bluegrass is found on the Rocky Canyon and Rocky Spring sites, but is not prevalent. However, bulbous bluegrass does appear to be increasing on the studies as indicated by the increase in mean sum of nested frequency (Figure 3a). The mean cover of bulbous bluegrass decreased slightly in 2012 and is considered to be low (Figure 3b).

The mid-level potential median cumulative forb trend has remained relatively stable since the outset of the study (Figure 7a). The mean sum of nested frequency and cover of perennial forb species has varied significantly from year to year over the duration of the sample years (Figure 3a and Figure 3b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these mid-level potential study areas. However, the mean abundance of deer pellet groups has decreased considerably since 2002. The decrease in deer pellet abundance in 2012 is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk pellet groups has varied from low abundance in 2002 and 2012 to moderate abundance in 2007. The mean abundance of livestock has remained low over the duration of the sample year; however, mean abundance of livestock pellet groups increased in 2012 (Figure 8).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has remained relatively stable with a fair ranking since 1997 (Table 1and Figure 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
97	20.2	7.8	9.0	14.8	-5.5	8.9	0.0	**55.2**	Fair
02	26.2	4.3	2.7	19.2	-2.6	7.7	0.0	**57.5**	Fair
07	20.8	3.9	4.9	25.9	-4.1	10.0	0.0	**61.4**	Fair
12	21.4	8.7	4.7	21.8	-9.6	5.2	0.0	**52.1**	Fair

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=4) by year for WMU 19A, West Desert, Deep Creek. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Discussion: Despite the drought years of the early 2000's, there was a considerable increase in mountain big sagebrush and black sagebrush within the Deep Creek unit. The slight decreases in both sagebrush species from 2002 and 2012 is likely not a major concern on these mid-level potential sites. Despite the decrease in decadence of both sagebrush species, decadence remains high and is a concern with regards to the future stability of the sagebrush populations within the unit.

The abundance of cheatgrass on the Rocky Spring study and the increased presence of bulbous bluegrass on the Rocky Canyon study will likely contribute to decreases in both sagebrush species in the future if persistent increase continues with these weedy grass species. These weedy species can form dense mats of cover that compete with other more desirable herbaceous species and with seedlings and young shrubs which limits establishment of new plants into the population. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event.

Low Potential Deer Range

Browse: The low potential site cumulative median browse trend has remained steady over the duration of the study years (Figure 7b). Wyoming big sagebrush is a dominant browse species on the Ibapah Harrow study. Black sagebrush is a dominant browse species on the Trail Gulch study, but is rare on the Wood Canyon study. The mean density of black sagebrush increased significantly in 2002 and 2012 (Figure 6a). The mean cover of black sagebrush decreased significantly in 2002, increased slightly in 2007, and increased significantly in 2012 (Figure 6b). Mean decadence of black sagebrush increased significantly in 2002, remained similar in 2007, but decreased significantly in 2012 (Figure 6c). Wyoming big sagebrush was sampled for the first time in the low-level potential winter range when Ibapah Harrow was established in 2007. The mean density of Wyoming big sagebrush decreased in 2012 (Figure 6a). Mean cover and decadence of Wyoming big sagebrush both decreased significantly in 2012 (Figure 6b and Figure 6c). The decrease in the mean density and cover of Wyoming big sagebrush is due to the harrow treatment that took place on the Ibapah Harrow study.

Herbaceous Understory: The low potential median cumulative grass trend has generally increased over the course of the sample years (Figure 7b). Despite the increase in trends of grasses, the grass component on most of the low potential studies is in poor condition. Annual grass species including cheatgrass (*Bromus tectorum*) dominate the grass component on all of the low-level potential studies. Mean sum of nested frequency of annual grasses decreased significantly in 2002, but has increased

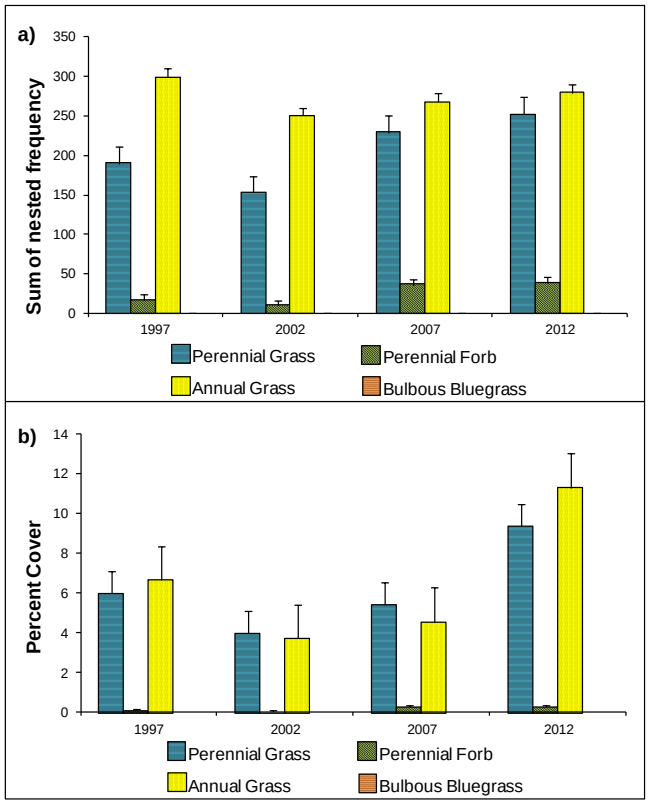


Figure 5. a) Low potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass sum of nested frequency by year for WMU 19A, West Desert, Deep Creeks. **b)** Low potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 19A.

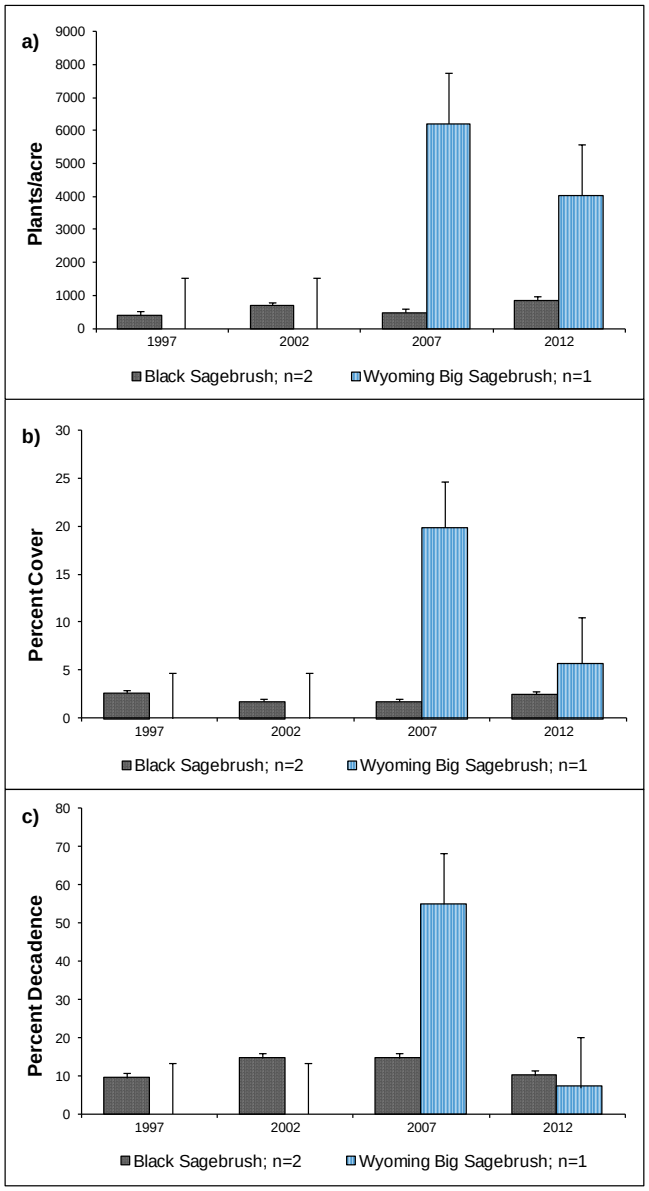


Figure 6. a) Low potential sites mean density of black sagebrush (*Artemisia nova)* and Wyoming big sagaebrush (*Artemisia tridentata* ssp. *wyomingensis.*) by year for WMU 19A, West Desert, Deep Creek. **b)** Low potential sites mean cover of big sagebrush and Stansbury cliffrose by year for WMU 19A. **c)** Low potential sites mean decadence of big sagebrush and Stansbury cliffrose by year for WMU 19A.

steadily over the remaining sample years (Figure 5a). The mean cover of annual grasses decreased in 2002, increased slightly in 2007, and increased significantly in 2012 (Figure 5b). The weedy perennial species bulbous bluegrass is absent from the low-level potential study sites. The mean sum of nested frequency of perennial grasses decreased slightly in 2002, but increased significantly in 2007 and increased slightly in 2012 (Figure 5a). The mean cover of perennial grass species was significantly higher in 2012 than in 1997 (Figure 5b).

The low potential median cumulative forb trend has remained stable since the outset of the study (Figure 7a). Perennial forb species are rare on most of the studies. The mean sum of nested frequency and cover of perennial forb species has remained low since 1997 (Figure 5a and Figure 5b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these low potential study areas. The mean abundance of deer pellet groups has been low over the duration of the sample year, and steadily decreased in abundance over the same period. The decrease in pellet abundance is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk and livestock sign has been low since 1997 (Figure 8b).

Deer Desirable Components Index (DCI): The low potential deer DCI has varied from poor to fair throughout the sample years. There has been a general decrease in the preferred browse cover score and an increase in the perennial grass score (Table 2 and Figure 9).

Discussion: The abundance of weedy annual species is a particular concern on these low potential sites. These weedy species can form dense mats of cover that compete with other more desirable herbaceous species and with seedlings and young shrubs which limits establishment of new plants into the population. 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
98	8.3	4.8	2.4	11.9	-5.0	0.2	0.0	**22.7**	Poor
03	20.2	7.0	4.3	10.7	-2.1	1.0	0.0	**41.1**	Fair
08	12.9	1.2	0.8	10.8	-3.4	0.6	0.0	**22.9**	Poor
12	6.9	6.4	5.7	18.6	-8.5	0.5	0.0	**29.7**	Fair

Table 2. Low potential scale mean deer DCI scores and rankings (n=3) by year for WMU 19A, West Desert, Deep Creek. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

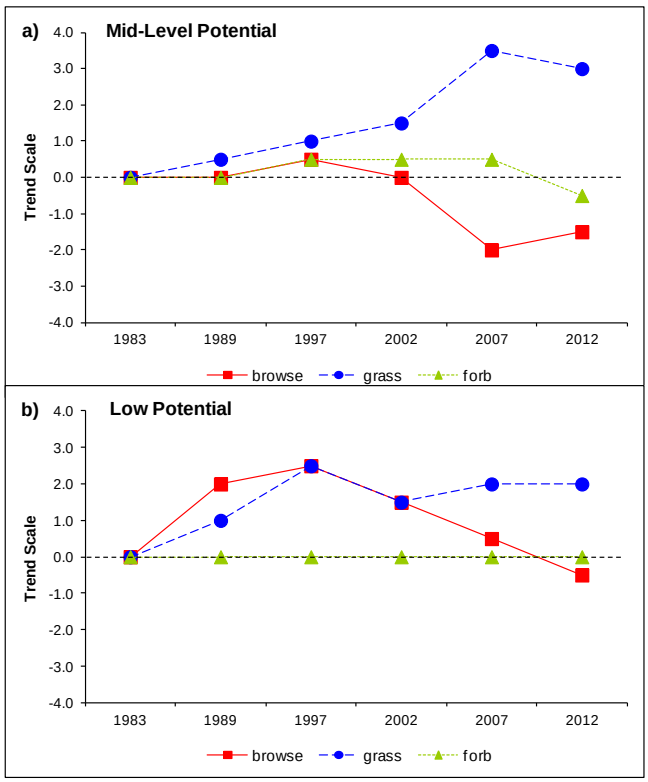


Figure 7. **a)** Mid-potential sites cumulative median browse, grass and forb trends by year for WMU 19A, West Desert, Deep Creek. **b)** Low-level potential sites cumulative median browse, grass, and forb trends by year for WMU 19A. **c)** Low potential sites cumulative median browse, grass, and forb trends by year for WMU 19A.

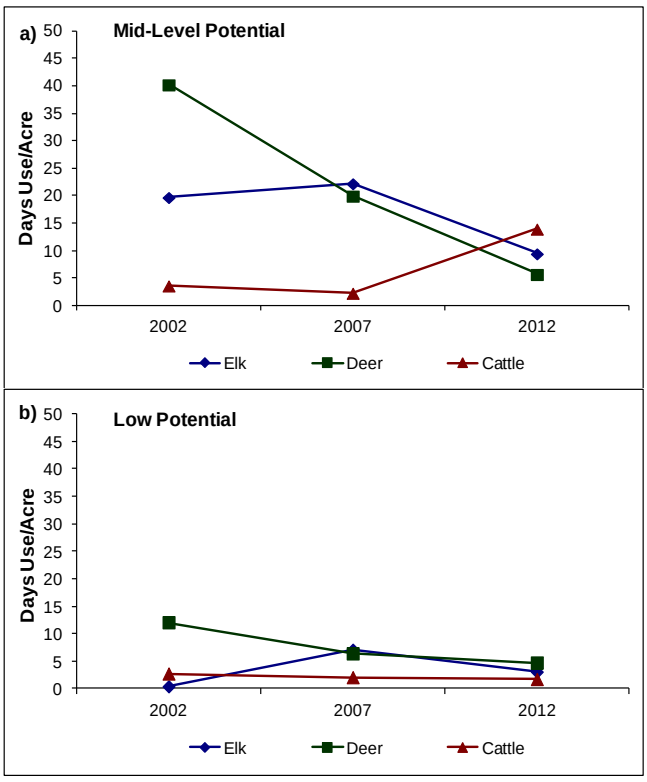


Figure 8. **a)** Mid-potential range sites mean animals days use/acre (n=4) by year for WMU 19A, West Desert, Deep Creek. **b)** Low-level potential sites mean animal days use/acre (n=6) by year for WMU 19A. **c)** Low potential sites mean animal days use/acre (n=5) by year for WMU 19A.

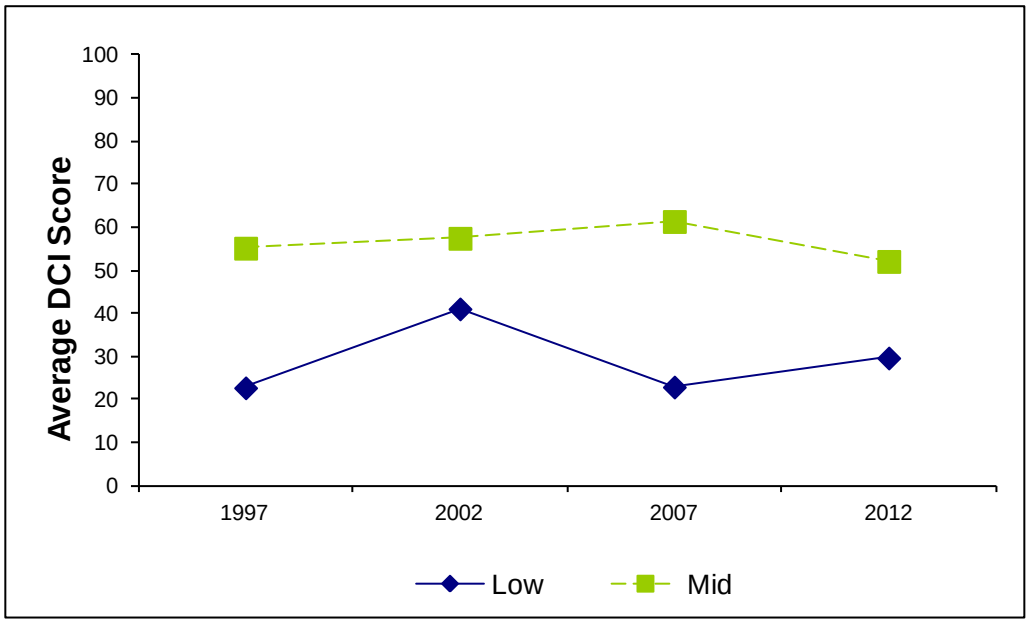
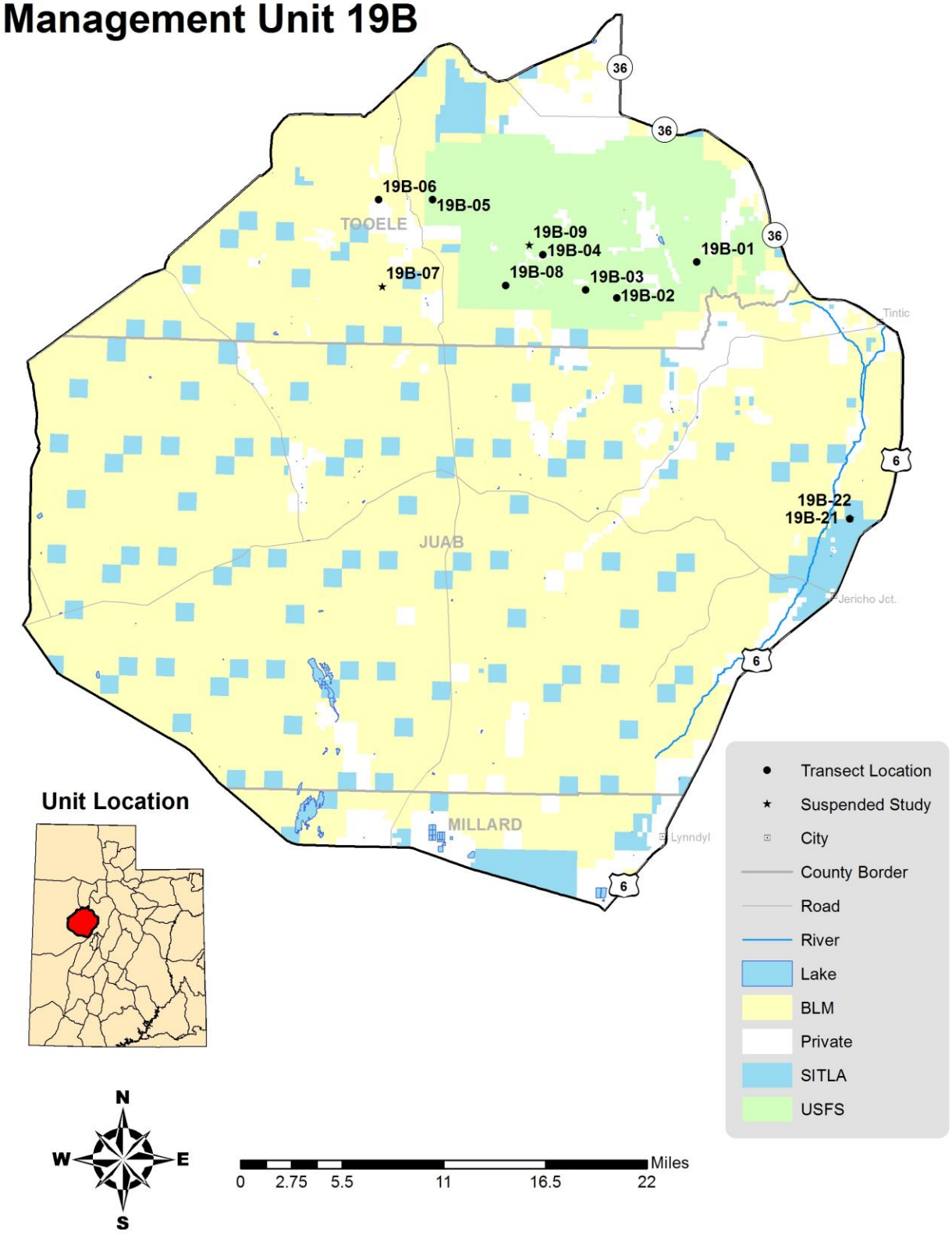


Figure 9. Mean mid-level (n=4) and low (n=3) potential scale deer DCI scores by year for WMU 19A, West Desert, Deep Creek. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Management Unit 19B



WILDLIFE MANAGEMENT SUBUNIT 19B - WEST DESERT, VERNON

Subunit 19B Boundary Description

> **Tooele and Juab Counties** - Boundary begins at the junction of SR-36 and the Pony Express Road; south on SR-36 to Hwy 6; south on Hwy 6 to SR 174; west on SR 174 to Brush Beryillium Rd; west to the Delta Rd; northwest on this road to 14 Mile Rd; north on this road to the Pony Express Road; northeast on this road to SR-36 returning to the beginning point.

Management Unit Description

The 19B Vernon Subunit encompasses the Simpson, Sheeprock, and West Tintic Mountains. Trend studies are concentrated primarily in the West Tintic and Sheeprock Mountains. Predation on fawns has been a major problem on the Vernon Subunit. In 1996, a predator management plan was implemented and several coyote dens were destroyed in the immediate vicinity of prime deer fawning areas. Two other issues that affect big game in the subunit are the availability of summer range, and wildfires. Due to the relatively low elevation of these desert mountain ranges, there is a lack of quality summer range. Large wildfires burned large areas of this unit between 1996 and 2002. Much of the burned areas have been seeded in restoration projects. The success of these projects in restoring deer winter habitat is in question, as browse re-establishment has been limited. However, the projects have been successful in establishing stands of perennial grasses.

Range Trend Studies

Eight interagency range trend studies were sampled in Subunit 19B during the summer of 2012. A total of eleven studies have been established within Subunit 19B since 1983. Nine studies were established in 1983: Sabie Mountain (19B-1), Upper Little Valley (19B-2), Bennion Creek (19B-4), Harker Canyon (19B-4), West Government Creek (19B-5), Lee's Creek (19B-6), Judd Creek (19B-7), South Pine Canyon (19B-8), and North Oak Brush Canyon (19B-9); and two studies were established in 1998: Jericho State Section (19-21) and Jericho BLM (19-22).

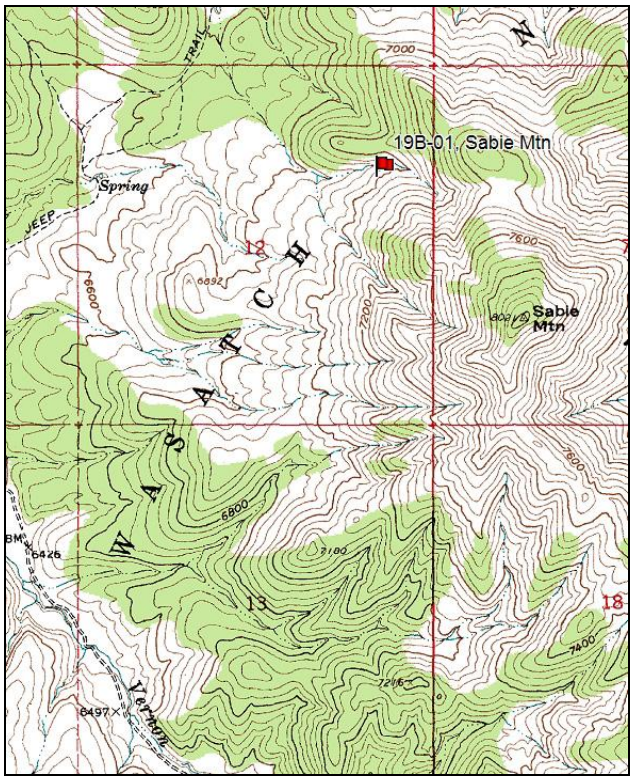
In 2002, two studies (Judd Creek and North Oak Brush Canyon) were suspended. In 2012, one study (Jericho State Section) was suspended. These studies were suspended for various reasons and if the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: http://www.wildlife.utah.gov/range.

SABIE MOUNTAIN - TREND STUDY NO. 19B-1-12

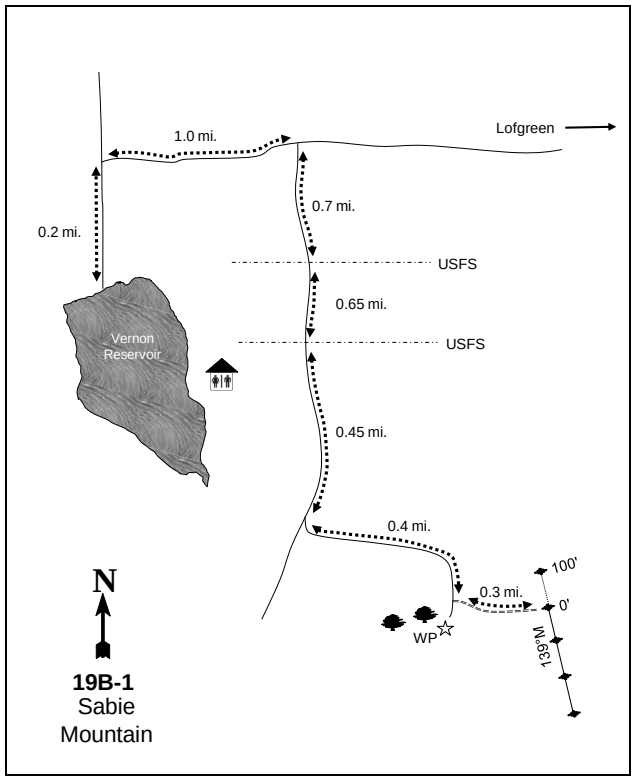
Vegetation Type: Mixed Mountain Brush
Range Type: Substantial Deer Spring/Fall
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: USFS
Elevation: 7,000 ft. (2,134 m)
Aspect: Northwest
Slope: 35%
Transect bearing: 319° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is on the 2ft mark on belt 3

Directions: From the north end of Vernon Reservoir, go 0.2 miles north until you reach an intersection. Turn right and go 1 mile on an eastbound road that eventually goes to Lofgreen. At 1 mile turn right onto a southbound road. Go 0.7 miles and cross a USFS fence. Go 0.65 miles and cross another USFS fence. Go 0.45 miles to a "Y" intersection; take the left fork and go 0.4 miles to an intersection of a 4WD footpath going off to the left. The witness post is on the right side of the road between some PIMOs and is ~12" tall. Walk 0.3 miles on the footpath to the 0-foot stake.

Map Name: Sabie Mountain



Diagrammatic Sketch:



Township: 10S Range: 5W Section: 12

GPS: NAD 83, UTM 12S 384770 E 4425573 N

SABIE MOUNTAIN - TREND STUDY NO. 19B-1

Site Information

Site Description: This transitional range study is located on the northwest slope of Sabie Mountain on land administered by the U.S. Forest Service (USFS), and is found on the Little Valley grazing allotment. The nearest water sources are Vernon Creek 1.4 miles to the west and Vernon Reservoir 2.3 miles to the northwest. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. Deer and elk appear to occupy the site in late spring to early summer. Deer pellet groups were sampled in low abundance in 2012, but in more moderate abundance in 2002 and 2007. Elk pellet groups were sampled in low abundance in 2007. Cattle sign has been sampled in low abundance since 2002 (Table - Pellet Group Data).

Browse: The dominant preferred browse species is mountain big sagebrush, though Saskatoon serviceberry (*Amelanchier alnifolia*) and Woods rose (*Rosa woodsii*) are also present. Mountain big sagebrush is a dense, mature population that is relatively stable in density. Decadence has been moderate for each sample year, and poor vigor has been low most sample years. Recruitment of young sagebrush to the population has been nominal throughout the duration of the study. Utilization of sagebrush has been mostly light to moderate with some heavy use. Crickets were abundant on the study in 2002 and had noticeably eaten many sagebrush leaves. Saskatoon serviceberry is a sparse, mature population that has maintained a constant population size. Decadence has been moderate to high in the serviceberry population, and poor vigor has been generally low. Recruitment of young serviceberry has fluctuated from good to poor levels over the course of the study. Utilization of serviceberry has been moderate to heavy throughout the study years. The growth form of serviceberry has been stunted due to heavy browsing. Woods rose is a dense, mature population that was spare in 1997, but has increased in density over the course of the study. The health of the rose population has been vigorous. Recruitment of young rose to the population has been substantial most sample year. Utilization of rose has been light over the course of the study. Mountain snowberry has the highest density of the shrub species present. Snowberry has been vigorous over the course of the study. Utilization of snowberry has been light most sample years, but was moderate in 1989. Other sampled browse includes stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and Oregon grape (*Mahonia repens*) (Table - Browse Characteristics). Singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) are sparsely scattered on the site, and both species have generally maintained a stable population size (Table - Point-Quarter Tree Data). The woodland succession stage is considered to be in Phase I (Tausch et al. 2009).

Herbaceous Understory: Mutton bluegrass (*Poa fendleriana*) and Sandberg bluegrass (*P. secunda*) are the most abundant grasses on the study. There may have been some misidentification between mutton bluegrass and Sandburg bluegrass in 2012. Other grasses scattered throughout the study include bluebunch wheatgrass (*Agropyron spicatum*), oniongrass (*Melica bulbosa*), spike fescue (*Leucopoa kingii*), bottlebrush squirreltail (*Sitanion hystrix*), and Great Basin wildrye (*Elymus cinereus*). The weedy species bulbous bluegrass (*Poa bulbosa*) has occasionally been sampled on the site. The invasive annual species cheatgrass (*Bromus tectorum*) was sampled in low nested frequency in 2007. Forbs are common and diverse on the study, and most have good forage value for wildlife. However in 2002, forb diversity decreased within the community and was less abundant. The most abundant species have included bastard toadflax (*Comandra pallida*), tapertip hawksbeard (*Crepis acuminata*), one-flower helianthella (*Helianthella uniflora*), silvery lupine (*Lupinus argenteus*), American vetch (*Vicia americana*), redroot eriogonum (*Eriogonum racemosum*), and mulesears wyethia (*Wyethia amplexicaulis*) (Table - Herbaceous Trends).

Soil: The soil is within the Reywat-Broad-Rock outcrop association and is likely part of the Reywat component, which occurs on hillsides and mountainsides. The parent material consists of residuum and colluvium derived from quartzite and igneous rocks (Soil Survey Staff 2011). The soil texture is a clay loam with a slightly acidic soil reaction (pH of 6.3) (Table - Soil Analysis Data). Bare ground cover has been moderate, with a high amount of vegetation and litter providing protective ground cover (Table - Basis Cover).

The abundance of vegetation and litter prevents increased erosion on the study site. In 1983, pocket gophers were reportedly active throughout the area and were a source of significant soil disturbance in. The erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - stable (0):** The density of mountain big sagebrush increased 4% from1,799 plants/acre to 1,865 plants/acre. Decadence of sagebrush increased from 15% to 21%, and poor vigor increased from 0% to 32%. Recruitment of young sagebrush to the population increased from 0% to 7%. The density of Saskatoon serviceberry increased 50% from 133 plants/acre to 199 plants/acre. Decadence of serviceberry increased from 0% to 33%, but poor vigor decreased from 100% to 0%. Recruitment of young serviceberry to the population increased from 0% to 67%.
- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence of sagebrush increased slightly to 25%, but poor vigor decreased to 14%. Recruitment of young sagebrush to the population remained minimal at 1%. Decadence of serviceberry decreased to 14%, and poor vigor increased slightly to 7%. Recruitment of young serviceberry to the population increased to 43%.
- **1997 to 2002 - stable (0):** The density of mountain big sagebrush increased 9% from 4,220 plants/acre to 4,580 plants/acre. Cover of sagebrush increased from 23% to 26%. Decadence of mountain big sagebrush remained similar at 26%, but poor vigor decreased to 2%. Recruitment of young sagebrush to the population remained nominal at 1%. The density of Saskatoon serviceberry decreased 14% from 280 plants/acre to 240 plants/acre. Cover of serviceberry remained under 1%. Decadence of serviceberry increased to 58%, but poor vigor decreased to 0%. Recruitment of young serviceberry decreased to 8%.
- **2002 to 2007 - down (-2):** The density of mountain big sagebrush decreased 30% to 3,220 plants/acre. Cover of sagebrush decreased to 16%. Decadence of sagebrush increased slightly to 29%, and poor vigor increased to 12%. Recruitment of young sagebrush to the population was not observed. The density of Saskatoon serviceberry decreased 67% to 80 plants/acre. Cover of serviceberry remained under 1%. Decadence of serviceberry decreased to 25%, and poor vigor remained at 0%. Recruitment of young serviceberry to the population was not observed.
- **2007 to 2012 - stable (0):** The density of mountain big sagebrush increased 9% to 3,500 plants/acre. Cover of sagebrush increased to 22%. Decadence of sagebrush decreased to22%, and poor vigor increased to 21%. Recruitment of young sagebrush to the population increased to 2%, but is still considered to be very poor. The density of Saskatoon serviceberry increased nearly four-fold to 300 plants/acre. Cover of serviceberry remained under 1%. Decadence of serviceberry decreased to 13%, but poor vigor increased to 13%. Recruitment of young serviceberry increased to 27%.

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1989 to 1997 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1997 to 2002 - down (-2):** The sum of nested frequencies of perennial grasses decreased 24%, and cover decreased from 11% to 5%.
- **2002 to 2007 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, and cover increased slightly to 6%.
- **2007 to 2012 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover increased to 15%.

Forb:

- **1983 to 1989 - slightly up (+1):** The sum of nested frequencies of perennial forbs increased 20%. Tapertip hawksbeard increased significantly in nested frequency.

- **1989 to 1997 - down (-2):** The sum of nested frequencies of perennial forbs decreased 45%. Forbs remain very common and diverse on the site.
- **1997 to 2002 - down (-2):** The sum of nested frequencies of perennial forbs decreased 75%, and cover decreased from 13% to 3%. Forb diversity decreased dramatically on the site.
- **2002 to 2007 - up (+2):** The sum of nested frequencies of perennial forbs increased nearly three-fold. Perennial forb cover increased slightly to 5%.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial forbs increased 34%. Perennial forb cover increased to 18%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron spicatum	ab59	b93	ab53	a38	a30	a21	1.65	.47	.50	1.23
G	Agropyron trachycaulum	9	5	-	-	-	-	-	-	-	-
G	Bromus carinatus	4	-	-	-	4	-	-	-	.06	-
G	Bromus tectorum (a)	-	-	-	-	3	-	-	-	.00	-
G	Elymus cinereus	-	-	3	-	-	2	.41	.03	-	.18
G	Leucopoa kingii	a-	a3	ab7	ab4	b16	ab4	.18	.15	.16	.66
G	Melica bulbosa	b11	b18	b9	a-	b11	ab7	.08	-	.04	.21
G	Poa bulbosa	-	-	3	-	-	1	.03	-	-	.03
G	Poa fendleriana	b200	cd241	d240	bc196	b173	a68	7.65	4.25	3.72	4.61
G	Poa secunda	a58	a23	a53	a47	a47	b201	1.13	.37	1.21	8.43
G	Sitanion hystrix	b19	ab6	a5	a-	a1	a-	.01	-	.03	-
Total for Annual Grasses		0	0	0	0	3	0	0	0	0.00	0
Total for Perennial Grasses		360	389	373	285	282	304	11.17	5.27	5.72	15.35
Total for Grasses		360	389	373	285	285	304	11.17	5.27	5.73	15.35
F	Agoseris glauca	b29	a-	a11	a-	a7	a3	.08	-	.12	.03
F	Allium sp.	b32	ab10	a5	a-	c102	a8	.01	-	.58	.01
F	Arabis sp.	ab2	b9	ab6	a-	a-	a-	.01	-	-	-
F	Astragalus cibarius	ab20	b28	a2	a-	a-	ab20	.01	-	-	.21
F	Astragalus convallarius	b58	b70	b70	a-	a5	a13	2.25	-	.01	.42
F	Balsamorhiza hookeri	a3	a2	b19	ab16	ab6	ab12	.66	.42	.22	.78
F	Balsamorhiza sagittata	ab30	b44	a12	a13	ab34	ab34	.66	.45	1.34	3.70
F	Calochortus nuttallii	1	3	-	-	-	-	-	-	-	-
F	Castilleja linariaefolia	1	4	-	-	-	-	-	-	-	-
F	Cirsium neomexicanum	ab14	b14	a2	a-	a-	a-	.03	-	-	-
F	Collinsia parviflora (a)	-	-	c22	a-	d175	b78	.07	-	.85	.26
F	Collomia linearis (a)	-	-	-	-	-	2	-	-	-	.00
F	Comandra pallida	a46	a42	ab66	a51	ab71	b118	.90	1.02	.71	2.48
F	Crepis acuminata	d155	e222	c59	a-	b12	c48	.74	-	.19	1.14
F	Delphinium nuttallianum	-	3	9	-	2	-	.02	-	.00	-
F	Erigeron eatonii	a-	b29	a4	a-	a3	a-	.01	-	.00	-
F	Eriogonum racemosum	abc20	c27	bc21	ab6	a2	c26	.28	.03	.03	.23
F	Eriogonum umbellatum	ab4	ab3	b10	ab4	a-	ab3	.29	.03	-	.03

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Fritillaria atropurpurea	-	3	1	-	-	-	.00	-	-	-
F	Helianthella uniflora	b92	b114	a63	a37	a38	a49	2.52	.59	.25	3.34
F	Holosteum umbellatum (a)	-	-	-	-	-	1	-	-	-	.00
F	Hydrophyllum occidentale	a-	ab4	a-	a-	b9	a-	-	-	.10	-
F	Lithospermum ruderale	4	2	4	10	3	1	.03	.21	.00	.03
F	Lomatium grayi	a8	ab17	a4	a-	a3	b38	.04	-	.01	.86
F	Lupinus argenteus	a5	a2	c69	a-	a5	b31	2.37	-	.10	1.01
F	Machaeranthera canescens	c26	c33	b7	a-	a-	a-	.02	-	-	-
F	Mertensia oblongifolia	a-	b15	a-	a-	b12	b14	-	-	.15	.13
F	Microsteris gracilis (a)	-	-	3	-	4	3	.00	-	.01	.00
F	Orobanche fasciculata	-	1	-	-	-	-	-	-	-	-
F	Penstemon subglaber	10	5	5	-	4	-	.01	-	.01	-
F	Phlox longifolia	b80	c124	b72	a2	a3	a28	.37	.00	.06	.21
F	Polygonum douglasii (a)	-	-	6	-	-	2	.01	-	-	.00
F	Senecio integerrimus	a-	a3	a14	a-	b35	a3	.22	-	.50	.03
F	Senecio multilobatus	a-	a-	b6	a-	a-	ab2	.06	-	-	.15
F	Taraxacum officinale	-	-	1	1	-	-	.00	.03	-	-
F	Tragopogon dubius (a)	4	-	-	-	-	-	-	-	-	-
F	Vicia americana	c199	c191	ab17	a-	a1	b43	.13	-	.00	1.23
F	Wyethia amplexicaulis	b28	b28	b23	a5	ab21	ab12	1.06	.21	.87	2.21
F	Zigadenus paniculatus	b10	a1	a-	a-	a-	a-	-	-	-	-
Total for Annual Forbs		4	0	31	0	179	86	0.09	0	0.86	0.27
Total for Perennial Forbs		877	1053	582	145	378	506	12.88	3.02	5.31	18.29
Total for Forbs		881	1053	613	145	557	592	12.97	3.02	6.17	18.57

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

BROWSE TRENDS--
Management unit 19B, Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Amelanchier alnifolia	11	11	3	10	.15	.06	.15	.33
B	Artemisia tridentata vaseyana	91	93	82	88	22.50	25.46	16.18	22.42
B	Chrysothamnus viscidiflorus viscidiflorus	55	25	25	20	1.48	.37	.44	.60
B	Juniperus osteosperma	0	0	0	0	.53	.63	.78	.85
B	Mahonia repens	3	3	3	2	1.11	.06	.17	.44
B	Opuntia sp.	22	8	23	20	-	-	-	-
B	Pinus monophylla	1	1	1	1	-	1.48	1.82	1.23
B	Rosa woodsii	22	26	18	28	.98	1.35	.70	1.82
B	Symphoricarpos oreophilus	82	75	81	79	9.67	11.79	13.41	19.66
Total for Browse		287	242	236	248	36.43	41.22	33.67	47.36

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 1

Species	Percent Cover		
	'02	'07	'12
Amelanchier alnifolia	.21	-	.11
Artemisia tridentata vaseyana	23.06	25.95	29.61
Chrysothamnus viscidiflorus viscidiflorus	.35	.48	.33
Juniperus osteosperma	.56	1.21	.61
Mahonia repens	.06	.16	.33
Pinus monophylla	1.03	1.60	.95
Rosa woodsii	.33	1.03	1.76
Symphoricarpos oreophilus	11.36	25.89	28.78

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 1

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	1.2	1.3	1.6

POINT-QUARTER TREE DATA--
Management unit 19B, Study no: 1

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	22	24	24
Pinus monophylla	51	44	45

Average diameter (in)		
'02	'07	'12
1.4	2.6	3.1
1.6	3.1	2.4

BASIC COVER--
Management unit 19B, Study no: 1

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	3.50	9.75	52.32	47.79	45.73	60.29
Rock	12.50	8.75	5.75	7.86	6.12	11.84
Pavement	5.00	11.50	5.65	6.34	8.35	4.56
Litter	51.75	58.50	57.13	44.81	31.95	49.34
Cryptogams	.25	.25	.04	.10	.00	.00
Bare Ground	27.00	11.25	5.33	16.31	17.39	12.78

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 1, Sabie Mountain

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.0	6.3	30.6	41.8	27.6	4.7	10.1	275.2	1.0

PELLET GROUP DATA--
Management unit 19B, Study no: 1

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	6	1	31	-
Elk	1	-	2	-
Deer	8	8	17	-
Cattle	-	1	4	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	14 (35)	-
19 (46)	22 (55)	5 (12)
5 (13)	11 (27)	2 (5)

BROWSE CHARACTERISTICS--
Management unit 19B, 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									
83	**133**	0	100	0	-	50	50	100	20/3
89	**199**	67	0	33	-	33	67	0	-/-
97	**280**	43	43	14	-	29	7	7	19/18
02	**240**	8	33	58	-	33	58	0	14/22
07	**80**	0	75	25	-	0	100	0	18/21
12	**300**	27	60	13	-	60	20	13	31/25
Artemisia tridentata vaseyana									
83	**1799**	0	85	15	-	30	0	0	22/20
89	**1865**	7	71	21	-	21	0	32	26/30
97	**4220**	1	73	25	80	20	.94	14	26/32
02	**4580**	1	73	26	-	4	24	2	25/35
07	**3220**	0	71	29	-	37	17	12	26/40
12	**3500**	2	76	22	-	10	2	21	27/41
Chrysothamnus viscidiflorus viscidiflorus									
83	**3666**	0	100	0	-	0	0	0	8/8
89	**4332**	35	49	15	-	3	0	5	18/18
97	**2640**	8	87	5	-	0	0	4	13/12
02	**800**	3	25	73	-	5	13	25	5/7
07	**820**	2	71	27	60	5	5	22	9/13
12	**620**	0	100	0	-	0	0	3	10/11
Eriogonum microthecum									
83	**0**	0	0	-	-	0	0	0	-/-
89	**199**	100	0	-	-	33	0	67	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

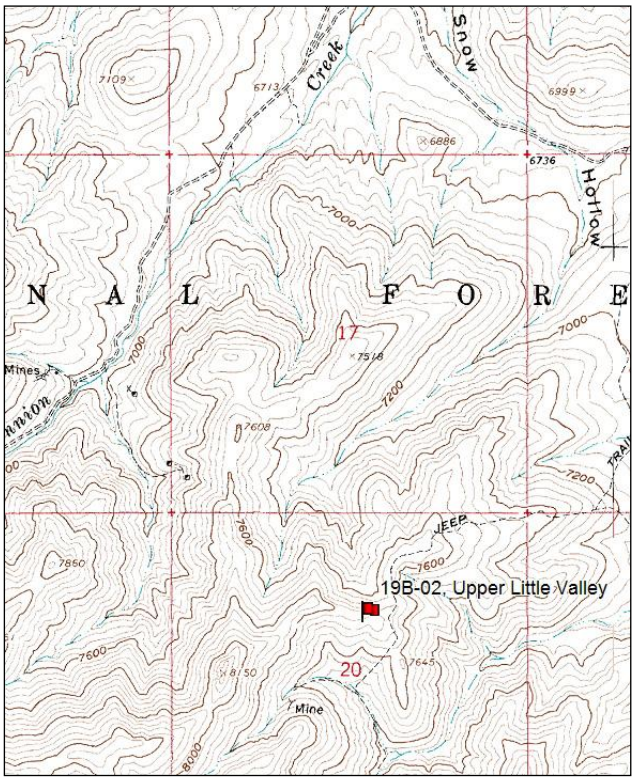
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Juniperus osteosperma									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**60**	100	0	-	-	0	0	0	-/-
02	**80**	50	50	-	-	0	0	0	-/-
07	**80**	50	50	-	-	0	0	0	-/-
12	**40**	0	100	-	-	0	0	0	-/-
Mahonia repens									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**2820**	8	92	0	-	0	0	0	3/5
02	**420**	0	90	10	-	0	0	0	4/5
07	**2400**	7	93	0	-	0	0	0	2/3
12	**1980**	2	98	0	-	0	0	0	3/4
Pinus monophylla									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**20**	100	0	-	20	0	0	0	-/-
02	**20**	0	100	-	20	0	0	0	-/-
07	**20**	0	100	-	-	0	0	0	-/-
12	**20**	100	0	-	-	0	0	0	-/-
Rosa woodsii									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**1820**	46	54	0	-	0	0	0	8/10
02	**1540**	21	69	10	-	0	0	1	9/9
07	**1500**	13	87	0	-	7	0	0	13/9
12	**2960**	11	88	1	-	0	0	1	8/10
Symphoricarpos oreophilus									
83	**6599**	0	100	0	-	0	0	0	22/14
89	**8864**	39	56	5	199	32	2	2	18/17
97	**5060**	5	93	2	40	0	0	0	13/20
02	**8360**	0	88	12	-	0	1	.23	12/17
07	**6600**	3	95	2	-	3	0	2	13/26
12	**9620**	17	82	1	80	1	0	1	13/17

UPPER LITTLE VALLEY - TREND STUDY NO. 19B-2-12

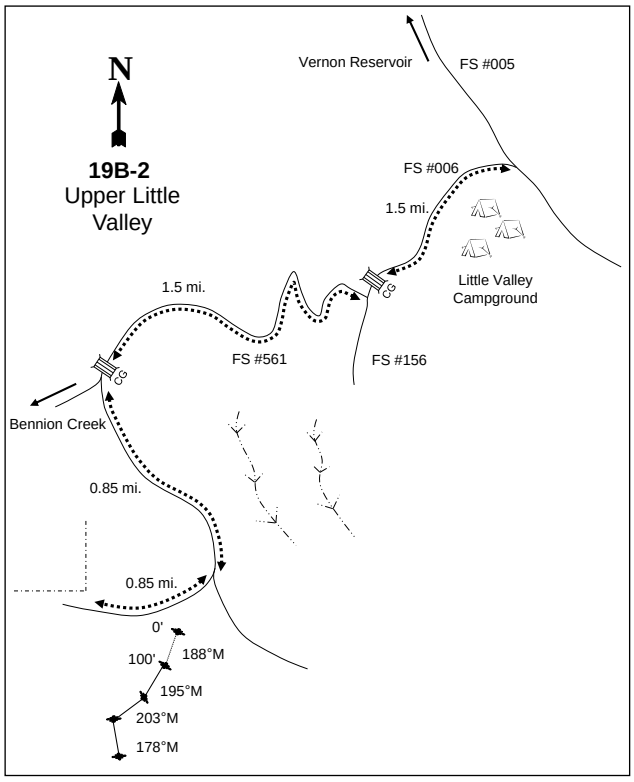
Vegetation Type: Mixed Mountain Big Sagebrush
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: USFS
Elevation: 7,700 ft. (2,347 m)
Aspect: South
Slope: 25-30%
Transect bearing: 188° magnetic (Line 1), 195° magnetic (Line 2), 203° magnetic (Line 3), 178° magnetic (Line 4)
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is on 4ft mark on belt 4

Directions: The steep, rocky road leading to this study site can be reached on the little Valley road either by traveling east 2.5 miles from Bennion Creek or west 2.6 miles from the Little Valley Campground. Turn south, and go 0.85 miles to an intersection. Bear right and continue southerly up the ridge for 0.85 miles to a fence corner on the ridge line. Continue up along the fence to the 19th fencepost. From this fencepost, the 0-foot baseline stake is 33 paces away at 169°M and is marked with a red browse tag number 3928.

Map Name: Dutch Peak



Diagrammatic Sketch:



Township: 10S Range: 5W Section: 20

GPS: NAD 83, UTM 12S 377780 E 4422418 N

Site Information

Site Description: This study samples deer summer range near the head of Little Valley on land administered by the U.S. Forest Service (USFS), and is within the Little Valley grazing allotment. Numerous intermittent and perennial streams in the area provide good distribution of water. However, thermal and escape cover is rare as most of the surrounding area is occupied by low-growing shrubs. Vegetation tall enough to provide thermal escape can only be found in nearby canyon bottoms. The study is frequented by deer, but less so by elk. Deer pellet groups were sampled in high abundance in 2002 and 2007, but in low abundance in 2012. Elk pellet groups were sampled in low abundance in 2002 and 2007. Cattle pats have been sampled in low abundance since 2002 (Table - Pellet Group Data). Thirteen deer were observed near the study in 2002.

Browse: The most abundant preferred browse is Saskatoon serviceberry (*Amelanchier alnifolia*), which is a moderately dense, mature population that has steadily decreased in density over the course of the study. Decadence within the serviceberry population has been generally good, but was moderate in 1983 and 1989. Serviceberry decadence in the early sample years can likely be attributed to an infestation of tent caterpillars (*Malacosoma* sp.) in 1983. Poor vigor has been low most sample years, but was high in 2002. It was reported in 2002 that serviceberry plants were not producing flowers or leader growth, and were losing many leaves due to the extremely dry conditions. Recruitment of young serviceberry to the population has been nominal most sample years, but was high in 1989. Utilization of serviceberry has fluctuated, but has generally been moderate to heavy. Serviceberry plants have increased in size since the outset of the study, but remain mostly available for animal use. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides additional browse for wildlife. Sagebrush is a moderately dense, mature population that has increased in density since 1997. The health of the sagebrush population has been fair most sample years, but has generally followed the same pattern as serviceberry with high decadence and poor vigor in 1989 and 2002. Recruitment of young sagebrush to the population has been low each sample year with the exception in 2007 when recruitment was good. Utilization of sagebrush has been mostly light with some moderate use throughout the study years. Although mountain snowberry (*Symphoricarpos oreophilus*) is not usually considered a preferred browse species, there has been light to moderate utilization of the species. Wildlife may use this species because it is more abundant than the two preferred browse species. Other browse sampled on the site include Oregon grape (*Mahonia repens*), Martin ceanothus (*Ceanothus martinii*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), and pricklypear cactus (*Opuntia* sp.) (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are diverse, but are not particularly abundant. With the exception of 2007 and 2012, perennial grasses were more abundant than annual grasses. The common perennial grasses include bluebunch wheatgrass (*Agropyron spicatum*), mutton bluegrass (*Poa fendleriana*), mountain brome (*Bromus carinatus*), and bottlebrush squirreltail (*Sitanion hystrix*). The invasive annual species cheatgrass (*Bromus tectorum*) has fluctuated in frequency and cover since 1997, but has dominated the grass component at times. With the exception in 2002, the forb component has been abundant and diverse. During sampling in 2002 most forbs were desiccated and unrecognizable. The most abundant perennial forbs included wild onion (*Allium* sp.), longleaf phlox (*Phlox longifolia*), tapertip hawksbeard (*Crepis acuminata*), gray lomatium (*Lomatium grayi*), and tailcup lupine (*Lupinus caudatus*). The most common annual forb species on the site include pale alyssum (*Alyssum alyssoides*), slenderleaf collomia (*Collomia linearis*), and blue-eyed Mary (*Collinsia parviflora*) (Table - Herbaceous Trends).

Soil: The study lies within the Podmor-Onaqui-Rock outcrop association and is likely part of the Onaqui component, which is found on ridges and mountainsides. The parent material consists of colluvium derived from quartzite and/or residuum weathered from quartzite (Soil Survey Staff 2011). The soil is relatively shallow and rocky with numerous basalt rocks and outcrops noticeable in the immediate area. The soil texture is a sandy clay loam with a slightly acidic soil reaction (pH of 6.2) (Table - Soil Analysis Data). Bare ground cover has been moderate in most years, but was high in 2002. Moderate amounts of vegetation and litter

provides too little protective ground cover as erosion control (Table - Basic Cover). A moderate level of surface rock movement and pedestalling provides the most evidence of erosion. Thus, the erosion condition was determined to be slight since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - up (+2):** The density of Saskatoon serviceberry increased 64% from 732 plants/acre to 1,198 plants/acre. Decadence of serviceberry increased slightly from 18% to 22%, but poor vigor decreased slightly from 9% to 6%. Recruitment of young serviceberry to the population increased considerably from 0% to 44%. The density of mountain big sagebrush increased 50% from 799 plants/acre to 1,198 plants/acre. Decadence of sagebrush increased from 0% to 22%, and poor vigor increased from 0% to 56%. Recruitment of young sagebrush to the population was absent.
- **1989 to 1997 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. The health of the Saskatoon serviceberry population improved significantly with decadence decreasing to 3%, and poor vigor decreasing to 3%. Recruitment of young serviceberry to the population decreased to 6%. The health of the mountain big sagebrush population improved considerably with decadence decreasing to 12%, and poor vigor decreasing to 6%. Recruitment of young sagebrush to the population was absent. .
- **1997 to 2002 - stable (0):** The density of Saskatoon serviceberry increased 9% from 640 plants/acre to 700 plants/acre, and cover decreased from 6% to 5%. Decadence of serviceberry decreased to 0%, but poor vigor increased to 49%. Recruitment of young serviceberry to the population was absent. The density of mountain big sagebrush increased 53% from 340 plants/acre to 520 plants/acre, but cover remained similar at 3%. Decadence of sagebrush increased to 19%, and poor vigor remained similar at 4%. Recruitment of young sagebrush to the population was absent.
- **2002 to 2007 - stable (0):** The density of Saskatoon serviceberry decreased 31% to 480 plants/acre, but cover remained similar at 5%. Decadence of serviceberry remained at 0%, and poor vigor decreased to 0%. Recruitment of young serviceberry to the population was absent. The density of Mountain big sagebrush increased 19% to 620 plants/acre, and cover increased to 4%. Decadence of sagebrush decreased to 10%, but poor vigor increased to 10%. Recruitment of young sagebrush to the population increased to 35%.
- **2007 to 2012 - up (+2):** The density of Saskatoon serviceberry decreased 8% to 440 plants/acre, but cover increased to 7%. Decadence of serviceberry increased slightly to 5%, and poor vigor remained at 0%. Recruitment of young serviceberry to the population was not observed. The density of Mountain big sagebrush increased 39% to 800 plants/acre, and cover increased to 6%. Decadence of sagebrush decreased to 5%, and poor vigor decreased to 0%. Recruitment of young sagebrush to the population decreased to 2%.

Grass:

- **1983 to 1989 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased 12%. Bottlebrush squirreltail decreased significantly in nested frequency.
- **1989 to 1997 - stable (0):** The sum of nested frequencies of perennial grasses remained similar. The invasive annual species cheatgrass was common on the site.
- **1997 to 2002 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover decreased from 8% to 6%. Bluebunch wheatgrass increased significantly in nested frequency. Cheatgrass deceased significantly in nested frequency, and decreased in cover from 2% to near 0%.
- **2002 to 2007 - down (-2):** The sum of nested frequencies of perennial grasses decreased 32%, and cover decreased to 4%. Bluebunch wheatgrass decreased significantly in nested frequency. Cheatgrass increased significantly in nested frequency, and increased in cover to 14%.
- **2007 to 2012 - up (+2):** The sum of nested frequency of perennial grasses increased 74%, and cover increased to 8%. Mountain brome increased significantly in nested frequency. The weedy perennial

species bulbous bluegrass was observed on the site for the first time in very low abundance. The invasive annual species cheatgrass remained common, but decreased in cover to 6%.

Forb:

- **1983 to 1989 - down (-2):** The sum of nested frequencies of perennial forbs decreased 42%. Forb diversity decreased on the site.
- **1989 to 1997 - up (+2):** The sum of nested frequencies of perennial forbs increased 22%.
- **1997 to 2002 - down (-2):** The sum of nested frequency of perennial forbs decreased 89%. Perennial forb cover decreased from 14% to 1%. Perennial forbs are rare on the site and have decreased in diversity.
- **2002 to 2007 - up (+2):** The sum of nested frequencies of perennial forbs increased four-fold, and increased in cover to 8%.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial forbs increased 64%, and increased in cover to 17%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron spicatum	a31	a49	a60	b144	a55	a50	1.86	4.98	1.95	2.65
G	Agropyron trachycaulum	a3	ab9	a-	a-	a1	b19	-	-	.15	.26
G	Bromus carinatus	ab41	b72	ab49	a32	a23	b63	1.17	.66	.20	1.77
G	Bromus tectorum (a)	-	-	b187	a5	c246	c278	1.71	.01	13.76	5.47
G	Festuca myuros (a)	-	-	-	-	3	1	-	-	.03	.00
G	Melica bulbosa	ab3	a-	ab8	a-	ab2	b16	.26	-	.01	.65
G	Poa bulbosa	-	-	-	-	-	4	-	-	-	.03
G	Poa fendleriana	b78	b78	ab50	a17	ab38	ab29	2.99	.53	1.30	1.05
G	Poa secunda	a-	ab9	b28	a5	ab17	b33	.66	.03	.22	.80
G	Sitanion hystrix	c58	b27	ab25	ab7	a3	ab16	.65	.04	.03	.09
G	Stipa lettermani	ab3	a-	ab3	a-	a-	b12	.03	.00	-	.45
Total for Annual Grasses		0	0	187	5	249	279	1.71	0.01	13.79	5.48
Total for Perennial Grasses		217	244	223	205	139	242	7.62	6.26	3.88	7.76
Total for Grasses		217	244	410	210	388	521	9.33	6.28	17.67	13.24
F	Achillea millefolium	1	-	-	-	-	-	-	-	-	-
F	Agoseris glauca	b12	a-	b26	ab5	ab3	b18	.47	.03	.03	.31
F	Allium sp.	d182	b70	c100	a-	a4	b44	.45	-	.04	.18
F	Alyssum alyssoides (a)	-	a21	ab249	a3	b236	c267	4.31	.01	2.94	5.34
F	Arenaria fendleri	-	-	-	-	-	3	-	-	-	.15
F	Aster sp.	-	1	4	-	-	-	.36	-	-	-
F	Astragalus cibarius	-	-	-	-	-	1	-	-	-	.00
F	Astragalus sp.	-	-	7	-	-	-	.06	-	-	-
F	Astragalus utahensis	3	-	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	10	17	10	11	8	11	.82	.54	.43	2.63
F	Camelina microcarpa (a)	-	-	ab11	a-	a-	b26	.02	-	-	.14
F	Chaenactis douglasii	3	-	-	-	-	-	-	-	-	-
F	Cirsium neomexicanum	9	8	3	2	3	9	.21	.03	.00	.48

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Collinsia parviflora (a)	-	-	$_{a}$32	$_{a}$1	$_{c}$227	$_{b}$184	.06	.00	2.99	1.93
F	Collomia linearis (a)	-	-	$_{c}$88	$_{a}$-	$_{a}$8	$_{b}$30	.38	-	.04	.39
F	Comandra pallida	$_{c}$81	$_{b}$43	$_{ab}$29	$_{ab}$24	$_{a}$13	$_{ab}$16	.35	.18	.13	.11
F	Crepis acuminata	$_{b}$63	$_{b}$59	$_{b}$50	$_{a}$3	$_{a}$5	$_{b}$43	1.20	.03	.06	.91
F	Cryptantha sp.	4	-	-	-	-	-	-	-	-	-
F	Cymopterus sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$11	-	-	-	.52
F	Delphinium nuttallianum	$_{b}$12	$_{a}$-	$_{b}$21	$_{a}$-	$_{a}$-	$_{b}$18	.15	-	-	.72
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$25	$_{a}$-	-	-	.70	-
F	Epilobium brachycarpum (a)	-	-	$_{ab}$15	$_{bc}$22	$_{a}$4	$_{c}$47	.06	.12	.03	.11
F	Epilobium sp.	-	-	-	-	7	-	-	-	.18	-
F	Eriogonum racemosum	$_{b}$17	$_{ab}$9	$_{a}$3	$_{a}$-	$_{a}$-	$_{a}$-	.15	-	-	-
F	Hackelia patens	11	10	-	-	9	4	-	-	.06	.01
F	Helianthella uniflora	3	-	-	-	-	-	-	-	-	-
F	Heuchera parvifolia	1	-	-	-	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	-	-	-	1	-	-	-	.15
F	Hydrophyllum capitatum	$_{b}$87	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$79	$_{b}$66	-	-	5.13	4.86
F	Hymenoxys acaulis	$_{a}$-	$_{a}$-	$_{b}$45	$_{a}$-	$_{a}$-	$_{a}$-	4.65	-	-	-
F	Lactuca serriola (a)	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$1	$_{b}$51	-	-	.03	.26
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$16	$_{b}$47	-	-	.09	.62
F	Lathyrus brachycalyx	8	-	-	3	-	-	-	.00	-	-
F	Lithospermum ruderale	$_{b}$9	$_{a}$1	$_{ab}$3	$_{ab}$4	$_{ab}$6	$_{ab}$7	.15	.18	.68	.68
F	Lomatium grayi	$_{b}$52	$_{ab}$30	$_{b}$49	$_{a}$-	$_{a}$7	$_{ab}$25	1.50	-	.12	1.35
F	Lupinus caudatus	$_{c}$78	$_{c}$72	$_{bc}$44	$_{a}$-	$_{b}$37	$_{bc}$62	1.74	-	.89	3.34
F	Machaeranthera canescens	1	-	1	-	-	1	.03	-	-	.00
F	Microsteris gracilis (a)	-	-	$_{a}$24	$_{a}$-	$_{b}$177	$_{a}$6	.14	-	3.23	.01
F	Penstemon sp.	-	-	5	-	-	-	.01	-	-	-
F	Phlox longifolia	$_{b}$29	$_{b}$43	$_{b}$56	$_{a}$-	$_{b}$29	$_{a}$-	.63	-	.38	-
F	Polygonum douglasii (a)	-	-	$_{b}$21	$_{a}$-	$_{a}$2	$_{a}$-	.10	-	.00	-
F	Ranunculus testiculatus (a)	-	-	-	-	2	2	-	-	.00	.03
F	Senecio integerrimus	-	9	5	-	1	4	.18	-	.00	.03
F	Taraxacum officinale	-	$_{b}$21	$_{a}$5	$_{a}$-	$_{a}$5	$_{a}$10	.12	-	.06	.19
F	Tragopogon dubius (a)	$_{ab}$20	$_{b}$30	$_{ab}$17	$_{a}$-	$_{a}$1	$_{a}$9	.07	-	.00	.25
F	Unknown forb-perennial	-	-	-	1	-	-	-	.00	-	-
F	Viola sp.	-	-	-	-	-	2	-	-	-	.00
F	Wyethia amplexicaulis	-	-	5	-	-	-	.15	-	-	-
F	Zigadenus paniculatus	-	-	8	-	-	-	.02	-	-	-
Total for Annual Forbs		20	51	457	26	699	670	5.15	0.14	10.09	9.28
Total for Perennial Forbs		676	393	479	53	216	355	13.47	1.01	8.23	16.54
Total for Forbs		696	444	936	79	915	1025	18.62	1.15	18.33	25.82

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

BROWSE TRENDS--
Management unit 19B, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
						'97	'02	'07	'12
B	Amelanchier alnifolia	22	24	20	18	5.56	4.55	4.51	7.00
B	Artemisia tridentata vaseyana	13	19	22	30	2.57	3.16	3.76	6.22
B	Ceanothus martinii	7	10	1	7	.33	.56	-	.38
B	Chrysothamnus viscidiflorus viscidiflorus	5	5	4	6	.93	.33	.15	1.16
B	Juniperus osteosperma	1	0	0	0				
B	Mahonia repens	25	18	23	22	2.66	.51	1.50	2.00
B	Opuntia sp.	6	5	1	1	.15	.15	-	.00
B	Symphoricarpos oreophilus	66	66	53	64	15.70	14.43	10.87	14.85
Total for Browse		145	147	124	148	27.91	23.71	20.80	31.63

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 2

Species	Percent Cover		
	'02	'07	'12
Amelanchier alnifolia	8.03	10.81	10.88
Artemisia tridentata vaseyana	3.31	5.16	10.69
Ceanothus martinii	.41	-	.60
Chrysothamnus viscidiflorus viscidiflorus	.30	.36	.45
Mahonia repens	.66	1.14	1.25
Opuntia sp.	-	-	.05
Symphoricarpos oreophilus	18.39	18.18	17.43

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 2

Species	Average leader growth (in)		
	'02	'07	'12
Amelanchier alnifolia	-	2.6	3.7
Artemisia tridentata vaseyana	1.6	1.7	3.5

BASIC COVER--
Management unit 19B, Study no: 2

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	4.75	10.25	50.93	27.84	57.93	59.16
Rock	5.50	9.25	6.74	10.16	9.20	9.68
Pavement	3.25	3.25	1.85	10.75	9.21	2.68
Litter	71.50	63.50	53.03	38.76	18.77	34.09
Cryptogams	0	0	.03	0	0	0
Bare Ground	15.00	13.75	8.91	32.10	13.53	11.86

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 2, Upper Little Valley

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.8	6.2	49.3	27.2	23.6	4.6	13.7	211.2	0.6

PELLET GROUP DATA--

Management unit 19B, Study no: 2

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	3	-	1	1
Elk	2	-	10	-
Deer	26	21	18	11
Cattle	-	1	-	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
2 (5)	15 (36)	-
42 (104)	38 (93)	7 (17)
9 (21)	2 (4)	2 (4)

BROWSE CHARACTERISTICS--

Management unit 19B, 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)
Amelanchier alnifolia									
83	**732**	0	82	18	-	64	36	9	27/27
89	**1198**	44	33	22	-	28	22	6	32/30
97	**640**	6	91	3	-	50	13	3	53/55
02	**700**	0	100	0	-	0	97	49	42/42
07	**480**	0	100	0	-	46	50	0	51/59
12	**440**	0	95	5	-	18	0	0	50/59
Artemisia tridentata vaseyana									
83	**799**	0	100	0	-	42	8	0	21/31
89	**1198**	6	72	22	-	22	0	56	20/25
97	**340**	0	88	12	-	0	0	6	26/43
02	**520**	0	81	19	-	15	8	4	22/40
07	**620**	35	55	10	140	13	13	10	23/44
12	**860**	2	93	5	-	12	0	0	28/45
Ceanothus martinii									
83	**732**	64	36	-	-	100	0	0	7/11
89	**733**	0	100	-	-	27	0	0	8/11
97	**300**	27	73	-	40	33	0	0	8/27
02	**340**	6	94	-	-	0	88	0	4/11
07	**40**	0	100	-	-	0	100	0	5/7
12	**160**	0	100	-	-	38	0	0	9/23

		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 nauseosus albicaulis									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	24/39
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	34/52
Chrysothamnus viscidiflorus viscidiflorus									
83	**199**	33	67	0	-	0	0	0	11/13
89	**332**	40	60	0	-	0	0	0	13/19
97	**180**	0	100	0	-	0	0	0	15/32
02	**180**	0	11	89	-	0	11	44	9/18
07	**180**	0	89	11	-	0	0	11	11/20
12	**200**	0	100	0	-	0	0	0	11/21
Juniperus osteosperma									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**40**	0	100	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Mahonia repens									
83	**533**	0	100	0	-	0	0	0	5/7
89	**1265**	11	84	5	-	0	0	0	2/5
97	**7560**	22	78	0	-	0	0	0	5/7
02	**1560**	0	54	46	-	0	0	46	4/5
07	**8700**	0	100	0	-	.22	0	0	3/5
12	**6160**	11	89	0	-	0	0	0	3/5
Opuntia sp.									
83	**599**	0	100	0	-	0	0	0	6/13
89	**732**	18	73	9	-	0	0	0	8/22
97	**180**	22	78	0	-	0	0	22	6/11
02	**100**	0	100	0	-	0	0	0	5/13
07	**20**	0	100	0	-	0	0	0	6/13
12	**20**	0	100	0	-	0	0	0	5/19
Pachistima myrsinites									
83	**532**	12	88	-	-	0	0	0	5/4
89	**799**	42	58	-	-	0	25	0	2/2
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

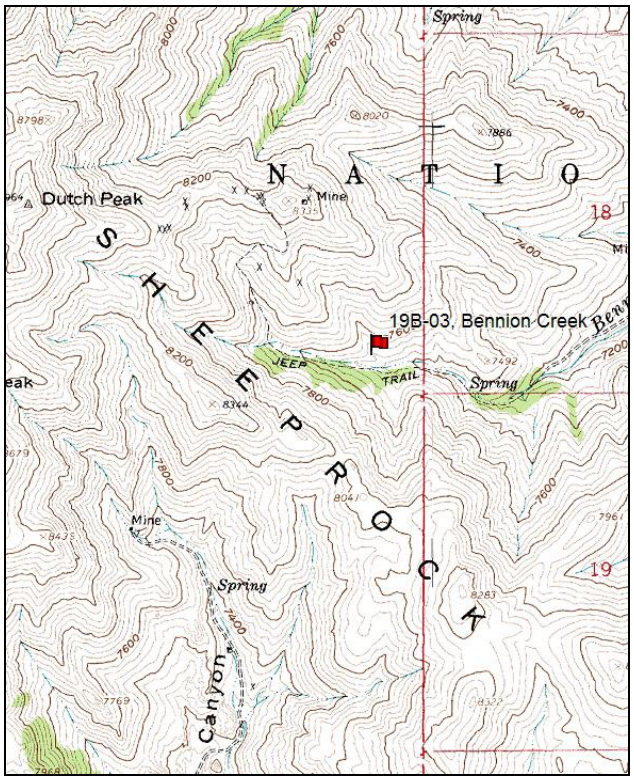
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus									
83	**1132**	41	59	0	-	12	0	0	19/15
89	**1599**	8	58	33	-	29	0	13	19/22
97	**3000**	23	61	15	40	25	7	11	25/45
02	**2880**	0	86	14	-	0	.69	35	21/36
07	**2200**	3	74	24	-	21	3	8	19/33
12	**2640**	17	81	2	60	11	0	2	23/43
Tetradymia canescens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	19/38
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

BENNION CREEK - TREND STUDY NO. 19B-3-12

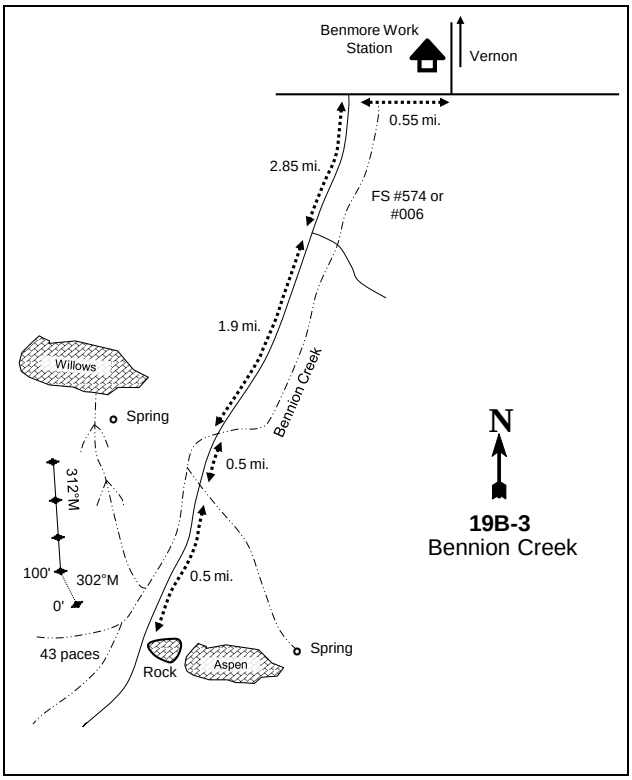
Vegetation Type: Mixed Mountain Brush
Range Type: Crucial Deer Spring/Fall
NRCS Ecological Site Description: Mountain Stony Loam (Mountain Big Sagebrush), R047XA461UT
Land Ownership: USFS
Elevation: 7,500 ft. (2,286 m)
Aspect: East
Slope: 15-30%
Transect bearing: 302° magnetic (Line 1), 312° magnetic (Line 2-4)
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is on the 4ft mark on belt 5

Directions: From the Benmore Work Station south of Vernon, Travel west 0.55 miles to the intersection with the USFS road 574 (may have been changed to road 006). Turn left and go south 2.85 miles to a fork. Bear right and go 1.7 miles to where Bennion Creek crosses the road. Proceed 0.5 miles to where a small drainage from a spring crosses the road. Continue up Bennion Creek 0.5 miles to the study site. Vehicle travel maybe restricted in this last 0.5 mile. The site is located on a ridge above the point where two springs come together. From the road, the 0-foot baseline stake is 43 paces northwest. A red browse tag, number 3979, is attached to the 0-foot baseline stake.

Map Name: Dutch Peak



Diagrammatic Sketch:



Township: 10S Range: 6W Section: 13

GPS: NAD 83, UTM 12S 375082 E 4423122 N

BENNION CREEK - TREND STUDY NO. 19B-3

Site Information

Site Description: This study is located on deer summer range found in the Sheeprock Mountains on land administered by the U.S. Forest Service (USFS) as part of the Benmore grazing allotment. The study samples a low-growth statured mountain brush community. Bennion Creek is a perennial stream that is located 200 yards down the slope to the south, and there is a seep spring on site that provides water for wildlife. A moderately large aspen stand and dense thickets of chokecherry and serviceberry provide nearby cover. Several deer were observed in the immediate area in 1983 and 2007. In 1997, several cows were observed grazing along Bennion Creek. Deer pellet groups have been sampled in low abundance since 2002. Elk pellet groups have been sampled in low abundance since 2002. Cattle pats were sampled low abundance in 2007 and 2012, but in moderate abundance in 2002 (Table - Pellet Group Data).

Browse: Utah serviceberry (*Amelanchier utahensis*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) are the key browse species found on the study site. Saskatoon serviceberry is a moderately dense, mature population that has varied in density over the course of the study. The health of the serviceberry population has been vigorous most sample years. Recruitment of young serviceberry to the population has been nominal over the course of the study. Utilization of serviceberry has been generally moderate to heavy. Mountain big sagebrush is a moderately dense, mature population that has increased in density over the course of the study. Decadence of sagebrush has fluctuated over the course of the study with several years of high decadence. Plants displaying poor vigor have generally been low, though poor vigor was at its highest in 1997. Crickets were abundant in 2002 and had defoliated many of the sagebrush plants. Recruitment of young sagebrush to the population has fluctuated with poor recruitment in 1997, 2002, and 2012, but good recruitment in 1983, 1989, and 2007. Utilization of sagebrush has been mostly light to moderate over the course of the study. Although mountain snowberry (*Symphoricarpos oreophilus*) is not considered a preferred browse species, the species has displayed some use throughout the study years. Snowberry is likely used by wildlife due to its high abundance in the area. Other shrubs sampled include black sagebrush (*Artemisia nova*), mountain lover (*Pachistima myrsinites*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), whorled buckwheat (*Eriogonum heracleoides*), Oregon grape (*Mahonia repens*), and pricklypear cactus (*Opuntia* sp.) (Table - Browse Characteristics).

Herbaceous Understory: Grasses are dominated by a variety of perennial species. These include spike fescue (*Leucopoa kingii*), mutton bluegrass (*Poa fendleriana*), oniongrass (*Melica bulbosa)*, and bluebunch wheatgrass (*Agropyron spicatum*). The invasive annual species cheatgrass (*Bromus tectorum*) has been low in abundance in most sample years, but was common in 2012. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) has increased in abundance between the sample years of 2007 and 2012. Grasses had been heavily grazed by insects in 2002. Forbs were very diverse and abundant in between the sample years of 1983 to 1997, but decreased significantly on the site in 2002. Since 2002, the forb community has gradually increased in abundance. The most abundant perennial forb species included wild onion (*Allium* sp.), aster (*Aster* sp.), arrowleaf balsamroot (*Balsamorhiza sagittata*), tapertip hawksbeard (*Crepis acuminata*), and lomatium (*Lomatium* sp.). Of the annual forbs, blue-eyed Mary (*Collinsia parviflora*), slenderleaf collomia (*Collomia linearis*), and pale alyssum (*Alyssum alyssoides*) have been the most abundant. The noxious weed houndstongue (*Cynoglossum officinale*) was sampled in 2002 (Table - Herbaceous Trends).

Soil: The study lies within the Podmor-Onaqui-Rock outcrop association and is likely part of the Onaqui component, which is found on ridges and mountainsides. The parent material consists of colluvium derived from quartzite and/or residuum weathered from quartzite (Soil Survey Staff 2011). The soil texture is a loam with a slightly acidic soil reaction (pH of 6.5) (Table - Soil Analysis Data). Bare ground cover is moderate with a moderate amount of rock, and high amounts of vegetation and litter providing protective ground cover (Table - Basic Cover). Some soil movement has been apparent, but appears minimal. The soil erosion condition was determined to be stable in 2002 and 2012, but slight in 2007.

Trend Assessments

Browse:

- **1983 to 1989 - slightly up (+1):** The density of Utah serviceberry increased 18% from 731 plants/acre to 865 plants/acre. Decadence of serviceberry increased from 9% to 15%, and poor vigor remained at 0%. Recruitment of young serviceberry decreased slightly from 55% to 46%. The density of mountain big sagebrush increased 25% from 532 plants/acre to 665 plants/acre. Decadence of sagebrush decreased from 25% to 0%, but poor vigor increased from 0% to 10%. Recruitment of young sagebrush to the population decreased from 25% to 10%.
- **1989 to 1997 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence of serviceberry increased to 37%, and poor vigor increased to 17%. Recruitment of young serviceberry to the population decreased to 9%. Decadence of sagebrush increased to 30%, and poor vigor increased to 21%. Recruitment of young sagebrush to the population was nominal at 2%.
- **1997 to 2002 - stable (0):** The density of Utah serviceberry decreased 11% from 720 plants/acre to 620 plants/acre, and cover decreased from 4% to 3%. Decadence of serviceberry decreased to16%, and poor vigor decreased to 10%. Recruitment of young serviceberry to the population remained similar at 10%. The density of mountain big sagebrush decreased 9% from 940 plants/acre to 860 plants/acre, and cover decreased from 5% to 4%. Decadence of sagebrush decreased slightly to 28%, and poor vigor decreased to 16%. Recruitment of young sagebrush to the population was low at 9%.
- **2002 to 2007 - stable (0):** The density of Utah serviceberry decreased 26% to 460 plants/acre, but cover remained similar at 3%. Despite the decrease in density, the health of the serviceberry population improved with decadence decreasing to 0%, and poor vigor decreasing to 4%. Recruitment of young serviceberry to the population decreased to 4%. The density of mountain big sagebrush increased 26% to 1,080 plants/acre, but cover decreased to 3%. The health of the sagebrush population improved with decadence decreasing to 9%, and poor vigor decreasing to 7%. Recruitment of young sagebrush to the population increased considerably to 30%.
- **2007 to 2012 - up (+2):** The density of Utah serviceberry increased 30% to 600 plants/acre, and cover increased to 4%. Decadence and poor vigor of serviceberry both increased to 7%. Recruitment of young serviceberry to the population increased to 10%. The density of mountain big sagebrush increased 91% to 2,060 plants/acre, and cover increased to 10%. The health of the sagebrush population remained similar with decadence decreasing to 8%, and poor vigor increasing to 13%. Recruitment of young sagebrush to the population decreased considerably to 1

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequencies of perennial grasses remained similar. Mutton bluegrass remains the dominant grass on the site.
- **1989 to 1997 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased 19%. Spike fescue, oniongrass, and mutton bluegrass increased significantly in nested frequency.
- **1997 to 2002 - down (-2):** The sum of nested frequencies of perennial grasses decreased 21%, and cover decreased from 16% to 9%. Bluebunch wheatgrass increased significantly in nested frequency. Oniongrass and Kentucky bluegrass decreased significantly in nested frequency.
- **2002 to 2007 - down (-2):** The sum of nested frequencies of perennial grasses decreased 27%, and cover decreased to 5%. Mutton bluegrass decreased significantly in nested frequency. Mountain brome increased significantly in nested frequency.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial grasses, excluding bulbous bluegrass, increased 31%, and cover increased to 12%. Spike fescue, slender wheatgrass, and Kentucky bluegrass increased significantly in nested frequency. Bulbous bluegrass was first observed in 2007, and increased significantly in nested frequency in 2012. Bulbous bluegrass also increased in cover from less than 1% to 1%.

Forb:

- **1983 to 1989 - stable (0):** The sum of nested frequencies of perennial forbs remained similar.
- **1989 to 1997 - down (-2):** The sum of nested frequencies of perennial forbs decreased 36%.
- **1996 to 2002 - down (-2):** The sum of nested frequencies of perennial forbs decreased 83%, and cover of perennial forbs decreased from 10% to 2%. Perennial forbs are rare and diversity has decreased considerably on the study. The noxious weed houndstongue was observed for the first time with low nested frequency and cover.
- **2002 to 2007 - up (+2):** The sum of nested frequencies of perennial forbs increased three-fold, and increased in cover to 9%. The perennial forb community increased in diversity and abundance.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial forbs increased 27%, and increased in cover to 17%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 3

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron spicatum	a49	a48	a70	b147	a51	a54	1.90	2.64	1.00	2.63
G	Agropyron trachycaulum	a13	ab14	a1	a-	a-	b35	.00	-	-	.74
G	Bromus carinatus	bc57	bc53	ab33	a3	c86	c68	.36	.03	1.87	1.54
G	Bromus tectorum (a)	-	-	a4	a-	a8	b117	.03	-	.07	1.37
G	Carex sp.	ab11	b26	a-	a6	a4	a7	-	.18	.03	.06
G	Elymus junceus	-	-	-	-	3	-	-	-	.15	-
G	Leucopoa kingii	b87	b84	c137	c124	a31	b81	6.78	4.69	.85	4.61
G	Melica bulbosa	a26	a26	b109	a22	a54	a46	2.29	.27	.57	.68
G	Phleum pratense	-	-	3	-	-	-	.03	-	-	-
G	Poa bulbosa	a-	a-	a-	a-	a10	b54	-	-	.19	1.41
G	Poa fendleriana	b147	b140	b120	b106	a38	a17	3.48	1.40	.43	.24
G	Poa pratensis	b14	b13	b13	a-	ab1	a-	.36	-	.01	-
G	Poa secunda	a13	a29	a31	a6	a21	b68	.57	.01	.31	1.56
G	Sitanion hystrix	-	-	-	-	-	3	-	-	-	.03
G	Stipa lettermani	5	7	5	1	3	4	.06	.00	.01	.00
Total for Annual Grasses		0	0	4	0	8	117	0.03	0	0.07	1.37
Total for Perennial Grasses		422	440	522	415	302	437	15.86	9.25	5.45	13.54
Total for Grasses		422	440	526	415	310	554	15.90	9.25	5.52	14.92
F	Achillea millefolium	3	-	3	-	1	1	.03	-	.00	.03
F	Agoseris glauca	a5	c69	b23	ab8	a3	a5	.07	.04	.03	.01
F	Allium sp.	d202	c121	c160	a-	b54	a7	.79	-	.27	.01
F	Alyssum alyssoides (a)	-	-	b79	a-	b76	c245	.15	-	1.05	1.33
F	Arabis sp.	-	6	1	-	-	3	.01	-	-	.01
F	Artemisia ludoviciana	4	1	10	9	5	5	.60	.21	.18	.18
F	Aster sp.	bc91	d115	c72	ab38	ab34	a19	1.04	.43	.81	.52
F	Astragalus cibarius	c60	c59	b17	a-	a-	b16	.26	-	-	.36
F	Balsamorhiza sagittata	ab18	b26	a5	a3	ab8	a4	.66	.28	1.95	2.62
F	Calochortus nuttallii	2	3	8	-	-	-	.02	-	-	-
F	Camelina microcarpa (a)	-	-	-	-	2	5	-	-	.03	.01

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Castilleja linariaefolia	$_{ab}$7	$_{ab}$3	$_{b}$10	$_{a}$-	$_{ab}$2	$_{a}$-	.05	-	.00	-
F	Chaenactis douglasii	1	-	1	-	-	3	.00	-	-	.00
F	Cirsium sp.	$_{b}$29	$_{a}$5	$_{a}$7	$_{a}$-	$_{a}$10	$_{a}$3	.34	-	.10	.01
F	Collinsia parviflora (a)	-	-	$_{b}$83	$_{a}$-	$_{c}$297	$_{b}$107	.16	-	7.29	.28
F	Collomia linearis (a)	-	-	$_{bc}$79	$_{a}$-	$_{c}$106	$_{b}$76	.24	-	.46	.22
F	Comandra pallida	$_{b}$35	$_{b}$35	$_{a}$-	$_{b}$18	$_{b}$11	$_{b}$21	-	.16	.22	.81
F	Crepis acuminata	$_{c}$138	$_{c}$140	$_{b}$86	$_{a}$1	$_{b}$59	$_{b}$92	2.53	.00	1.80	3.53
F	Cruciferae	-	-	-	-	4	-	-	-	.03	-
F	Cymopterus sp.	-	-	-	-	-	3	-	-	-	.07
F	Cynoglossum officinale	-	-	-	3	-	-	-	.00	-	-
F	Delphinium nuttallianum	$_{b}$31	$_{a}$-	$_{a}$13	$_{a}$-	$_{a}$2	$_{a}$-	.04	-	.00	-
F	Epilobium brachycarpum (a)	-	-	$_{a}$25	$_{a}$8	$_{b}$39	$_{a}$18	.07	.04	.28	.05
F	Erigeron divergens	4	1	8	-	3	-	.09	-	.03	-
F	Eriogonum brevicaule	-	-	-	-	3	4	-	-	.00	.01
F	Eriogonum racemosum	$_{b}$49	$_{b}$42	$_{a}$6	$_{a}$12	$_{a}$6	$_{a}$12	.04	.25	.09	.26
F	Eriogonum umbellatum	$_{bc}$40	$_{c}$38	$_{a}$13	$_{a}$3	$_{a}$-	$_{ab}$15	.17	.00	-	.14
F	Erysimum asperum	$_{b}$15	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
F	Fritillaria pudica	2	-	-	-	-	-	-	-	-	-
F	Gayophytum ramosissimum(a)	-	-	-	-	7	-	-	-	.03	-
F	Hackelia patens	2	-	2	-	-	-	.00	-	-	.00
F	Holosteum umbellatum (a)	-	-	$_{a}$5	$_{a}$-	$_{a}$2	$_{b}$22	.01	-	.00	.07
F	Hydrophyllum occidentale	$_{b}$28	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$56	$_{c}$103	-	-	1.69	5.64
F	Lactuca serriola (a)	$_{a}$-	$_{a}$-	$_{a}$2	$_{a}$-	$_{b}$29	$_{a}$14	.00	-	.25	.03
F	Lappula occidentalis (a)	-	-	-	-	5	-	-	-	.03	-
F	Lithospermum sp.	-	-	-	2	-	2	.00	.03	-	.18
F	Lomatium sp.	$_{c}$149	$_{c}$163	$_{b}$59	$_{a}$-	$_{b}$24	$_{b}$56	.91	-	1.06	1.92
F	Lupinus caudatus	$_{c}$59	$_{b}$23	$_{a}$-	$_{a}$-	$_{a}$6	$_{a}$6	-	-	.18	.04
F	Lupinus sericeus	$_{c}$29	$_{bc}$19	$_{ab}$11	$_{ab}$2	$_{a}$-	$_{a}$-	.33	.15	.01	-
F	Machaeranthera canescens	$_{ab}$6	$_{ab}$1	$_{ab}$11	$_{a}$-	$_{ab}$3	$_{b}$18	.03	-	.15	.13
F	Microsteris gracilis (a)	-	-	$_{b}$20	$_{a}$-	$_{b}$18	$_{b}$21	.05	-	.13	.04
F	Orobanche uniflora	2	-	-	-	7	-	-	-	.04	-
F	Phlox longifolia	$_{ab}$17	$_{b}$32	$_{ab}$18	$_{a}$-	$_{ab}$20	$_{a}$3	.21	-	.17	.00
F	Polygonum douglasii (a)	-	-	$_{b}$67	$_{a}$-	$_{b}$49	$_{b}$28	.22	-	.31	.06
F	Senecio integerrimus	$_{a}$7	$_{b}$43	$_{b}$44	$_{a}$3	$_{a}$6	$_{a}$10	.54	.03	.07	.11
F	Streptanthus cordatus	-	-	-	-	-	1	-	-	-	.00
F	Tragopogon dubius (a)	-	1	1	-	-	1	.03	-	-	.15
F	Veronica biloba (a)	-	-	8	-	3	5	.01	-	.00	.02
F	Viola sp.	-	-	-	-	-	3	-	-	-	.01
F	Wyethia amplexicaulis	$_{a}$-	$_{ab}$3	$_{b}$21	$_{a}$1	$_{a}$-	$_{a}$-	.91	.15	.03	-
Total for Annual Forbs		0	1	369	8	633	542	0.96	0.04	9.89	2.27
Total for Perennial Forbs		1035	948	609	103	327	415	9.75	1.75	8.98	16.68
Total for Forbs		1035	949	978	111	960	957	10.72	1.79	18.88	18.96

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

BROWSE TRENDS--
Management unit 19B, Study no: 3

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Amelanchier utahensis	32	28	20	24	3.65	3.19	3.10	4.30
B	Artemisia nova	8	1	1	4	.44	-	.03	.33
B	Artemisia tridentata vaseyana	40	34	39	55	4.48	3.56	3.44	9.97
B	Chrysothamnus viscidiflorus viscidiflorus	4	3	5	4	.38	.03	1.00	.38
B	Eriogonum heracleoides	18	27	21	26	.27	1.31	.51	1.25
B	Juniperus osteosperma	1	0	0	0	-	-	-	-
B	Mahonia repens	16	3	14	8	.75	.04	.42	.27
B	Opuntia sp.	3	5	6	3	.15	.54	.38	.18
B	Pachistima myrsinites	21	26	13	13	.70	.87	.23	.09
B	Rosa woodsii	21	7	7	9	1.88	.21	.39	.66
B	Salix bebbiana perrostrata	0	0	0	0	-	-	.85	-
B	Symphoricarpos oreophilus	68	61	56	54	9.90	6.23	8.05	7.71
B	Tetradymia canescens	0	1	0	0	-	-	-	-
Total for Browse		232	196	182	200	22.63	16.02	18.44	25.16

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 3

Species	Percent Cover		
	'02	'07	'12
Amelanchier utahensis	5.16	6.84	8.14
Artemisia nova	-	-	.80
Artemisia tridentata vaseyana	5.08	7.91	11.41
Chrysothamnus viscidiflorus viscidiflorus	.13	.45	-
Eriogonum heracleoides	1.00	1.21	1.23
Mahonia repens	.01	.20	.25
Opuntia sp.	.45	.75	.05
Pachistima myrsinites	.25	.43	.45
Rosa woodsii	.21	.95	.53
Salix bebbiana perrostrata	-	.16	-
Symphoricarpos oreophilus	8.03	9.71	11.03

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 3

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	1.1	1.5	2.5

BASIC COVER--
Management unit 19B, Study no: 3

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	3.50	8.50	49.18	26.78	43.98	50.25
Rock	12.00	10.25	12.07	15.73	12.13	13.71
Pavement	2.50	13.75	5.51	15.27	13.27	1.82
Litter	55.50	52.75	50.44	32.01	18.13	45.34
Cryptogams	0	0	.17	0	.00	.00
Bare Ground	26.50	14.75	7.03	27.78	20.61	19.75

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 3, Bennion Creek

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.2	6.5	43.3	30.7	26.0	4.5	12.3	307.2	0.6

PELLET GROUP DATA--
Management unit 19B, Study no: 3

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	1	-	-	-
Elk	1	-	-	-
Deer	8	5	1	-
Cattle	5	10	5	1

Days use per acre (ha)		
'02	'07	'12
-	-	-
1 (2)	5 (12)	1 (2)
11 (28)	13 (33)	5 (12)
12 (52)	9 (22)	2 (4)

BROWSE CHARACTERISTICS--
Management unit 19B, 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 utahensis									
83	**731**	55	36	9	-	45	0	0	33/21
89	**865**	46	38	15	66	46	0	0	34/19
97	**700**	9	54	37	-	49	43	17	33/35
02	**620**	6	77	16	-	32	65	10	34/35
07	**460**	4	96	0	-	26	52	4	42/42
12	**600**	10	83	7	-	30	0	7	44/49
Artemisia nova									
83	**132**	50	50	0	-	0	0	0	14/23
89	**0**	0	0	0	-	0	0	0	-/-
97	**240**	0	75	25	-	17	0	25	12/22
02	**60**	0	100	0	-	0	0	0	8/26
07	**100**	0	100	0	-	0	0	0	10/26
12	**100**	20	80	0	-	60	0	0	6/25

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana									
83	**532**	25	50	25	-	38	0	0	21/51
89	**665**	10	90	0	-	10	10	10	21/35
97	**940**	2	68	30	-	21	0	21	24/39
02	**860**	9	63	28	-	28	14	16	19/35
07	**1080**	30	61	9	800	41	6	7	22/38
12	**2060**	1	91	8	40	8	4	13	18/33
Chrysothamnus viscidiflorus viscidiflorus									
83	**0**	0	0	0	-	0	0	0	-/-
89	**133**	0	100	0	-	0	0	0	16/10
97	**80**	0	75	25	-	0	0	25	16/28
02	**60**	0	100	0	-	0	0	33	10/15
07	**100**	0	100	0	-	0	0	0	11/19
12	**80**	0	100	0	-	0	0	0	10/20
Eriogonum heracleoides									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**680**	21	76	3	60	0	0	3	12/13
02	**980**	0	94	6	-	12	8	2	6/13
07	**660**	6	94	0	20	18	3	0	6/14
12	**1360**	3	96	1	-	0	0	1	5/12
Juniperus osteosperma									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**40**	0	100	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Mahonia repens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**1920**	33	67	-	-	0	0	0	4/6
02	**120**	0	100	-	-	0	0	0	2/3
07	**1900**	4	96	-	-	11	0	0	4/5
12	**920**	0	100	-	-	0	0	2	3/5
Opuntia sp.									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**140**	0	100	-	-	0	0	0	8/32
02	**120**	0	100	-	-	0	0	0	6/33
07	**160**	0	100	-	-	0	0	0	5/17
12	**280**	0	100	-	-	0	0	0	6/13

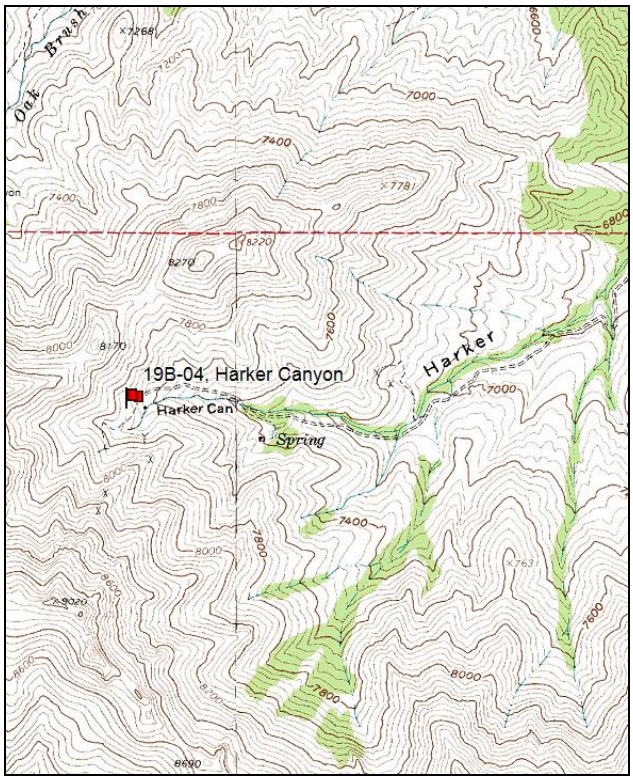
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Pachistima myrsinites									
83	**733**	0	100	-	-	0	0	0	5/4
89	**133**	100	0	-	533	0	0	0	-/-
97	**1560**	24	76	-	40	0	0	0	5/12
02	**1740**	0	100	-	-	14	10	0	4/7
07	**600**	10	90	-	60	13	3	0	4/11
12	**720**	6	94	-	-	0	0	0	3/8
Rosa woodsii									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**1140**	65	30	5	260	0	0	2	12/17
02	**820**	12	88	0	-	27	0	0	5/6
07	**660**	0	100	0	-	9	0	0	13/10
12	**1240**	6	85	8	-	0	0	0	13/9
Symphoricarpos oreophilus									
83	**2465**	43	57	0	-	0	0	0	24/21
89	**5999**	66	26	9	133	3	0	2	30/31
97	**3620**	21	71	8	20	16	1	8	16/29
02	**2980**	2	91	7	-	0	0	17	14/22
07	**1980**	2	97	1	-	5	1	10	15/32
12	**2860**	3	94	2	20	1	0	2	14/26
Tetradymia canescens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

HARKER CANYON - TREND STUDY NO. 19B-4-12

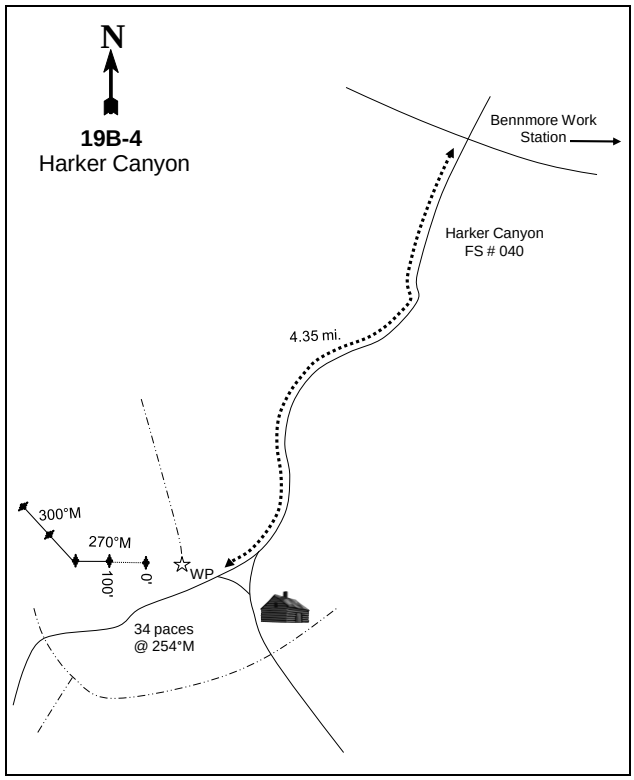
Vegetation Type: Snowberry
Range Type: Crucial Deer Spring/Fall
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: USFS
Elevation: 7,700 ft. (2,347 m)
Aspect: East
Slope: 35%
Transect bearing: 270° magnetic (Line 1), 300° magnetic (Line 3-4)
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is on the 7ft mark on belt 3, 1ft mark on belt 4, and 1ft mark on belt 5

Directions: From the USFS Benmore Work Station, proceed south 0.10 miles to a "T" intersection. Turn right at the intersection (west) for 2.0 miles to an intersection and a sign for "Harker Canyon". Turn left, heading southwest towards Harker Canyon for 4.35 miles. Just after passing an old cabin on the left hand side of the road, look for a half high green steel "T" fencepost with a white top on the right side of the road (northeast). From the fencepost the 0-foot stake of the baseline is 34 paces away at 245°M.

Map Name: Erickson Knoll



Diagrammatic Sketch:



Township: 10S Range: 6W Section: 3

GPS: NAD 83, UTM 12S 371356 E 4426183 N

Site Information

Site Description: This study samples deer summer range located near the upper end of Harker Canyon on private land. The study was thought to be on U.S. Forest Service (USFS) land within the Vernon grazing allotment when the study was established, but was placed on a small section of private land within the allotment. The vegetation is dominated by mountain brush and there is a perennial water source about 150 yards to the south. Nearby Harker Canyon there are scattered aspen and tall brush thickets that provide escape cover during the summer. It was noted that there were off-road vehicle tracks traversing the study in 2007. In 1983, two mature bucks and one doe were observed, and there was a moderate number of deer pellet groups and cattle pats noted. Only a few deer and elk pellet groups were observed in 1997. During 2002 and 2007, several deer were seen nearby, including a couple of small bucks. Deer pellet groups were sampled in high abundance in 2002, but in moderate abundance in 2007 and 2012. Elk pellet groups were sampled in low abundance in 2002 and 2007. Cattle pats have been sampled in low abundance since 2002 (Table - Pellet Group Data).

Browse: The vegetation community is dominated by the browse component. The three most abundant browse species are mountain snowberry (*Symphoricarpos oreophilus*), Saskatoon serviceberry (*Amelanchier alnifolia*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). An infestation of Mormon crickets (*Anabrus simplex*) was noted in 2002 and appeared to have an impact on the health of mountain snowberry and Saskatoon serviceberry. Although mountain snowberry is not considered to be a preferred browse species, it has experienced some light utilization. Snowberry is likely used due to it being the most abundant species on the study. Snowberry is a dense population of mostly mature plants with low decadence and good vigor in most years. Saskatoon serviceberry is a scattered, mature population. Decadence within the serviceberry population has been low most sample years but was high in 1989, and poor vigor has been low over the course of the study, but was high in 2002. Recruitment of young serviceberry to the population has been low over the course of the study. Utilization of serviceberry was light at the outset of the study, but has been moderate to heavy since 1997. Mountain big sagebrush is a sparse, mature population that has increased in density since 2002. Decadence within the sagebrush population was high in 1989 and moderate in 2002, but has been low for the remaining sample years. Poor vigor has been low over the course of the study. Recruitment of young sagebrush to the population has been good in the majority of the sample years. Utilization of sagebrush has been light most sample years, but was mostly moderate in 1983. Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) and true mountain mahogany (*Cercocarpus montanus*) are also present, but have low abundance. Curl-leaf mahogany occurs as large, tree-like plants on the hillslope above the transect. The site supports many other less preferred browse, including: Martin ceanothus (*Ceanothus martinii*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), whorled buckwheat (*Eriogonum heracloides*), Oregon grape (*Mahonia repens*), mountain lover (*Pachistima myrsinites*), and Woods' rose (*Rosa woodsii*) (Table - Browse Characteristics).

Herbaceous Understory: The grass understory has been diverse and abundant. The most abundant perennial species are oniongrass (*Melica bulbosa*), spike fescue (*Leucopoa kingii*), mutton bluegrass (*Poa fendleriana*), and mountain brome (*Bromus carinatus*). The invasive annual species cheatgrass (*Bromus tectorum*) has been sampled in low abundance since 1997. The forb community is especially important to deer within summer range, so forb density and composition quality are crucial. Perennial forbs on the study have been common and diverse most sample years, but decreased in 2002 and have since recovered. The most abundant perennial species have been wild onion (*Allium* sp.), tapertip hawksbeard (*Crepis acuminata*), ballhead waterleaf (*Hydrophyllum capitatum*), silky lupine (*Lupinus sericeus*), longleaf phlox (*Phlox longifolia*), and mulesear wyethia (*Wyethia amplexicaulis*) (Table - Herbaceous Trends).

Soil: The study lies within the Podmor-Onaqui-Rock outcrop association and is likely part of the Onaqui component, which is found on ridges and mountainsides. The parent material consists of colluvium derived

from quartzite and/or residuum weathered from quartzite (Soil Survey Staff 2011). The soil is coarse and rocky with a loam texture and a moderately acidic soil reaction (pH of 6.0) (Table - Soil Analysis Data). Bare ground cover is low with high amounts of vegetation and litter providing protective ground cover (Table - Basic Cover). Most signs of erosion occur on animal trails that zigzag through the area. The erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - slightly up (+1):** The density of Saskatoon serviceberry increased nearly four-fold from 333 plants/acre to 1,265 plants/acre. Decadence of serviceberry increased from 0% to 26%, but poor vigor remained at 0%. Recruitment of young serviceberry to the population increased from 0% to 11%. The density of mountain big sagebrush decreased 25%. Decadence of serviceberry increased from 19% to 50%, and poor vigor increased from 13% to 17%. Recruitment of young sagebrush to the population increased from 6% to 17%.
- **1989 to 1997 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence of serviceberry decreased to 4%, and poor vigor remained at 0%. Recruitment of young serviceberry remained at 11%. Decadence of mountain big sagebrush decreased substantially to 8%, and poor vigor decreased to 13%. Recruitment of young sagebrush to the population increased considerably to 57%.
- **1997 to 2002 - slightly down (-1):** The density of Saskatoon serviceberry increased 43% from 560 plants/acre to 800 plants/acre, but cover remained similar at 4%. Decadence of serviceberry decreased to 0%, but poor vigor increased to 38%. Recruitment of young serviceberry to the population decreased to 5%. The density of mountain big sagebrush decreased 64% from 1,540 plants/acre to 560 plants/acre, but cover increased from 2% to 4%. Decadence of sagebrush increased to 21%, and poor vigor remained similar at 11%. Recruitment of young sagebrush to the population decreased to 0%.
- **2002 to 2007 - slightly down (-1):** The density of Saskatoon serviceberry decreased 38% to 500 plants/acre, but cover remained similar at 4%. Decadence of serviceberry increased to 12%, but poor vigor decreased considerably to 4%. Recruitment of young serviceberry to the population increased to 16%. The density of mountain big sagebrush increased slightly to 580 plants/acre, but cover decreased to 2%. Decadence of sagebrush decreased to 10%, and poor vigor decreased 3%. Recruitment of young sagebrush to the population increased considerably to 34%.
- **2007 to 2012 - slightly up (+1):** The density of Saskatoon serviceberry increased slightly to 540 plants/acre, and increased to 5%. Decadence and poor vigor of serviceberry decreasing to 0%. Recruitment of young serviceberry to the population decreased to 0%. The density of mountain big sagebrush increased 21% to 700 plants/acre, and cover increased to 3%. Decadence and poor vigor deceased to 0%. Recruitment of young sagebrush to the population decreased to 11%.

Grass:

- **1983 to 1989 - up (+2):** The sum of nested frequencies of perennial grasses increased 51%. Bluebunch wheatgrass (*Agropyron spicatum*), slender wheatgrass (*A. trachycaulum*), mountain brome, Kentucky bluegrass (*Poa pratensis*), and Sandberg bluegrass (*P. secunda*) increased significantly in nested frequency.
- **1989 to 1997 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1997 to 2002 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover decreased from 17% to 14%.
- **2002 to 2007 - down (-2):** The sum of nested frequencies of perennial grasses decreased 38%, and cove decreased to 7%. Spike fescue and mutton bluegrass decreased significantly in nested frequency.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial grasses increased 40%, and cover increased to 11%. Spike fescue increased significantly in nested frequency.

Forb:

- **1983 to 1989 - up (+2):** The sum of nested frequencies of perennial forbs increased 45%.
- **1989 to 1997 - down (-2):** The sum of nested frequencies of perennial forbs decreased 57%.
- **1997 to 2002 - down (-2):** The sum of nested frequencies of perennial forbs decreased 89%, and cover decreased from 7% to 2%.
- **2002 to 2007 - up (+2):** The sum of nested frequencies of perennial forbs increased nine-fold, and cover increased to 13%.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial forbs increased 64%, and cover increased to 23%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron spicatum	a1	b29	ab16	ab13	b29	a-	.49	.40	.43	-
G	Agropyron trachycaulum	a8	b61	a6	a-	a-	a12	.06	-	-	.20
G	Bromus carinatus	a44	b81	b103	ab61	ab71	b98	3.81	1.21	3.04	2.16
G	Bromus tectorum (a)	-	-	ab2	a-	ab5	b7	.00	-	.06	.03
G	Carex sp.	-	-	-	4	-	4	-	.38	-	.03
G	Festuca ovina	-	-	3	-	-	-	.03	-	-	-
G	Leucopoa kingii	ab41	ab61	c114	c107	a33	bc83	5.06	4.92	.91	4.42
G	Melica bulbosa	bc243	c224	bc179	bc197	a112	ab165	6.02	5.75	2.07	3.63
G	Poa fendleriana	a16	ab28	bc46	c75	ab27	a15	1.27	1.32	.68	.11
G	Poa pratensis	a6	b26	ab20	a2	a-	a7	.26	.03	-	.01
G	Poa secunda	a2	b26	a13	a-	a6	a3	.24	-	.06	.03
G	Stipa columbiana	ab1	b11	ab1	a-	a-	b13	.00	-	-	.39
G	Stipa lettermani	4	6	1	-	8	-	.00	-	.01	-
Total for Annual Grasses		0	0	2	0	5	7	0.00	0	0.06	0.03
Total for Perennial Grasses		366	553	502	459	286	400	17.27	14.03	7.22	11.01
Total for Grasses		366	553	504	459	291	407	17.28	14.03	7.29	11.04
F	Agoseris glauca	ab15	a2	a-	a-	a5	b22	-	-	.01	.22
F	Allium sp.	c87	d124	cd118	a-	cd115	b35	.52	-	1.17	.10
F	Alyssum alyssoides (a)	-	-	b19	a-	b20	c116	.07	-	.23	.91
F	Arabis sp.	-	-	2	-	-	6	.01	-	-	.01
F	Aster chilensis	a20	b84	a7	a-	a5	a-	.03	-	.06	-
F	Astragalus cibarius	b10	b5	ab1	a-	a-	ab7	.00	-	-	.04
F	Balsamorhiza hookeri	3	-	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	-	-	-	1	4	2	-	.18	.53	.59
F	Calochortus nuttallii	-	3	7	-	3	4	.02	-	.00	.01
F	Castilleja linariaefolia	-	-	-	-	1	-	-	-	.00	-
F	Chaenactis douglasii	-	-	1	-	-	-	.00	-	-	-
F	Cirsium sp.	a-	b12	ab1	a-	a-	a-	.23	-	-	-
F	Collinsia parviflora (a)	-	-	b31	a-	c164	b46	.08	-	1.21	.13
F	Collomia linearis (a)	-	-	b38	a-	b54	c122	.09	-	.45	.94
F	Comandra pallida	-	-	-	-	-	7	-	-	-	.30

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Crepis acuminata	$_{c}$65	$_{d}$143	$_{bc}$46	$_{a}$-	$_{a}$3	$_{b}$42	.56	-	.01	.91
F	Cruciferae	$_{a}$-	$_{b}$30	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
F	Delphinium nuttallianum	-	-	4	3	-	-	.01	.03	-	-
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$18	$_{c}$31	-	-	.21	.07
F	Erigeron eatonii	$_{b}$22	$_{ab}$16	$_{a}$-	$_{a}$-	$_{a}$3	$_{a}$6	-	-	.00	.04
F	Eriogonum racemosum	$_{ab}$14	$_{b}$17	$_{ab}$20	$_{a}$3	$_{ab}$6	$_{ab}$14	.55	.06	.07	.20
F	Eriogonum umbellatum	$_{c}$53	$_{a}$32	$_{a}$3	$_{a}$2	$_{a}$2	$_{a}$7	.00	.00	.00	.04
F	Fritillaria pudica	5	7	-	-	-	-	-	-	-	-
F	Galium aparine (a)	-	-	-	-	-	4	-	-	-	.01
F	Grindelia squarrosa	-	-	-	-	-	2	-	-	-	.00
F	Hackelia patens	$_{b}$5	$_{a}$-	$_{ab}$2	$_{a}$-	$_{ab}$3	$_{a}$-	.00	-	.03	-
F	Helianthella uniflora	9	9	-	2	-	6	-	.15	-	.31
F	Holosteum umbellatum (a)	-	-	-	-	-	2	-	-	-	.00
F	Hydrophyllum capitatum	$_{b}$35	$_{a}$3	$_{a}$-	$_{a}$-	$_{c}$99	$_{c}$143	-	-	5.08	7.46
F	Ipomopsis aggregata	-	-	-	-	-	1	-	-	-	.15
F	Lomatium sp.	$_{b}$15	$_{b}$30	$_{b}$27	$_{a}$-	$_{b}$14	$_{b}$23	.18	-	.15	.54
F	Lupinus sericeus	$_{de}$155	$_{e}$160	$_{b}$68	$_{a}$-	$_{b}$25	$_{cd}$102	1.45	-	.79	4.49
F	Machaeranthera canescens	1	8	3	-	3	3	.00	-	.03	.00
F	Microsteris gracilis (a)	-	-	$_{b}$10	$_{a}$-	$_{ab}$5	$_{b}$14	.05	-	.01	.03
F	Penstemon caespitosus	-	2	3	-	-	-	.00	-	-	-
F	Penstemon humilis	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$9	$_{b}$20	-	-	.09	.95
F	Petradoria pumila	-	-	-	-	-	-	-	.00	-	-
F	Phlox hoodii	-	-	-	-	-	3	-	-	-	.03
F	Phlox longifolia	$_{b}$47	$_{c}$87	$_{b}$37	$_{a}$-	$_{b}$26	$_{b}$49	.22	-	.20	1.24
F	Polygonum douglasii (a)	-	-	$_{c}$85	$_{a}$2	$_{bc}$61	$_{b}$51	.41	.00	.42	.14
F	Senecio integerrimus	$_{a}$-	$_{b}$26	$_{a}$-	$_{a}$3	$_{a}$4	$_{a}$9	-	.03	.05	.02
F	Taraxacum officinale	$_{a}$-	$_{b}$19	$_{a}$3	$_{a}$-	$_{a}$-	$_{a}$-	.03	-	-	-
F	Veronica biloba (a)	-	-	1	-	3	6	.00	-	.03	.01
F	Viola sp.	$_{a}$2	$_{a}$3	$_{a}$-	$_{a}$1	$_{a}$3	$_{b}$56	-	.00	.03	.24
F	Wyethia amplexicaulis	$_{a}$49	$_{b}$74	$_{a}$35	$_{a}$27	$_{a}$35	$_{a}$31	2.80	1.05	4.80	5.00
F	Zigadenus paniculatus	7	1	2	-	-	5	.03	-	-	.03
Total for Annual Forbs		0	0	184	2	325	392	0.72	0.00	2.59	2.26
Total for Perennial Forbs		619	897	390	42	368	605	6.71	1.52	13.15	22.97
Total for Forbs		619	897	574	44	693	997	7.43	1.52	15.75	25.24

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

BROWSE TRENDS--
Management unit 19B, Study no: 4

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Amelanchier alnifolia	21	27	20	20	3.65	4.08	3.48	5.34
B	Artemisia tridentata vaseyana	30	22	18	26	1.87	3.67	2.00	2.93
B	Ceanothus martinii	9	0	0	9	.60	-	-	.34
B	Cercocarpus ledifolius	0	1	1	1	.45	-	.53	5.80
B	Cercocarpus montanus	0	1	1	0	-	-	.03	-
B	Chrysothamnus nauseosus albicaulis	3	0	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	20	11	6	14	1.19	.13	.06	.39
B	Eriogonum heracleoides	22	33	23	17	1.49	1.08	1.53	.39
B	Mahonia repens	16	13	17	17	.78	.45	.33	.90
B	Pachistima myrsinites	0	9	9	8	-	.64	.39	.33
B	Rosa woodsii	10	7	12	12	.06	.09	.40	.54
B	Symphoricarpos oreophilus	55	71	65	75	22.89	19.06	20.27	25.81
Total for Browse		186	195	172	199	32.99	29.23	29.04	42.81

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 4

Species	Percent Cover			
	'97	'02	'07	'12
Amelanchier alnifolia	-	6.25	7.88	10.89
Artemisia tridentata vaseyana	-	3.48	2.01	3.40
Ceanothus martinii	-	-	-	.16
Cercocarpus ledifolius	1.00	6.36	7.33	5.21
Cercocarpus montanus	-	-	.18	-
Chrysothamnus viscidiflorus viscidiflorus	-	.18	.05	.20
Eriogonum heracleoides	-	2.56	.61	.46
Mahonia repens	-	.41	.61	.55
Pachistima myrsinites	-	.76	.38	-
Rosa woodsii	-	.36	.85	.53
Symphoricarpos oreophilus	-	25.54	33.18	39.51

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 4

Species	Average leader growth (in)		
	'02	'07	'12
Amelanchier alnifolia	1.9	4.1	2.7
Artemisia tridentata vaseyana	1.8	1.8	3.1
Cercocarpus ledifolius	2.5	1.7	2.5

BASIC COVER--
Management unit 19B, Study no: 4

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	1.75	18.50	61.45	41.98	49.82	63.99
Rock	3.50	5.50	4.61	9.05	6.51	8.47
Pavement	3.00	4.50	2.66	9.95	7.61	1.36
Litter	72.25	61.50	65.00	36.07	27.82	57.06
Cryptogams	.25	0	.01	.38	0	0
Bare Ground	19.25	10.00	2.91	23.61	17.22	10.73

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 4, Harker Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.1	6.0	46.3	31.1	22.6	5.4	21.2	342.4	0.6

PELLET GROUP DATA--
Management unit 19B, Study no: 4

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	-	-	-	1
Elk	2	-	3	-
Deer	6	11	4	3
Cattle	-	5	3	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
1 (3)	1 (2)	-
40 (99)	25 (63)	23 (56)
10 (25)	5 (13)	2 (5)

BROWSE CHARACTERISTICS--
Management unit 19B, 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									
83	**333**	0	100	0	-	0	0	0	39/35
89	**1265**	11	63	26	-	0	0	0	55/31
97	**560**	11	86	4	-	25	4	0	55/51
02	**800**	5	95	0	-	25	45	38	47/43
07	**500**	16	72	12	-	8	44	4	51/48
12	**540**	0	100	0	60	26	0	0	57/61
Artemisia tridentata vaseyana									
83	**1064**	6	75	19	-	69	0	13	26/30
89	**798**	17	33	50	-	0	0	17	24/39
97	**1540**	57	35	8	-	3	1	13	26/33
02	**560**	0	79	21	-	0	0	11	22/35
07	**580**	34	55	10	160	17	3	3	22/40
12	**700**	11	89	0	20	0	0	0	19/29

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Ceanothus martinii									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**580**	45	55	-	-	3	0	0	8/18
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**340**	6	94	-	-	0	0	0	7/14
Cercocarpus ledifolius									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	157/177
02	**20**	0	100	-	-	0	0	0	161/236
07	**20**	0	100	-	-	0	0	0	143/223
12	**20**	0	100	-	-	100	0	0	-/-
Cercocarpus montanus									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	100	51/70
07	**20**	0	100	-	-	0	0	0	61/76
12	**0**	0	0	-	-	0	0	0	61/78
Chrysothamnus nauseosus albicaulis									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**80**	100	0	-	-	25	50	25	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus viscidiflorus viscidiflorus									
83	**666**	0	100	0	-	0	0	0	12/10
89	**666**	20	80	0	-	0	0	0	16/14
97	**760**	21	79	0	-	0	0	0	16/17
02	**260**	0	46	54	-	0	0	38	10/12
07	**160**	0	100	0	-	50	0	0	11/19
12	**500**	0	100	0	-	0	0	0	11/15
Eriogonum heracleoides									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**920**	0	100	0	-	0	0	0	15/14
02	**1560**	0	88	12	-	21	5	10	7/14
07	**780**	0	97	3	80	0	21	3	5/12
12	**520**	0	100	0	-	0	0	0	5/12

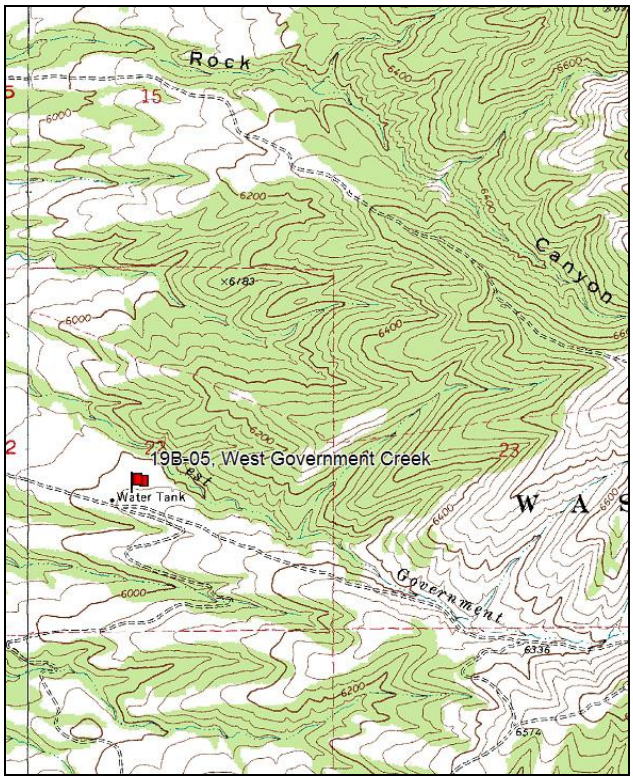
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Mahonia repens									
83	**666**	0	100	0	-	0	0	0	8/7
89	**532**	0	88	12	-	0	0	13	3/3
97	**2180**	14	86	0	-	0	0	0	4/6
02	**1040**	0	100	0	-	0	0	0	3/4
07	**3600**	4	96	0	-	0	0	0	3/4
12	**3340**	0	100	0	-	0	0	0	4/6
Opuntia sp.									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	4/18
12	**0**	0	0	-	-	0	0	0	7/14
Pachistima myrsinites									
83	**399**	0	100	0	-	0	0	0	16/49
89	**14731**	44	48	9	1066	16	6	1	10/9
97	**0**	0	0	0	-	0	0	0	-/-
02	**880**	20	80	0	-	7	0	0	3/6
07	**880**	27	73	0	-	23	14	0	4/9
12	**1120**	2	98	0	-	0	0	0	4/8
Purshia tridentata									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	23/65
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Rosa woodsii									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**880**	55	45	0	20	0	0	0	9/8
02	**420**	24	76	0	20	0	0	0	9/8
07	**880**	0	98	2	-	0	7	2	10/10
12	**540**	22	74	4	20	0	0	0	18/6
Symphoricarpos oreophilus									
83	**999**	0	100	0	-	0	0	0	32/31
89	**2132**	25	41	34	199	0	0	3	27/35
97	**2620**	8	90	2	-	0	0	2	33/64
02	**3000**	1	91	9	-	.66	0	24	27/45
07	**2480**	1	87	12	-	3	0	16	30/52
12	**2960**	6	93	1	20	0	0	.67	32/55

WEST GOVERNMENT CREEK - TREND STUDY NO. 19B-5-12

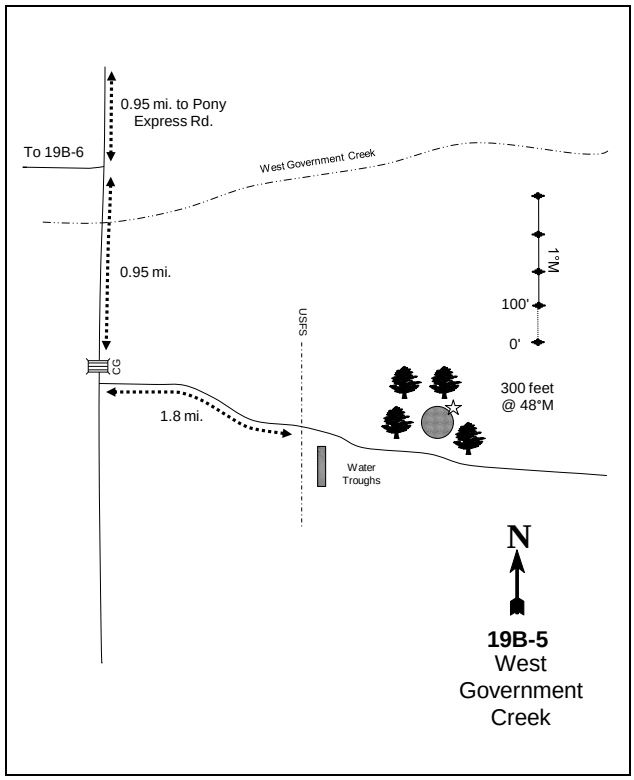
Vegetation Type: Wyoming Big Sagebrush
Range Type: Crucial Deer Winter/Spring
NRCS Ecological Site Description: Upland Gravelly Loam (Wyoming Big Sagebrush), R028AY307UT
Land Ownership: USFS
Elevation: 6,060 ft. (1,847 m)
Aspect: Northwest
Slope: 7-10%
Transect bearing: 357° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions: Turn south off the Pony Express Road onto the Erickson Pass Road. Go 4.6 miles to the turnoff to study 19B-6. Continue 0.95 miles to a cattleguard. Turn left 60 yards past the cattleguard. Go 1.8 miles to a water trough. From the northeast side of the circular trough, the 0-foot baseline stake is 300 feet away at 48°M and is marked with 3975.

Map Name: Lookout Pass



Diagrammatic Sketch:



Township: 9S Range: 7W Section: 22

GPS: NAD 83, UTM 12S 361722 E 4430996 N

WEST GOVERNMENT CREEK - TREND STUDY NO. 19B-5

Site Information

Site Description: This winter range study is located in the lower portion of the Lee's Creek drainage on an old juniper chaining on land administered by the U.S. Forest Service (USFS) within the Qnaqui grazing allotment. The area is a former Utah juniper (*Juniperus osteosperma*) woodland that was chained and windrowed in the late 1960s. The area was then seeded using a rangeland drill. The area was again treated as part of the West Government Creek treatment in 2012 (WRI Project #2024). Juniper trees were treated by a lop and scatter to improve mule deer habitat and the sagebrush steppe in 2011 and 2012 (WRI Database 2013). Deer pellet groups were sampled in low abundance in 2002 and 2012, but moderate abundance in 1997. Elk pellet groups were sampled in low abundance in 2007. Cattle pats were sampled in moderate abundance in 2002, but in low abundance in 2007 (Table - Pellet Group Data). In 1983, it was noted that heavy cattle use was depressing grass vigor. There is a steel water trough 300 feet to the southwest, which may explain the localized, intense grazing.

Browse: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant preferred browse species on the site. Sagebrush is a dense, mature population. Decadence of sagebrush was low at the outset of the study, but has been high since 2002. Poor vigor was low at the outset of the study, but has been high since 2007. Recruitment of young sagebrush to the population was substantial between 1983 through 1997, but was low to absent since 2002. Utilization of sagebrush has been mostly moderate over the course of the study. Antelope bitterbrush (*Purshia tridentata*) is a sparse, mature population. The bitterbrush population has been vigorous over the course of the study, but decadence within the population was high in 1989. Recruitment of young bitterbrush to the population has been absent to low over the duration of the study. Utilization of bitterbrush has been heavy over the duration of the study. Other species scattered around the site include white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), pricklypear cactus (*Opuntia* sp.), and broom snakeweed (*Gutierrezia sarothrae*) (Table - Browse Characteristics). Utah juniper (*Juniperus osteosperma*) has occurred as a scattered population on the study. Most trees were mature in 2002 and 2007, but all of the sampled trees were young in 2012 following the lop and scatter treatment (Table - Point-Quarter Tree Data). The woodland succession stage is considered to be in Phase I (Tausch et al. 2009).

Herbaceous Understory: The herbaceous understory is dominated by perennial grasses. Crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*A. intermedium*), and Sandberg bluegrass (*Poa secunda*) are the dominant species. Other perennial grasses sampled in very low frequencies are bluebunch wheatgrass (*Agropyron spicatum*) and bottlebrush squirreltail (*Sitanion hystrix*). The invasive annual species cheatgrass (*Bromus tectorum*) has been measured in low frequencies since 1997. Forb diversity and abundance has been fair. The most abundant perennial species include silky milkvetch (*Astragalus cibarius*), tapertip harksbeard (*Crepis acuminata*), alfalfa (*Medicago sativa*), American vetch (*Vicia americana*), and longleaf phlox (*Phlox longifolia*) (Table - Herbaceous Trends).

Soil: The soil is part of the Abela component, which is found on fan remnants. The parent material consists of alluvium derived from limestone and/or alluvium derived from quartzite (Soil Survey Staff 2011). The soil texture is a gravelly loam with a slightly alkaline soil reaction (pH 7.6) (Table - Soil Analysis Data). Bare ground cover has been is moderate with high amounts vegetation and litter providing protective ground cover (Table - Basic Cover). Erosion is minimal due to minimal slope and high vegetation and litter cover. The erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - up (+2):** The density of Wyoming big sagebrush increased 71% from 3,098 plants/acre to 5,298 plants/acre. Decadence of sagebrush increased from 1% to 9%, and poor vigor increased from 1% to 7%. Recruitment of young sagebrush to the population increased from 31% to 26%.
- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Wyoming big sagebrush decadence remained at 9%, and poor vigor decreased slightly to 6%. Recruitment of young sagebrush to the population decreased to 16%.
- **1997 to 2002 - up (+2):** The density of Wyoming big sagebrush increased 37% from 2,300 plants/acre to 3,160 plants/acre, and cover increased from 18% to 21%. Decadence of sagebrush increased to 24%, but poor vigor remained at 6%. Recruitment of young sagebrush to the population decreased to 3%.
- **2002 to 2007 - down (-2):** The density of Wyoming big sagebrush decreased 27% to 2,320 plants/acre, and cover decreased to 16%. Decadence of sagebrush increased to 39%, and poor vigor increased to 21%. Recruitment of young sagebrush to the population decreased to 1%.
- **2007 to 2012 - stable (0):** The density of Wyoming big sagebrush increased slightly to 2,420 plants/acre, and cover increased to 19%. Decadence of sagebrush decreased to 24%, and poor vigor increased to 27%. Recruitment of young sagebrush to the population was not observed. The density of antelope bitterbrush increased 50% from 80 plants/acre to 120 plants/acre, and cover increased from less than 1% to 2%.

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1989 to 1997 - stable (0):** The sum of nested frequencies of perennial grasses remained similar. Sandberg bluegrass increased significantly in nested frequency.
- **1997 to 2002 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover decreased from 16% to 12%.
- **2002 to 2007 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover increased to 21%. Sandberg bluegrass increased significantly in nested frequency.
- **2007 to 2012 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased 12%, and cover increased to 28%.

Forb:

- **1983 to 1989 - up (+2):** The sum of nested frequencies of perennial forbs increased 66%.
- **1989 to 1997 - stable (0):** The sum of nested frequencies of perennial forbs remained similar.
- **1997 to 2002 - down (-2):** The sum of nested frequencies of perennial forbs decreased 92%, and cover decreased from 5% to less than 1%. Perennial forbs are rare on the site and diversity of the community is very low.
- **2002 to 2007 - up (+2):** The sum of nested frequencies of perennial forbs increased nearly nine-fold, and cover increased to 3%. Perennial forbs are common on the site, and have increased in diversity.
- **2007 to 2012 - up (+2):** The sum of nested frequencies of perennial forbs increased 25%, and cover increased to 4%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19B, 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
97	23.2	12.4	8.1	30.0	0.0	10.0	0.0	**83.6**	Excellent
02	26.9	8.1	1.6	23.9	0.0	0.7	0.0	**61.1**	Good
07	21.0	3.5	0.5	30.0	0.0	6.0	0.0	**60.9**	Good
12	26.1	8.4	0.0	30.0	0.0	7.5	0.0	**72.0**	Excellent

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 5

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	c279	bc263	ab231	a176	a196	ab205	8.53	5.74	8.01	11.96
G	Agropyron intermedium	ab154	a192	abc136	c132	bc109	c138	3.59	3.02	3.58	5.92
G	Agropyron spicatum	a-	a-	ab7	b9	b12	ab8	.18	.39	.51	.36
G	Bromus tectorum (a)	-	-	b12	ab3	b10	a-	.02	.00	.05	-
G	Oryzopsis hymenoides	1	-	-	-	-	-	-	-	-	-
G	Poa secunda	a39	a50	b168	b176	c216	c244	3.95	2.73	9.18	9.48
G	Sitanion hystrix	3	-	-	4	-	-	-	.03	-	-
Total for Annual Grasses		0	0	12	3	10	0	0.02	0.00	0.05	0
Total for Perennial Grasses		476	505	542	497	533	595	16.26	11.93	21.29	27.74
Total for Grasses		476	505	554	500	543	595	16.29	11.93	21.35	27.74
F	Agoseris glauca	a-	a-	a2	a3	a4	b23	.00	.00	.06	.31
F	Alyssum alyssoides (a)	-	-	d249	a-	b76	c122	.63	-	.20	.26
F	Antennaria rosea	a-	b8	ab3	a-	a-	a-	.00	-	-	-
F	Arabis sp.	-	-	6	-	-	-	.01	-	-	-
F	Astragalus cibarius	bc25	d74	b25	a-	d47	cd48	1.14	-	1.69	.66
F	Astragalus convallarius	3	6	3	-	2	4	.04	-	.03	.23
F	Calochortus nuttallii	1	-	1	-	6	-	.00	-	.01	-
F	Castilleja chromosa	-	2	1	-	-	-	.03	-	-	-
F	Chaenactis douglasii	b16	ab9	ab3	a-	a-	a-	.00	-	-	-
F	Cirsium neomexicanum	1	6	2	-	-	2	.03	-	-	.00
F	Collinsia parviflora (a)	-	-	c45	a-	c65	b15	.11	-	.20	.05
F	Comandra pallida	-	-	3	-	2	5	.03	-	.00	.06
F	Crepis acuminata	ab14	b26	ab15	a-	ab15	a5	.16	-	.14	.09
F	Cymopterus longipes	a11	b31	a10	a-	a3	a6	.04	-	.01	.04
F	Draba sp. (a)	-	-	-	-	4	-	-	-	.00	-
F	Erigeron pumilus	16	16	9	-	-	-	.02	-	-	-
F	Eriogonum sp.	-	-	1	-	-	-	.03	-	-	-
F	Galium boreale	-	-	4	-	5	-	.18	-	.01	-
F	Holosteum umbellatum (a)	-	-	-	-	5	1	-	-	.01	.00
F	Medicago sativa	b18	c38	b13	a-	a-	a-	1.72	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Microsteris gracilis (a)	-	-	$_{b}$23	$_{a}$-	$_{ab}$10	$_{ab}$2	.04	-	.02	.01
F	Petradoria pumila	$_{bc}$30	$_{c}$37	$_{ab}$18	$_{ab}$12	$_{a}$10	$_{a}$11	.34	.28	.22	.51
F	Phlox longifolia	$_{b}$55	$_{b}$69	$_{b}$68	$_{a}$-	$_{b}$53	$_{b}$63	.66	-	.35	.44
F	Ranunculus testiculatus (a)	-	-	$_{d}$200	$_{a}$-	$_{c}$158	$_{b}$70	1.00	-	.56	.15
F	Tragopogon dubius (a)	-	2	-	-	2	-	-	-	.01	-
F	Vicia americana	$_{a}$4	$_{a}$-	$_{c}$123	$_{a}$10	$_{b}$75	$_{c}$111	.94	.04	.42	1.37
F	Zigadenus paniculatus	-	-	-	-	1	-	-	-	.01	-
Total for Annual Forbs		0	2	517	0	320	210	1.78	0	1.00	0.47
Total for Perennial Forbs		194	322	310	25	223	278	5.43	0.33	2.98	3.75
Total for Forbs		194	324	827	25	543	488	7.21	0.33	3.99	4.23

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

BROWSE TRENDS--
Management unit 19B, Study no: 5

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia tridentata wyomingensis	73	76	74	76	17.67	20.67	16.40	18.82
B	Atriplex canescens	0	0	0	0	-	.38	-	-
B	Gutierrezia sarothrae	10	10	5	0	.03	.12	.03	-
B	Juniperus osteosperma	1	3	2	3	.85	1.37	1.50	.30
B	Purshia tridentata	5	4	4	5	.71	.38	.33	1.69
Total for Browse		89	93	85	84	19.27	22.94	18.28	20.82

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 5

Species	Percent Cover		
	'02	'07	'12
Artemisia tridentata wyomingensis	31.35	28.64	28.48
Gutierrezia sarothrae	.06	-	-
Juniperus osteosperma	2.21	3.23	-
Purshia tridentata	.05	.25	1.54

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 5

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata wyomingensis	1.2	1.2	1.3

POINT-QUARTER TREE DATA--
Management unit 19B, Study no: 5

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	30	20	21

Average diameter (in)		
'02	'07	'12
4.1	3.9	6.1

BASIC COVER--
Management unit 19B, Study no: 5

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	5.25	10.00	42.08	35.67	42.98	55.73
Rock	2.75	2.75	.76	1.08	.40	1.66
Pavement	8.75	22.50	6.08	5.15	5.71	2.66
Litter	32.25	38.75	42.22	37.11	39.62	49.96
Cryptogams	0	0	4.57	1.06	.53	.03
Bare Ground	51.00	26.00	16.29	40.34	26.13	15.38

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 5, West Government Creek

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.2	7.6	40.4	35.1	24.6	3.4	23.8	336.0	0.2

PELLET GROUP DATA--
Management unit 19B, Study no: 5

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	21	12	54	2
Elk	-	-	1	-
Deer	3	3	8	6
Cattle	10	10	6	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	1 (3)	-
14 (35)	25 (63)	4 (10)
33 (82)	3 (7)	-

BROWSE CHARACTERISTICS--
Management unit 19B, Study no: 5

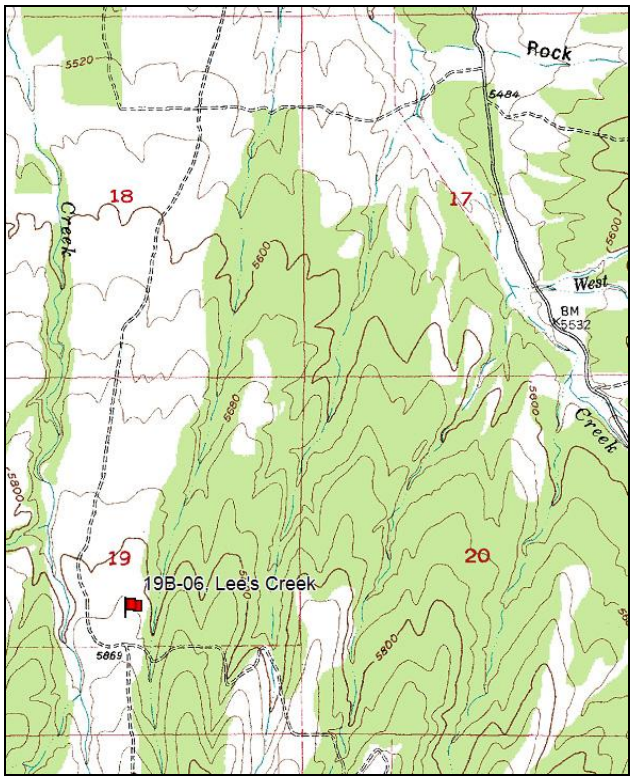
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis									
83	**3098**	31	68	1	1166	55	0	1	25/36
89	**5298**	26	65	9	33	17	0	7	21/24
97	**2300**	16	76	9	20	40	0	6	31/51
02	**3160**	3	73	24	-	30	3	6	30/47
07	**2320**	1	60	39	-	30	21	21	31/49
12	**2420**	0	76	24	-	37	2	27	36/46
Gutierrezia sarothrae									
83	**0**	0	0	0	-	0	0	0	-/-
89	**33**	0	100	0	-	0	0	0	7/4
97	**240**	25	75	0	20	0	0	0	12/11
02	**440**	5	91	5	-	0	0	0	7/9
07	**140**	0	57	43	-	0	0	43	6/7
12	**0**	0	0	0	-	0	0	0	8/8
Juniperus osteosperma									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**20**	100	0	0	-	0	0	0	-/-
02	**60**	33	67	0	-	0	0	0	-/-
07	**40**	0	100	0	-	0	0	0	-/-
12	**60**	0	33	67	-	0	0	0	-/-
Purshia tridentata									
83	**66**	0	100	0	-	0	100	0	9/28
89	**132**	0	50	50	-	25	75	0	12/22
97	**100**	20	80	0	-	20	40	0	15/38
02	**120**	17	83	0	-	0	83	0	17/51
07	**80**	0	100	0	-	0	75	0	23/59
12	**120**	0	100	0	20	50	50	0	29/56

LEE'S CREEK - TREND STUDY NO. 19B-6-12

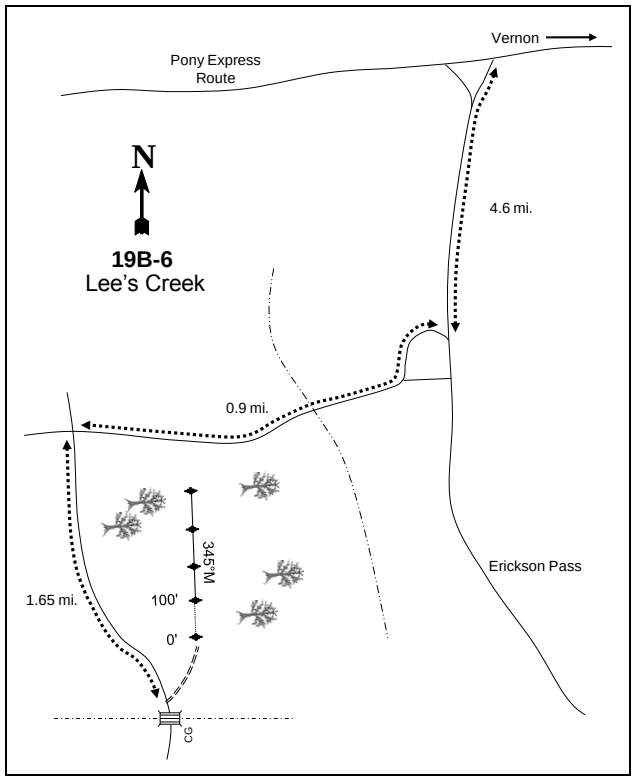
Vegetation Type: Juniper
Range Type: Crucial Deer Winter/Spring
NRCS Ecological Site Description: Upland Loam (Wyoming Big Sagebrush), R028AY309UT
Land Ownership: USFS
Elevation: 5,850 ft. (1,783 m)
Aspect: North
Slope: 5%
Transect bearing: 345° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions: Starting at the intersection of the Erickson Pass and Pony Express Roads, proceed south on the Erickson Pass Road for 4.6 miles to an intersection. Turn right at the intersection and proceed west for 0.9 miles to another intersection. Turn left at the intersection and proceed south for 1.65 miles to a cattle guard and gate. From the cattle guard, the 0-foot stake is 70 paces away at 12 degrees magnetic. The study is located just inside the chaining that is adjacent to the burn. The 0-foot stake is marked with a red browse tag number 121.

Map Name: Indian Peaks



Diagrammatic Sketch:



Township: 9S Range: 7W Section: 19

GPS: NAD 83, UTM 12S 357007 E 4430991 N

LEE'S CREEK - TREND STUDY NO. 19B-6

Site Information

Site Description: This winter range study samples an old Utah juniper (*Juniperus osteosperma*) chaining that is located in the lower portion of the Lee's Creek drainage. The area is administered by the Bureau of Land Management (BLM) as part of the Government Creek allotment. It is situated on a ridge that runs north-south, and the perennial stream Lee's Creek is located 900 feet to the west. The study is located on a fairly narrow corridor of intact pinyon-juniper woodland surrounded by large areas that had been burned before 1997. The area immediately to the north of the study was treated by the Rockwell Ranch Bullhog project (WRI Project #1630) in order to maintain sagebrush habitat for sage grouse and big game (WRI Database 2013). Deer and elk pellet groups were sampled in low abundance in 2002 and 2007, but none were sampled in 2012. Cattle pats were sampled in moderate abundance in 2002, but in low abundance in 2007. Cattle were seen grazing a burned area west of the study in 1997. Sheep pellet groups were sampled in low abundance in 2007 (Table - Pellet Group Data).

Browse: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant preferred browse species. Sagebrush is a moderately sparse, mature population that has varied in density over the course of the study. Decadence has been generally low, and vigor good within the sagebrush population. Half of the population was infested by the sagebrush defoliator moth (*Aroga websteri*) in 2007. Recruitment of young sagebrush to the population has ranged from moderate to high most sample years, but was minimal in 2012. Utilization of sagebrush has been light to moderate throughout the study years. Antelope bitterbrush (*Purshia tridentata*) is present in low numbers and is scattered across the site. The majority of the sampled plants were in the young and mature age classes. Bitterbrush present on the site has an erect growth form. Utilization of bitterbrush was heavy from 1983 to 1997, but moderate in 2007 and 2012. Other species scattered around the site include white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), pricklypear cactus (*Opuntia* sp.), and broom snakeweed (*Gutierrezia sarothrae*) (Table - Browse Characteristics). Utah juniper is a moderately sparse, mature population that has gradually decreased density, but has increased in mean tree diameter (Table - Point-Quarter Tree Data). Moreover, cover of juniper has increased since 2002 (Table - Canopy Cover, Line Intercept). The woodland succession stage on the immediate site is considered to be between Phase I and II (Tausch et al. 2009).

Herbaceous Understory: The herbaceous understory is dominated by perennial grasses. Crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) are the dominant species and account for nearly all the grass cover on the site. Crested wheatgrass individuals were small in stature and drought stressed in 2012. Other perennial grasses sampled in very low frequencies are bluebunch wheatgrass (*Agropyron spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and Letterman needlegrass (*Stipa lettermani*). The invasive annual species cheatgrass (*Bromus tectorum*) has been observed on the site, but in low frequencies. The few forb species present have poor forage values. The most abundant perennial forbs are rose pussytoes (*Antennaria rosea*), rock goldenrod (*Petradoria pumila*) and Hood's phlox (*Phlox hoodii*). The annual species pale alyssum (*Alyssum alyssoides*) and bur buttercup (*Ranunculus testiculatus*) have been the most abundant annual species and are more common than the perennial forb species (Table - Herbaceous Trends).

Soil: The soil is part of the Abela component, which is found on fan remnants. The parent material consists of alluvium derived from limestone and/or alluvium derived from quartzite (Soil Survey Staff 2011). The soil texture is loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is moderate with moderate amounts of vegetation and litter that provide some protective ground cover (Table - Basic Cover). Erosion is minimal due to minimal slope and moderate vegetation and litter cover. The erosion condition has been determined to be stable since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - stable (0):** The density of Wyoming big sagebrush did not change at 698 plants/acre. Decadence of sagebrush decreased from 14% to 9%, but poor vigor increased from 0% to 14%. Recruitment of young sagebrush to the population remained a major component of the population, but decreased from 48% to 38%.
- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Wyoming big sagebrush decadence decreased to 0%, and poor vigor decreased to 5%. Recruitment of young sagebrush to the population was high at 72%, and was the main component of the population.
- **1997 to 2002 - up (+2):** The density of Wyoming big sagebrush increased 44% from 2,260 plants/acre to 3,260 plants/acre, but cover remained similar at 5%. Decadence of sagebrush increased to 7%, and poor vigor decreased to 3%. Recruitment of young sagebrush to the population decreased to 36%, but is still considered to be very good.
- **2002 to 2007 - down (-2):** The density of Wyoming big sagebrush decreased 33% to 2,200 plants/acre, but cover remained similar at 5%. Decadence of sagebrush increased to 19%, and poor vigor decreased to 3%. Recruitment of young sagebrush to the population decreased to 19%.
- **2007 to 2012 - down (-2):** The density of Wyoming big sagebrush decreased 25% to 1,660 plants/acre, but cover increased to 9%. Decadence of sagebrush decreased to 7%, but poor vigor increased to 22%. Recruitment of young sagebrush to the population decreased to 5% and is considered poor.

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1989 to 1997 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1997 to 2002 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover decreased from 15% to 12%.
- **2002 to 2007 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover increased to 14%.
- **2007 to 2012 - stable (0):** The sum of nested frequencies of perennial grasses remained similar, but cover increased to 19%.

Forb:

- **1983 to 1989 - stable (0):** Perennial forbs are rare on the site.
- **1989 to 1997 - stable (0):** Perennial forbs are rare on the site.
- **1997 to 2002 - stable (0):** Perennial forbs are rare on the site.
- **2002 to 2007 - stable (0):** Perennial forbs are rare on the site.
- **2007 to 2012 - stable (0):** Perennial forbs are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19B, 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
97	5.8	0.0	0.0	29.1	-0.2	3.8	0.0	**38.5**	Fair
02	6.4	12.9	9.5	24.3	0.0	1.7	0.0	**54.9**	Good
07	5.8	0.0	0.0	28.5	0.0	1.1	0.0	**35.4**	Fair
12	11.1	12.9	2.5	30.0	0.0	2.0	0.0	**58.5**	Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 6

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	$_{c}$298	$_{c}$308	$_{b}$277	$_{b}$238	$_{b}$245	$_{a}$176	10.01	8.93	8.02	4.84
G	Agropyron spicatum	$_{b}$25	$_{a}$-	$_{a}$-	$_{a}$3	$_{a}$5	$_{a}$5	-	.03	.07	.03
G	Bromus tectorum (a)	-	-	$_{b}$21	$_{a}$-	$_{b}$12	$_{b}$9	.21	-	.03	.01
G	Oryzopsis hymenoides	1	-	-	-	-	-	.00	-	-	-
G	Poa secunda	$_{a}$94	$_{b}$165	$_{c}$215	$_{c}$213	$_{c}$241	$_{d}$289	4.44	3.03	6.14	13.60
G	Sitanion hystrix	$_{b}$28	$_{a}$8	$_{a}$2	$_{a}$4	$_{a}$-	$_{a}$-	.03	.18	.01	-
G	Stipa lettermani	-	-	1	-	-	-	.03	-	-	-
Total for Annual Grasses		0	0	21	0	12	9	0.20	0	0.03	0.01
Total for Perennial Grasses		446	481	495	458	491	470	14.53	12.17	14.24	18.48
Total for Grasses		446	481	516	458	503	479	14.74	12.17	14.28	18.50
F	Alyssum alyssoides (a)	-	-	$_{c}$116	$_{a}$-	$_{b}$41	$_{c}$133	.25	-	.11	.32
F	Antennaria rosea	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$1	$_{ab}$9	$_{b}$17	-	.00	.01	.11
F	Astragalus convallarius	-	-	-	-	-	6	-	-	-	.06
F	Astragalus sp.	$_{a}$-	$_{ab}$1	$_{ab}$8	$_{a}$-	$_{b}$9	$_{b}$12	.20	-	.08	.12
F	Astragalus utahensis	-	-	-	-	-	3	.00	-	-	.06
F	Chaenactis douglasii	1	-	5	2	-	3	.01	.00	-	.00
F	Crepis acuminata	-	3	4	-	-	3	.01	-	-	.03
F	Descurainia pinnata (a)	-	-	-	-	1	-	-	-	.00	-
F	Hymenoxys acaulis	-	4	-	-	-	-	-	-	-	-
F	Lactuca serriola (a)	-	-	-	-	5	-	-	-	.01	-
F	Microsteris gracilis (a)	-	-	1	-	-	2	.00	-	-	.00
F	Petradoria pumila	$_{a}$4	$_{ab}$11	$_{b}$28	$_{b}$30	$_{ab}$14	$_{b}$25	1.33	.76	.40	.47
F	Phlox hoodii	$_{ab}$25	$_{b}$29	$_{ab}$23	$_{ab}$17	$_{a}$8	$_{a}$13	.31	.09	.02	.10
F	Phlox longifolia	$_{a}$-	$_{ab}$1	$_{ab}$2	$_{a}$-	$_{ab}$6	$_{b}$10	.01	-	.04	.02
F	Ranunculus testiculatus (a)	-	-	$_{b}$98	$_{a}$-	$_{c}$221	$_{c}$190	.31	-	.84	.70
F	Townsendia incana	-	2	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	-	-	-	-	1	3	.03	-	.00	.00
Total for Annual Forbs		0	0	215	0	268	325	0.57	0	0.96	1.02
Total for Perennial Forbs		30	51	70	50	47	95	1.92	0.86	0.56	1.00
Total for Forbs		30	51	285	50	315	420	2.49	0.86	1.53	2.03

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

BROWSE TRENDS--
Management unit 19B, Study no: 6

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia tridentata wyomingensis	42	52	47	45	4.61	5.14	4.62	8.89
B	Atriplex canescens	0	1	0	0				
B	Chrysothamnus nauseosus albicaulis	5	1	0	0	.01	-	-	-
B	Gutierrezia sarothrae	4	4	4	0	.30	1.23	.03	-
B	Juniperus osteosperma	6	7	8	7	9.64	9.37	12.67	12.96
B	Purshia tridentata	1	1	1	1	-	-	-	-
Total for Browse		58	66	60	53	14.57	15.75	17.32	21.86

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 6

Species	Percent Cover			
	'97	'02	'07	'12
Artemisia tridentata wyomingensis	-	6.94	10.63	8.66
Chrysothamnus nauseosus albicaulis	-	.10	-	-
Gutierrezia sarothrae	-	.48	.05	-
Juniperus osteosperma	6.00	14.38	16.75	18.48

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 6

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata wyomingensis	1.1	1.9	1.0

POINT-QUARTER TREE DATA--
Management unit 19B, Study no: 6

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	97	87	83

Average diameter (in)		
'02	'07	'12
5.1	7.7	10.4

BASIC COVER--
Management unit 19B, Study no: 6

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	3.25	7.75	26.29	27.71	33.07	42.15
Rock	0	5.00	1.88	2.55	1.35	2.46
Pavement	4.50	11.50	11.55	23.43	14.53	10.45
Litter	59.75	36.75	32.06	31.87	33.57	39.48
Cryptogams	0	0	5.19	.58	.35	.43
Bare Ground	32.50	39.00	24.19	25.08	34.04	24.36

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 6, Lee's Creek

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.2	7.0	38.0	36.1	25.9	3.0	6.3	182.4	0.7

PELLET GROUP DATA--

Management unit 19B, Study no: 6

Type	Quadrat Frequency				Days use per acre (ha)		
	'97	'02	'07	'12	'02	'07	'12
Rabbit	27	8	60	8	-	-	-
Elk	-	-	1	-	-	1 (3)	-
Deer/ Antelope	14	3	10	2	1 (2)	7 (17)	-
Cattle	22	14	7	2	21 (52)	15 (38)	-
	-	-	-	-	-	2 (5)	-

BROWSE CHARACTERISTICS--

Management unit 19B, 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)
Artemisia tridentata wyomingensis									
83	**698**	48	38	14	133	5	0	0	35/36
89	**698**	38	52	9	99	38	0	14	25/27
97	**2260**	72	28	0	1760	6	.88	5	25/38
02	**3260**	23	69	7	20	7	0	7	21/30
07	**2200**	19	62	19	20	46	5	3	24/32
12	**1660**	5	88	7	100	31	0	22	24/36
Atriplex canescens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**40**	0	100	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus nauseosus albicaulis									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**140**	100	0	0	60	14	29	14	-/-
02	**20**	0	0	100	-	0	100	0	11/16
07	**0**	0	0	0	-	0	0	0	9/14
12	**0**	0	0	0	-	0	0	0	11/23

		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									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**240**	17	83	0	-	0	0	0	7/10
02	**480**	4	58	38	-	0	0	13	7/11
07	**140**	0	43	57	-	0	0	29	8/10
12	**0**	0	0	0	-	0	0	0	-/-
Juniperus osteosperma									
83	**66**	0	100	-	-	0	0	0	67/41
89	**99**	0	100	-	-	0	0	0	87/52
97	**120**	0	100	-	-	0	0	0	-/-
02	**160**	0	100	-	-	0	0	0	-/-
07	**180**	0	100	-	-	0	0	0	-/-
12	**140**	0	100	-	20	0	0	0	-/-
Leptodactylon pungens									
83	**99**	0	100	0	-	0	0	0	8/15
89	**198**	33	33	33	-	0	0	33	6/7
97	**0**	0	0	0	-	0	0	0	-/-
02	**0**	0	0	0	-	0	0	0	-/-
07	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Opuntia sp.									
83	**33**	0	100	-	-	0	0	0	6/15
89	**33**	0	100	-	-	0	0	0	6/15
97	**0**	0	0	-	-	0	0	0	6/21
02	**0**	0	0	-	-	0	0	0	5/18
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/14
Purshia tridentata									
83	**133**	0	100	0	-	0	100	0	13/31
89	**166**	0	80	20	-	0	80	20	10/19
97	**20**	100	0	0	-	0	100	0	9/24
02	**40**	100	0	0	-	0	0	0	12/51
07	**20**	100	0	0	-	100	0	0	16/49
12	**20**	0	100	0	20	100	0	0	19/44

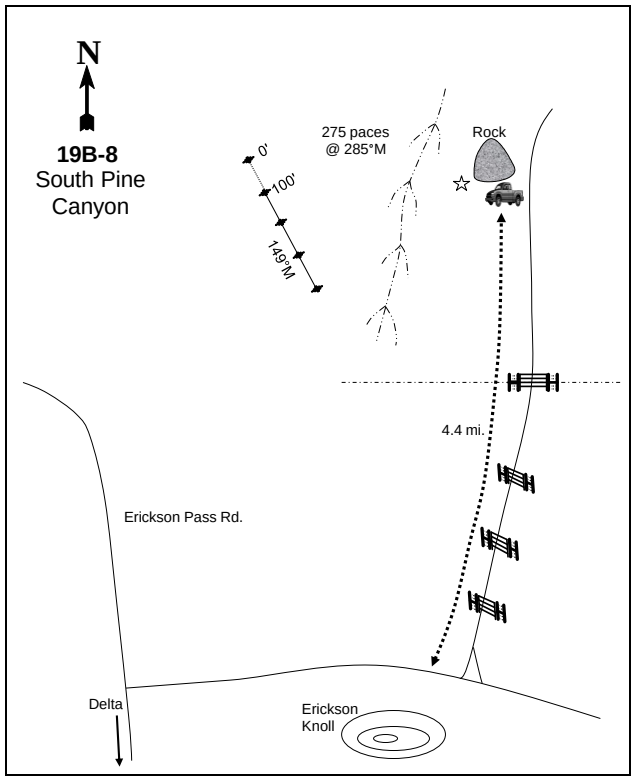
SOUTH PINE CANYON - TREND STUDY NO. 19B-8-12

Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter/Spring
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: USFS
Elevation: 6,900 ft. (2,103 m)
Aspect: South
Slope: 22%
Transect bearing: 149° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions: Starting on the road north of Erickson Knoll (road 564), take the South Pine Canyon Road north for 4.4 miles. Pass through a series of four gates and the National USFS boundary. Stop next to a huge rock on the west side of the road. From the west side of the road, the 0-foot baseline stake is 250 paces away at 285°M (across South Pine wash). The 0-foot baseline is marked by browse tag 3976.

Map Name: Erickson Knoll

Diagrammatic Sketch:



Township: 10S Range: 6W Section: 17

GPS: NAD 83, UTM 12S 368087 E 4423525 N

SOUTH PINE CANYON - TREND STUDY NO. 19B-8

Site Information

Site Description: This study is located on a small ridgeline that samples important winter range for mule deer on land that is administered by the U.S. Forest Service (USFS) within the West Cottonwood grazing allotment. The vegetation sampled is a mountain brush community with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the main browse component. An ephemeral stream is located 750 feet to the east. Due to a wildfire sometime between 1989 and 1997 eliminating the majority of the browse species, the study was not sampled in 1997. Deer pellet groups were sampled in high abundance in 2002, moderate abundance in 2007, and low abundance in 2012. Elk pellet groups were sampled in low abundance in 2007. Cattle pats were sampled in low abundance in 2002 and 2012 (Table - Pellet Group Data). Cattle were grazing in the vicinity while the study was sampled in 2002.

Browse: The preferred browse species found on the site are Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush, and antelope bitterbrush (*Purshia tridentata*). Mountain big sagebrush is a dense, mature population that has increased dramatically in density since 2002. Both decadence and poor vigor within the sagebrush population has been low over the course of the study. However, sagebrush plants in 2012 were highly stressed by drought indicated by many of the plants displaying leaf abscission. Recruitment of young sagebrush to the population has been minimal most sample years, but was prolific in 2007 and was the dominant component of the population in that year. Utilization of sagebrush was moderate from 1983 to 2002, but has been light since 2007. Utah serviceberry is a sparse, mature population that has maintained a stable population since 2002. However, prior to the fire, repeat photography suggests that the Utah serviceberry population was more prominent within the community. Decadence and poor vigor have been low in the serviceberry population throughout most of the sample years. Recruitment of young serviceberry to the population has been minimal over the course the study. Utilization of serviceberry has been mostly moderate, though with several years of heavy use. Antelope bitterbrush was a dense population before the wildfire, but is now a very sparse, mature population. Utilization of bitterbrush has been moderate to heavy throughout the duration of the study (Table - Browse Characteristics).

Herbaceous Understory: The perennial understory was rather sparse before the fire, and was even more so after the fire. Bluebunch wheatgrass (*Agropyron spicatum*) has been the dominant perennial grass every sample year, but became infrequent following the fire. Other perennial grasses found on the site include mutton bluegrass (*Poa fendleriana*), Sandberg bluegrass (*P. secunda*), and sand dropseed (*Sporobolus cryptandrus*). The invasive annual species cheatgrass has been the dominant grass since 2002. Prior to 2007, cattle were reported to have heavily grazed bluebunch wheatgrass. Perennial forbs were common and diverse in 1983 and 1989, but have decreased on the site since the wildfire. The most common species found on the site are American vetch (*Vicia americana*), wild onion (*Allium* sp.), longstalk springparsley (*Cymopterus longipes*), longleaf phlox (*Phlox longifolia*), and thistle (*Cirsium* sp.). More desirable species such as redroot eriogonum (*Eriogonum racemosum*), tapertip hawksbeard (*Crepis acuminata*), and gray lomatium (*Lomatium grayi*) have been sampled infrequently. The annual species pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*) are the dominant forb species on the site (Table - Herbaceous Trends).

Soil: The soil is within the Reywat-Broad-Rock outcrop soil association and is likely part of the Reywat component, which is found on mountainsides and hillsides. The parent material consists of residuum and colluvium derived from quartzite and igneous rocks (Soil Survey Staff 2011). The soil texture is a sandy loam with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover is moderate with high amounts of vegetation and litter, and a moderate amount of rock providing protective ground cover. In 2002, bare ground cover was high with a limited amount of vegetation and litter to provide protective cover (Table - Basic Cover). Additionally, there were signs of significant pedestalling, as well as sheet and gully erosion. The soil erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - stable (0):** Bitterbrush density decreased 28% from 1,665 plants/acre to 1,199 plants/acre. Decadence of bitterbrush increased from 4% to 11%. The density of mountain big sagebrush increased 34% from 399 plants/acre to 533 plants/acre. Decadence of sagebrush remained at 0%, but poor vigor increased from 0% to 13%. Recruitment of young sagebrush to the population was not observed. The density of Utah serviceberry increased 17% from 799 plants/acre to 932 plants/acre. Decadence of serviceberry increased from 0% to 14%, but poor vigor remained at 0%. Recruitment of young serviceberry to the population increased from 0% to 14%.
- **1989 to 2002 - down (-2):** Due to wildfire, the loss of browse species on the site was dramatic. All of the preferred species were reduced on the site, but bitterbrush was almost entirely removed.
- **2002 to 2007 - up (+2):** The density of mountain big sagebrush increased substantially from 100 plants/acre to 10,620 plants/acre, and cover increased from less than 1% to 12%. Decadence of sagebrush remained at 0%, and poor vigor remaining near 0%. Recruitment of young sagebrush to the population increased dramatically to 56%. The density of Utah serviceberry decreased 38% from 320 plants/acre to 200 plants/acre, but cover increased from 2% to 4%. Decadence of serviceberry decreased from 31% to 0%, and poor vigor decreased from 38% to 10%. No new recruitment of young serviceberry plants was sampled.
- **2007 to 2012 - stable (0):** The density of mountain big sagebrush remained similar at 10,480 plants/acre, but cover increased to 26%. Decadence of sagebrush increased to 12%, and poor vigor increased to 22%. Recruitment of young sagebrush to the population decreased dramatically to 2%. The density of Utah serviceberry increased at 40% to 280 plants/acre, but cover remained similar at 4%. Decadence remained at 0%, and poor vigor decreased to 0%. Recruitment of young serviceberry to the population was not observed.

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1989 to 2002 - down (-2):** The sum of nested frequencies of perennial grasses decreased 66%. Perennial grasses are rare on the site. The invasive annual species is common on the site, and has a cover of 10%.
- **2002 to 2007 - stable (0):** Perennial grasses are rare on the site.
- **2007 to 2012 - stable (0):** Perennial grasses are rare on the site.

Forb:

- **1983 to 1989 - up (+2):** The sum of nested frequencies of perennial forbs increased 30%.
- **1989 to 2002 - down (-2):** The sum of nested frequencies of perennial forbs decreased 95%. Perennial forbs are rare on the site and are not diverse.
- **2002 to 2007 - up (+2):** The sum of nested frequencies of perennial forbs increased nearly six-fold, and perennial forbs increased in cover from 1% to 2%. The perennial forbs community increased in diversity.
- **2007 to 2012 - down (-2):** The sum of nested frequencies of perennial forbs decreased 47%, and decreased in cover to 1%. Perennial forbs are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19B, 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
02	3.2	0.0	0.0	3.5	-7.4	1.5	0.0	**0.8**	Very Poor
07	22.3	14.2	15.0	1.9	-7.6	3.3	0.0	**49.1**	Poor-Fair
12	30.0	12.1	0.8	1.7	-8.5	2.8	0.0	**38.8**	Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 19B, Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'02	'07	'12	'02	'07	'12
G	Agropyron spicatum	$_{bc}$90	$_{c}$90	$_{ab}$33	$_{a}$13	$_{a}$17	1.70	.78	.64
G	Bromus tectorum (a)	-	-	290	315	315	9.86	10.13	11.32
G	Poa fendleriana	1	9	3	-	-	.03	-	-
G	Poa secunda	$_{b}$13	$_{b}$15	$_{a}$1	$_{a}$-	$_{ab}$14	.01	.01	.19
G	Sporobolus cryptandrus	-	-	2	3	-	.03	.15	-
Total for Annual Grasses		0	0	290	315	315	9.86	10.13	11.32
Total for Perennial Grasses		104	114	39	16	31	1.77	0.94	0.83
Total for Grasses		104	114	329	331	346	11.63	11.07	12.15
F	Agoseris glauca	5	-	-	-	-	-	-	-
F	Allium sp.	$_{c}$54	$_{b}$29	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Alyssum alyssoides (a)	-	-	$_{a}$-	$_{b}$179	$_{c}$222	-	.93	2.67
F	Arabis sp.	-	11	-	-	-	-	-	-
F	Arenaria sp.	-	3	-	-	-	-	-	-
F	Artemisia ludoviciana	11	7	-	1	-	-	.03	-
F	Astragalus sp.	3	2	-	-	3	-	-	.00
F	Calochortus nuttallii	-	2	-	-	-	-	-	-
F	Chaenactis douglasii	$_{a}$1	$_{ab}$21	$_{a}$1	$_{b}$30	$_{b}$21	.00	.22	.41
F	Cirsium sp.	13	7	9	2	1	.45	.25	.09
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{c}$87	$_{b}$11	-	.29	.05
F	Collomia linearis (a)	-	-	-	4	-	-	.01	-
F	Comandra pallida	$_{ab}$7	$_{b}$11	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Crepis acuminata	$_{ab}$18	$_{b}$24	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Cryptantha sp.	$_{ab}$18	$_{b}$20	$_{a}$2	$_{b}$4	$_{a}$-	.03	.01	-
F	Cymopterus longipes	$_{b}$29	$_{a}$-	$_{a}$-	$_{a}$10	$_{a}$4	-	.02	.06
F	Descurainia pinnata (a)	$_{a}$-	$_{a}$3	$_{a}$-	$_{b}$69	$_{a}$5	-	.68	.03
F	Epilobium brachycarpum (a)	-	-	-	3	-	-	.01	-
F	Eriogonum racemosum	$_{a}$2	$_{a}$-	$_{a}$-	$_{b}$12	$_{b}$16	-	.22	.16
F	Erodium cicutarium (a)	-	-	$_{a}$14	$_{b}$71	$_{a}$29	.21	.84	.20
F	Hackelia patens	$_{b}$12	$_{b}$12	$_{a}$-	$_{ab}$3	$_{a}$-	-	.03	-
F	Lactuca serriola (a)	$_{a}$-	$_{a}$-	$_{b}$10	$_{b}$2	$_{ab}$4	.13	.01	.01
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$52	$_{a}$-	-	.33	-

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'02	'07	'12	'02	'07	'12
F	Lithospermum ruderale	5	5	5	8	4	.24	.45	.53
F	Lomatium grayi	a11	b77	a-	a7	a2	-	.02	.03
F	Machaeranthera canescens	ab2	ab3	a-	b8	ab2	-	.05	.00
F	Microsteris gracilis (a)	-	-	-	4	-	-	.01	-
F	Phlox longifolia	a2	b45	a3	b43	a9	.00	.30	.02
F	Ranunculus testiculatus (a)	-	-	-	3	-	-	.00	-
F	Sanguisorba minor	-	-	2	-	-	.03	-	-
F	Tragopogon dubius (a)	-	4	-	-	-	-	-	-
F	Vicia americana	b140	b155	a-	a2	a7	-	.00	.06
F	Viola sp.	1	-	-	-	-	-	-	-
Total for Annual Forbs		0	7	24	474	271	0.34	3.14	2.97
Total for Perennial Forbs		334	434	22	130	69	0.77	1.63	1.38
Total for Forbs		334	441	46	604	340	1.11	4.77	4.36

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

BROWSE TRENDS--
Management unit 19B, Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'02	'07	'12	'02	'07	'12
B	Amelanchier utahensis	13	9	12	1.45	3.56	4.11
B	Artemisia tridentata vaseyana	5	76	82	.33	12.03	25.50
B	Chrysothamnus nauseosus	0	19	27	-	.85	1.46
B	Chrysothamnus viscidiflorus viscidiflorus	7	58	56	.56	3.41	4.90
B	Mahonia repens	2	2	2	.06	.30	.30
B	Opuntia sp.	1	3	2	-	-	-
B	Purshia tridentata	3	3	3	.38	1.31	2.12
B	Tetradymia canescens	1	0	0			
Total for Browse		32	170	184	2.78	21.47	38.40

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 8

Species	Percent Cover		
	'02	'07	'12
Amelanchier utahensis	2.71	5.08	6.36
Artemisia tridentata vaseyana	1.11	12.91	24.64
Chrysothamnus nauseosus	-	.95	1.25
Chrysothamnus viscidiflorus viscidiflorus	.86	3.95	7.03
Mahonia repens	-	.25	.08
Purshia tridentata	.40	2.21	2.71

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19B, Study no: 8

Species	Average leader growth (in)		
	'02	'07	'12
Amelanchier utahensis	-	1.4	2.0
Artemisia tridentata vaseyana	2.1	1.5	0.6
Purshia tridentata	2.5	1.2	1.9

BASIC COVER--
Management unit 19B, Study no: 8

Cover Type	Average Cover %				
	'83	'89	'02	'07	'12
Vegetation	2.75	6.25	15.07	35.24	51.71
Rock	6.75	9.50	13.52	13.41	12.86
Pavement	1.75	2.75	24.91	21.13	8.57
Litter	65.25	62.75	27.26	16.01	45.13
Cryptogams	.25	.25	0	.00	.15
Bare Ground	23.25	18.50	26.89	22.06	16.79

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 8, South Pine Canyon

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.4	7.1	69.3	16.7	14.0	2.5	13.8	227.2	0.6

PELLET GROUP DATA--
Management unit 19B, Study no: 8

Type	Quadrat Frequency		
	'02	'07	'12
Rabbit	1	6	1
Elk	-	5	-
Deer	20	17	6
Cattle	5	1	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	3 (7)	-
55 (136)	27 (68)	10 (25)
6 (14)	-	1 (2)

BROWSE CHARACTERISTICS--
Management unit 19B, 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)
Amelanchier utahensis									
83	**799**	0	100	0	-	0	100	0	45/53
89	**932**	14	71	14	-	79	0	0	45/48
02	**320**	0	69	31	-	0	88	38	21/44
07	**200**	0	100	0	-	70	10	10	33/59
12	**280**	0	100	0	-	14	0	0	34/57

		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 tridentata vaseyana									
83	**399**	0	100	0	-	50	0	0	28/36
89	**533**	0	100	0	-	63	0	13	11/13
02	**100**	40	60	0	-	40	0	0	20/34
07	**10620**	56	44	0	4060	9	2	.18	15/25
12	**10480**	2	85	12	20	13	2	22	10/22
Atriplex canescens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	10/22
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus nauseosus									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
02	**0**	0	0	0	-	0	0	0	-/-
07	**540**	7	93	0	-	26	4	4	16/20
12	**680**	0	88	12	-	3	0	6	22/24
Chrysothamnus viscidiflorus viscidiflorus									
83	**331**	20	60	20	-	0	0	0	14/10
89	**266**	0	100	0	-	0	0	0	9/9
02	**220**	0	100	0	-	9	0	0	15/33
07	**4980**	29	64	7	240	16	0	11	14/29
12	**4800**	4	95	1	-	0	0	.83	10/19
Gutierrezia sarothrae									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Juniperus osteosperma									
83	**66**	0	100	-	-	0	0	0	67/173
89	**66**	0	100	-	-	0	0	0	197/157
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Mahonia repens									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
02	**200**	10	90	0	-	0	0	80	2/6
07	**960**	0	77	23	-	0	0	88	5/7
12	**520**	0	100	0	-	0	0	0	3/5

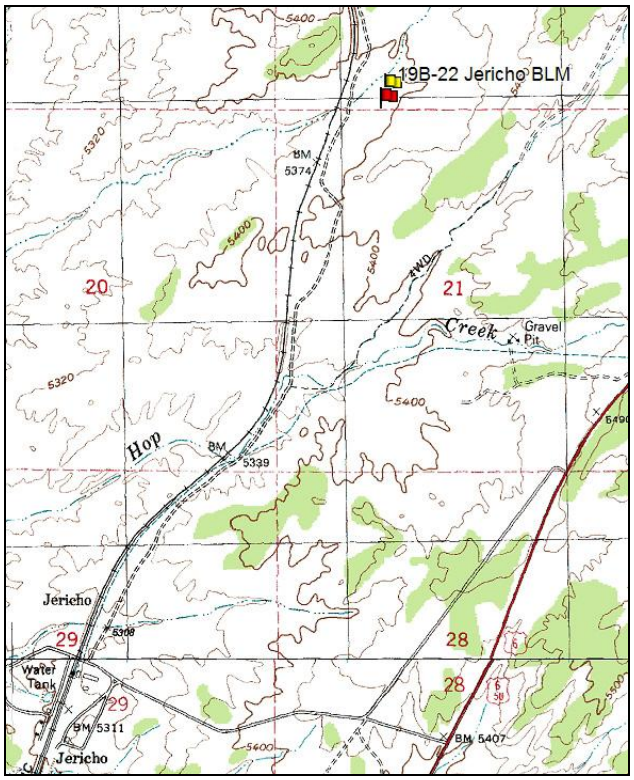
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Opuntia sp.									
83	**866**	0	100	0	-	0	0	0	10/17
89	**864**	23	69	8	-	0	0	54	7/28
02	**20**	0	100	0	-	0	0	0	6/18
07	**60**	0	100	0	-	0	0	33	5/25
12	**40**	0	100	0	-	0	0	0	4/13
Purshia tridentata									
83	**1665**	0	96	4	-	4	96	0	17/25
89	**1199**	0	89	11	-	33	67	0	14/31
02	**60**	0	100	0	-	0	100	0	8/24
07	**60**	0	67	33	-	0	100	0	15/61
12	**60**	0	100	0	-	67	33	0	22/71
Symphoricarpos oreophilus									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	21/40
12	**0**	0	0	-	-	0	0	0	13/38
Tetradymia canescens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
02	**20**	100	0	-	-	100	0	0	-/-
07	**0**	0	0	-	-	0	0	0	17/69
12	**0**	0	0	-	-	0	0	0	-/-

JERICHO BLM - TREND STUDY NO. 19B-22-12

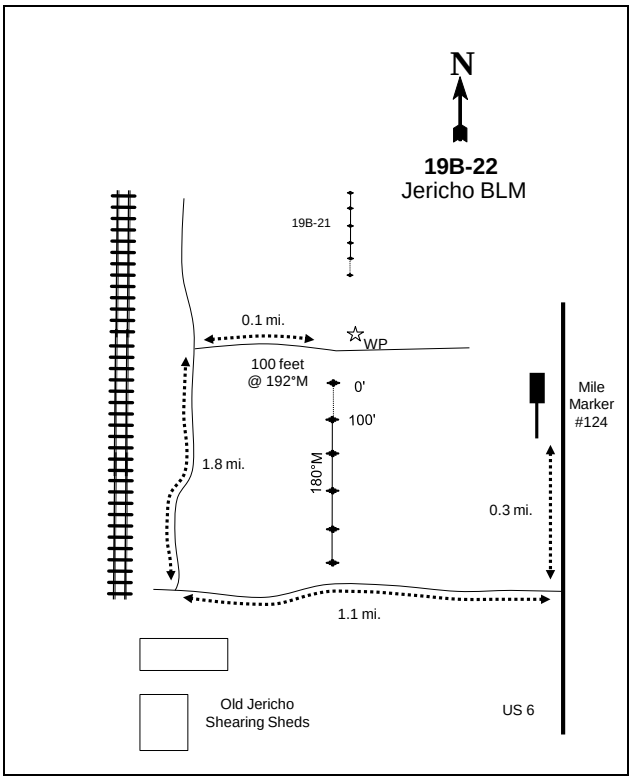
Vegetation Type: Perennial Grass
Range Type: Deer Winter
NRCS Ecological Site Description: Semidesert Loam (Wyoming Big Sagebrush), R028AY220UT
Land Ownership: BLM
Elevation: 5,400 ft. (1,646 m)
Aspect: Southwest
Slope: 5%
Transect bearing: 0° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)

Directions: From mile marker 124 in Hwy 6, drive 0.1 miles south to a road heading west. Take this road for 1.1 miles to the old Jericho shearing sheds on the left and an intersection before the railroad tracks. Turn right and follow the road on the east side of the tracks for 1.8 miles. At this point is the border of state land and BLM land. Turn right and follow the faint road along the border for 0.1 miles to a witness post and some clipping baskets. The 0-foot stake is 100 at 192 degrees magnetic from the witness post. The 0-foot stake has browse tag 475.

Map Name: McIntyre



Diagrammatic Sketch:



Township: 12S Range: 3W Section: 16

GPS: NAD 83, UTM 12S 398115 E 4403152 N

JERICHO BLM - TREND STUDY NO. 19B-22

Site Information

Site Description: This study is located in Tintic Valley west of U.S. Highway 6 and north of the old Jericho sheep shearing sheds, and is adjacent to the Jericho State Section study (19B-21). The area was part of the extensive Leamington burn complex of 1996 that burned 138,340 acres, and eliminated the dense sagebrush stand of the area. This study samples a section of land that is administered by the Utah School and Institutional Trust Lands Administration (SITLA), and samples an area that was aerially seeded and then one-way chained with an Ely chain after the fire. Additionally, fourwing saltbush (*Atriplex canescens*) was seeded using a dribbler during the chaining. Deer pellet groups were sampled in low abundance for all sample years. Cattle pats were sampled in low abundance in 1998 and 2012. Sheep pellet groups were sampled in moderate abundance in 2002, high abundance in 2007, and low abundance in 2012 (Table - Pellet Group Data).

Browse: Before the fire consumed all of the basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) in 1996, the sagebrush was estimated to be very dense on the site. This estimate was made from the number of burned sagebrush stems measured in 1998. No living sagebrush plants have been sampled since the fire. Fourwing saltbush is the only preferred browse species sampled since the fire. Saltbush is a sparse, mature population that has gradually decreased in density over the course of the study. The health of the saltbush population was vigorous in 1998, but has since been very poor. Saltbush decadence and poor vigor has been high since 2002. Recruitment of young saltbush to the population was high in 1998, but has been absent from the population since 2002. Utilization has ranged from light in 1998 to heavy in 2012. The average height and crown measurements of saltbush have steadily increased over the duration of the study. Together, with density and height and crown data suggest that the population is composed of fewer, but larger plants (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous community is particularly dominated by the seeded perennial grass species. The dominant perennial grasses are crested wheatgrass (*Agropyron cristatum*) and tall wheatgrass (*A. elongatum*), and together have comprised over half of the total vegetation cover since 2002. Russian wildrye (*Elymus junceus*) and smooth brome (*Bromus inermis*) are two other seeded species that are present on the site in lower frequencies. Western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), and bottlebrush squirreltail (*Sitanion hystrix*) have also been measured in lower frequencies. The invasive annual species cheatgrass (*Bromus tectorum*) is common on the site, but has had relatively low cover since 2002. Perennial forbs are extremely rare on the site and have had no cover since 1998. The dominant forbs have been the weedy annually species desert alyssum (*Alyssum desertorum*), draba (*Draba* sp.), and tumblemustard (*Sisymbrium altissimum*) (Table - Herbaceous Trends).

Soil: The soil is part of the Wales component, which is found on alluvial fans. The parent material consists of alluvium derived from limestone and sandstone and/or alluvium derived from quartzite (Soil Survey Staff 2011**).** The soil texture is a loam with a neutral soil reaction (pH 7.3). Phosphorous may have limited availability for plant growth and development at 3.8 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Relative bare ground cover is abundant with a moderate amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2002, but stable in 2007 and 2012.

Trend Assessments

Browse:

- **1998 to 2002 - down (-2):** The density of fourwing saltbush decreased 50% from 400 plants/acre to 200 plants/acre. Decadence increased from 0% to 80%, and poor vigor increased from 0% to 80%. Recruitment of young saltbush to the population decreased from 75% to 0%.

- **2002 to 2007 - stable (0):** The density of fourwing saltbush decreased 10 % to 180 plants/acre. Decadence of saltbush decreased to 78%, and poor vigor decreased to 33%. Recruitment of young saltbush to the population was not observed.
- **2007 to 2012 - stable (0):** The density of fourwing saltbush decreased 11 % to 160 plants/acre. Decadence of saltbush increased to 88%, and poor vigor increased to 88%. Recruitment of young saltbush to the population was not observed.

Grass:
- **1998 to 2002 - up (+2):** The sum of nested frequencies of perennial grasses increased 15%, but cover decreased from 24% to 22%. Crested wheatgrass and western wheatgrass increased significantly in nested frequency. The invasive annual cheatgrass decreased significantly in nested frequency, and decreased in cover from 10% to near 0%.
- **2002 to 2007 - slightly down (-1):** The sum of nested frequencies of perennial grasses decreased 6%, and cover increased to 19%. Crested wheatgrass increased significantly in nested frequency. Cheatgrass increased significantly in nested frequency, and increased in cover to 2%.
- **2007 to 2012 - slightly up (+1):** The sum of nested frequencies of perennial grasses remained similar, but cover increased to 24%. Cheatgrass decreased significantly in nested frequency, but increased in cover to 3%.

Forb:
- **1998 to 2002 - stable (0):** Perennial forbs are rare on the site.
- **2002 to 2007 - stable (0):** Perennial forbs are rare on the site.
- **2007 to 2012 - stable (0):** Perennial forbs are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19B, 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
98	15.8	7.3	3.7	30.0	-0.9	0.4	0.0	**56.2**	Fair
02	13.8	2.5	1.2	30.0	0.0	0.7	0.0	**48.1**	Poor-Fair
07	11.3	4.7	1.1	30.0	-0.4	0.8	0.0	**47.5**	Poor
12	11.3	4.7	1.1	30.0	-0.4	0.8	0.0	**47.5**	Poor

Trend Summary

SEED MIX--
Management unit 19B, Study no: 22

Project Name: n/a WRI Database #: n/a			
Application: Arieal/dribbler		Acres: n/a	
Seed type		Kg/ha	lbs/acre
G	High Crest (*Agropyron cristatum*)	3.5	3.10
G	Russian wildrye (*Elymus junceus*)	2.4	2.10
G	Tall wheatgrass (*Agropyron elongatum*)	2.3	2.00
G	Smooth brome (*Bromus inermis*)	2.1	1.90
B	Fourwing saltbush (*Atriplex canescens*)	1	2.10
Total Pounds:			11.10

HERBACEOUS TRENDS--
Management unit 19B, Study no: 22

Type	Species	Nested Frequency				Average Cover %			
		'98	'02	'07	'12	'98	'02	'07	'12
G	Agropyron cristatum	$_{a}$133	$_{b}$193	$_{c}$250	$_{c}$270	5.14	10.33	11.31	16.24
G	Agropyron elongatum	$_{b}$198	$_{a}$108	$_{a}$93	$_{a}$89	14.29	7.15	4.66	5.05
G	Agropyron smithii	$_{a}$-	$_{c}$87	$_{b}$45	$_{b}$64	-	1.35	.93	1.57
G	Agropyron spicatum	-	5	-	-	-	.15	-	-
G	Bromus inermis	$_{ab}$35	$_{b}$46	$_{a}$21	$_{ab}$24	1.29	.51	.30	.49
G	Bromus japonicus (a)	-	-	3	-	-	-	.01	-
G	Bromus tectorum (a)	$_{d}$334	$_{a}$14	$_{c}$239	$_{b}$94	9.84	.06	1.72	2.51
G	Elymus junceus	$_{b}$35	$_{b}$35	$_{b}$57	$_{a}$10	1.79	1.83	1.99	.36
G	Festuca ovina	-	-	-	3	-	-	-	.00
G	Oryzopsis hymenoides	-	-	-	-	.00	-	-	-
G	Sitanion hystrix	$_{b}$31	$_{ab}$21	$_{a}$2	$_{a}$-	1.79	.48	.03	-
G	Vulpia octoflora (a)	-	-	2	-	-	-	.03	-
Total for Annual Grasses		334	14	244	94	9.84	0.06	1.75	2.51
Total for Perennial Grasses		432	495	468	460	24.32	21.83	19.23	23.73
Total for Grasses		766	509	712	554	34.17	21.89	20.99	26.25
F	Agoseris glauca	3	-	-	-	.00	-	-	-
F	Alyssum desertorum (a)	$_{b}$87	$_{a}$13	$_{d}$395	$_{c}$184	.62	.03	2.50	.43
F	Calochortus nuttallii	2	-	-	-	.00	-	-	-
F	Collinsia parviflora (a)	-	-	3	4	-	-	.00	.01
F	Descurainia pinnata (a)	4	-	1	4	.01	-	.00	.00
F	Draba sp. (a)	$_{a}$-	$_{a}$-	$_{a}$4	$_{b}$37	-	-	.01	.10
F	Helianthus annuus (a)	-	-	3	-	-	-	.03	-
F	Lactuca serriola (a)	-	-	1	1	-	-	.00	.00
F	Phlox longifolia	-	-	-	4	-	-	-	.00
F	Senecio multilobatus	1	-	-	-	.00	-	-	-
F	Sisymbrium altissimum (a)	$_{c}$33	$_{a}$2	$_{b}$9	$_{a}$-	1.91	.00	.08	-
F	Sphaeralcea grossulariifolia	-	1	-	-	.00	.00	-	-
F	Tragopogon dubius (a)	-	-	-	2	-	-	-	.03
Total for Annual Forbs		124	15	416	232	2.54	0.03	2.63	0.59
Total for Perennial Forbs		6	1	0	4	0.01	0.00	0	0.00
Total for Forbs		130	16	416	236	2.56	0.03	2.63	0.59

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

BROWSE TRENDS--
Management unit 19B, Study no: 22

Type	Species	Strip Frequency				Average Cover %			
						'98	'02	'07	'12
B	Atriplex canescens	16	9	8	8	.33	.58	.59	.53
B	Opuntia sp	0	1	1	0	-	-	-	-
Total for Browse		16	10	9	8	0.32	0.58	0.59	0.53

CANOPY COVER, LINE INTERCEPT--
Management unit 19B, Study no: 22

Species	Percent Cover	
	'07	'12
Atriplex canescens	1.39	.56

BASIC COVER--
Management unit 19B, Study no: 22

Cover Type	Average Cover %			
	'98	'02	'07	'12
Vegetation	39.77	24.76	25.67	27.23
Rock	.11	.12	.22	.32
Pavement	2.41	2.14	1.60	.98
Litter	14.53	26.26	37.40	28.48
Cryptogams	0	.04	2.17	.07
Bare Ground	49.61	56.15	46.90	45.04

SOIL ANALYSIS DATA --

Management unit 19B, Study no: 22, Jericho BLM

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
17.5	7.3	44.0	30.1	25.9	2.5	4.0	364.8	0.7

PELLET GROUP DATA--
Management unit 19B, Study no: 22

Type	Quadrat Frequency			
	'98	'02	'07	'12
Sheep	-	17	7	4
Rabbit	1	4	28	3
Grouse	-	-	-	2
Deer	-	3	3	1
Cattle	-	-	1	1

Days use per acre (ha)		
'02	'07	'12
35 (88)	40 (99)	19 (46)
-	-	-
		1 (9)
-	-	-
-	-	7 (16)

BROWSE CHARACTERISTICS--
Management unit 19B, Study no: 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)
Atriplex canescens									
98	**400**	75	25	0	-	0	0	0	17/17
02	**200**	0	20	80	-	10	30	80	26/37
07	**180**	0	22	78	-	33	11	33	40/56
12	**160**	0	13	88	-	25	50	88	41/58
Opuntia sp.									
98	**0**	0	0	0	-	0	0	0	-/-
02	**20**	0	0	100	-	0	0	100	2/3
07	**20**	0	100	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-

SUMMARY
WILDLIFE MANAGEMENT UNIT 19B - WEST DESERT, VERNON

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which inlude **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) 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. Eight interagency range trend studies were sampled in Unit 19B during the summer of 2012.

Four of the studies [Sabie Mountain (19B-1), Upper Little Valley (19B-2), Bennion Creek (19B-3), and Harker Canyon (19B-4)] are categorized as deer summer range, and sample mountain big sagebrush, mountain brush, or snowberry (*Symphoricarpos oreophilus*) communities. Three of the studies [West Government Creek (19B-5), Lee's Creek (19B-6), and Jericho BLM (19B-22)] are categorized as low-level potential sites for deer winter range, and sample a Wyoming big sagebrush, pinyon and juniper chaining, or a burn communities. Because South Pine Canyon (19B-8) study is the only mid-level potential site within the unit, it is not included in this summary. For further information regarding this study, refer to the study discussion section.

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 both the Western (Division 1) and North Central (Division 3) divisions. Studies that are located in the Western division include the Upper Little Canyon, Bennion Creek, Harker Canyon, West Government Creek, Lee's Creek, and South Pine Canyon. Studies that are located in the North Central division include Sabie Mountain and Jericho BLM. The Western division had a historic annual mean precipitation of 8.66 inches from 1895 to 2012. The North Central

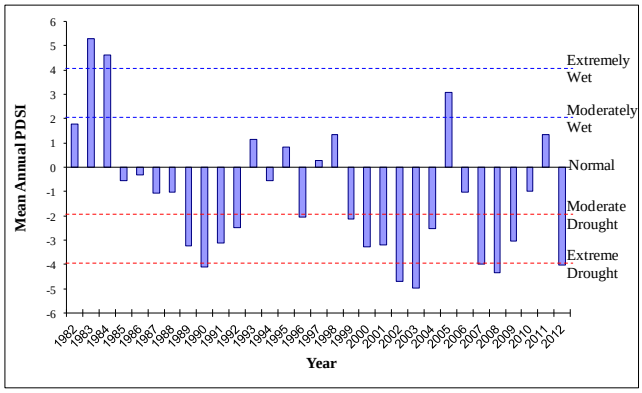


Figure 1. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the Western division (Division 1). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

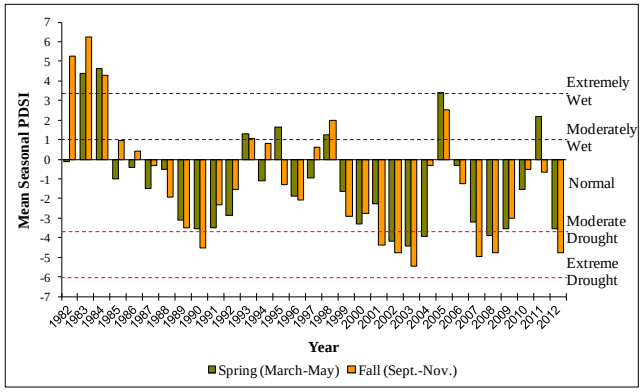


Figure 2. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the Western division (Division 1). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

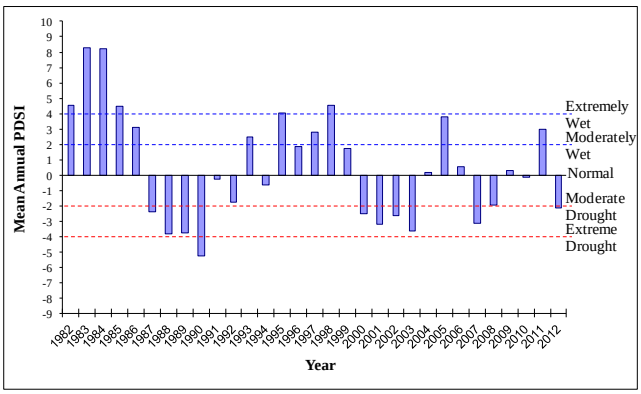


Figure 3. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the North Central division (Division 3). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

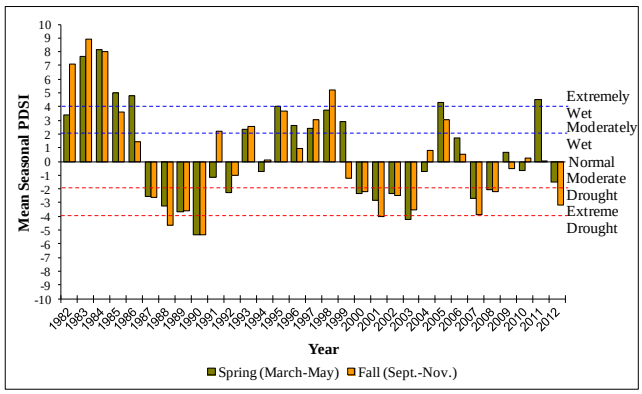


Figure 4. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the North Central division (Division 3). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

division had a historic annual mean precipitation of 16.51 inches from 1895 to 2012. The mean annual PDSI of the Western division displays long periods of drought years followed by short periods of wet years over the course of the sample years. However, the North Central division displays a cycle of several wet years followed by several drought years over the course of study years (Figure 1, Figure 2, Figure 3, and Figure 4) (Time Series Data 2013).

The 1961-1990 mean annual precipitation was 12-14 in. on the Jericho BLM study; 14-16 in. on the West Government Creek and Lee's Creek studies; 18-20 in. Sabie Mountain and South Pine Canyon studies; 20-24 Upper Little Valley and Harker Canyon studies; and 24-28 in. on the Bennion Creek study (PRISM Climate Group 2011).

Deer Summer Range

Browse: The summer range cumulative median browse trend has generally increased over the duration of the study years. There was a slight decrease in the median browse trend in 2007, and a large increase in 2012 (Figure 9b). Mountain big sagebrush is the dominant browse species on the Sabie Mountain study, but co-dominant with Saskatoon serviceberry (*Amelachier alnifolia*) on the remaining summer range studies. The mean density and cover of mountain big sagebrush decreased significantly in 2007, but increased significantly in 2012, returning to 1997 levels (Figure 6a and Figure 6b). The decrease in mean density of mountain big sagebrush is largely attributed to the decrease in sagebrush on Sabie Mountain study. The combination of high decadence and an infestation of crickets in 2002 may be linked to the decrease in sagebrush in 2007 (Figure 6c).

Saskatoon serviceberry is common on all of the summer range studies. The mean density of serviceberry decreased significantly in 2007, but increased slightly in 2012 and nearly returned to 1997 levels (Figure 6a). The mean cover of serviceberry remained similar from 1997 to 2007, but increased significantly in 2012 (Figure 6b). Mean decadence of serviceberry increased in 2002 and was high, but mean decadence decreased significantly in 2007 and was low throughout the unit (Figure 6c).

Herbaceous Understory: The summer range median cumulative grass trend has generally decreased over the duration of the study years; however, cumulative grass trend in 2012 increased considerably (Figure 9b).

Perennial grasses are typically diverse and abundant on these studies. The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, steadily decreased from 1997 to 2002, and decreased significantly in 2007; however, the mean sum of nested frequency increased significantly in 2012 and returned to 2002 levels (Figure 5a). The mean cover of perennial grass species decreased significantly in 2002 and continued to decrease in 2007, but increased significantly in 2012 and returned to just under 1997 levels (Figure 5b). With the exception of the Upper Little Valley study, annual grass species including cheatgrass (*Bromus tectorum*) are not prevalent on the summer range studies. Mean sum of nested frequency and cover of annual grasses decreased significantly in 2002, but increased significantly again in 2007 and slightly again in 2012 (Figure 5a and Figure 5b). Additionally, the weedy perennial species bulbous bluegrass is rare to absent on the summer range study sites, but appears to be increasing slowly throughout the area. There was a significant increase in the mean nested frequency and cover of bulbous bluegrass in 2012 (Figure 5a and Figure 5b).

The deer summer range median cumulative forb trend decreased considerably from 1989 to 2002, but increased with the same magnitude in 2007 and 2012 (Figure 9b). Perennial forb species are common on most of the summer range studies. However, the mean sum of nested frequency of perennial forb species decreased significantly in 2002, but increased significantly in 2007. The mean cover of perennial forbs decreased significantly in 2002, but increased significantly each subsequent sample year (Figure 5a and Figure 5b).

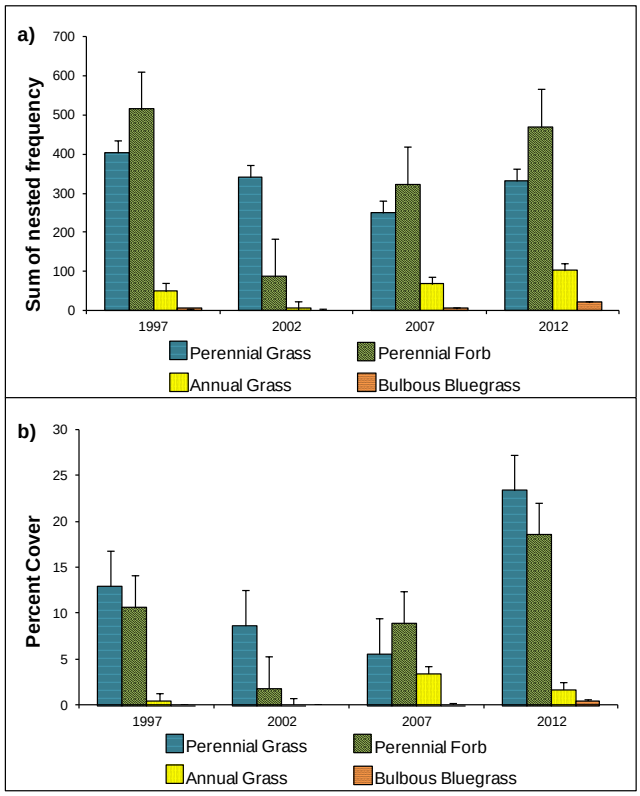


Figure 5. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass sum of nested frequency by year for WMU 19B, West Desert, Vernon. **b)** Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 19B.

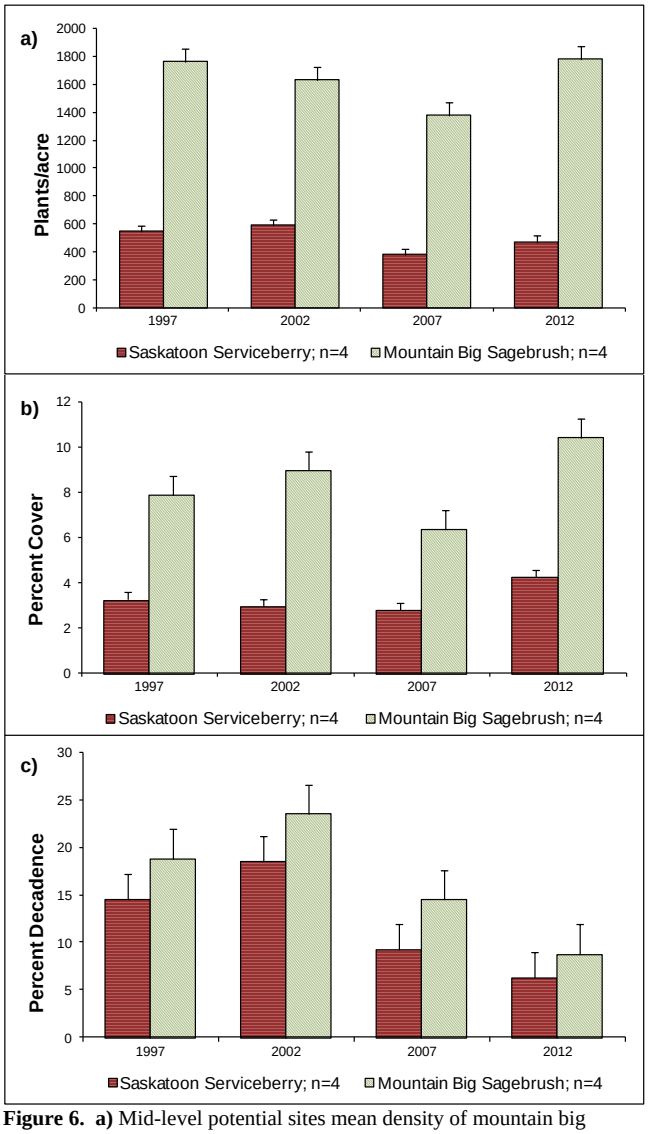


Figure 6. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Saskatoon serviceberry (*Amelanchier alnifolia*) by year for WMU 19B, West Desert, Vernon. **b)** Mid-level potential sites mean cover of mountain big sagebrush and Saskatoon serviceberry by year for WMU 19B. **c)** Mid-level potential mean decadence of mountain big sagebrush and Saskatoon serviceberry by year for WMU 19B.

Occupancy: Pellet group transect data indicates that deer predominantly occupy these summer range study areas. The mean abundance of deer pellet groups was moderate on most studies from 2002 to 2007, but was substantially lower in 2012. The decrease in pellet abundance is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk and livestock sign has been generally low since 2002 (Figure 10b).

Discussion: The summer range study sites appear to be doing well; however, with the presence of weedy annual species and bulbous bluegrass on most of these sites, there is a concern that these weedy species may increase throughout the area. These weedy species can form dense mats of cover that compete with other more desirable herbaceous species and with seedlings and young shrubs which limits establishment of new plants into the population. Annual grass species can also increase fuel loads and increase the chance of a catastrophic fire event.

Low Potential Deer Range

Browse: The low potential site cumulative median browse trend has remained steady most sample years, but increased substantially in 2002, and decreased to previous levels in 2007 (Figure 9c). Wyoming big sagebrush is a dominant browse species on the West Government Creek and Lee's Creek studies, but is absent on the Jericho BLM study. The mean density of Wyoming big sagebrush increased significantly in 2002, but decreased significantly in 2007 and continued to decrease slightly in 2012 (Figure 8a). The mean cover of Wyoming big sagebrush has

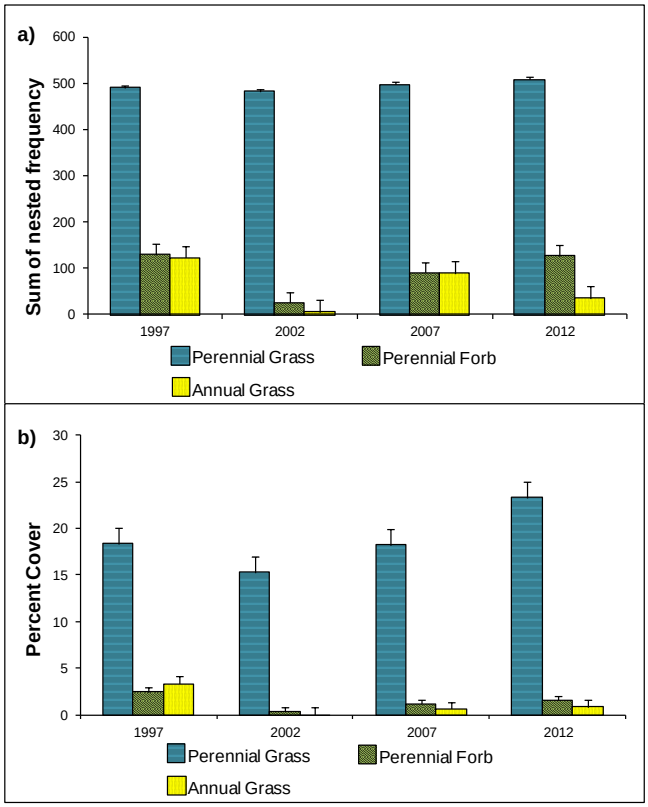


Figure 7. a) Low potential sites mean perennial grass , perennial forb, and annual grass sum of nested frequency by year for WMU 19B, West Desert, Vernon. **b)** Low potential sites mean perennial grass, perennial forb, and annual grass cover by year for WMU 19B.

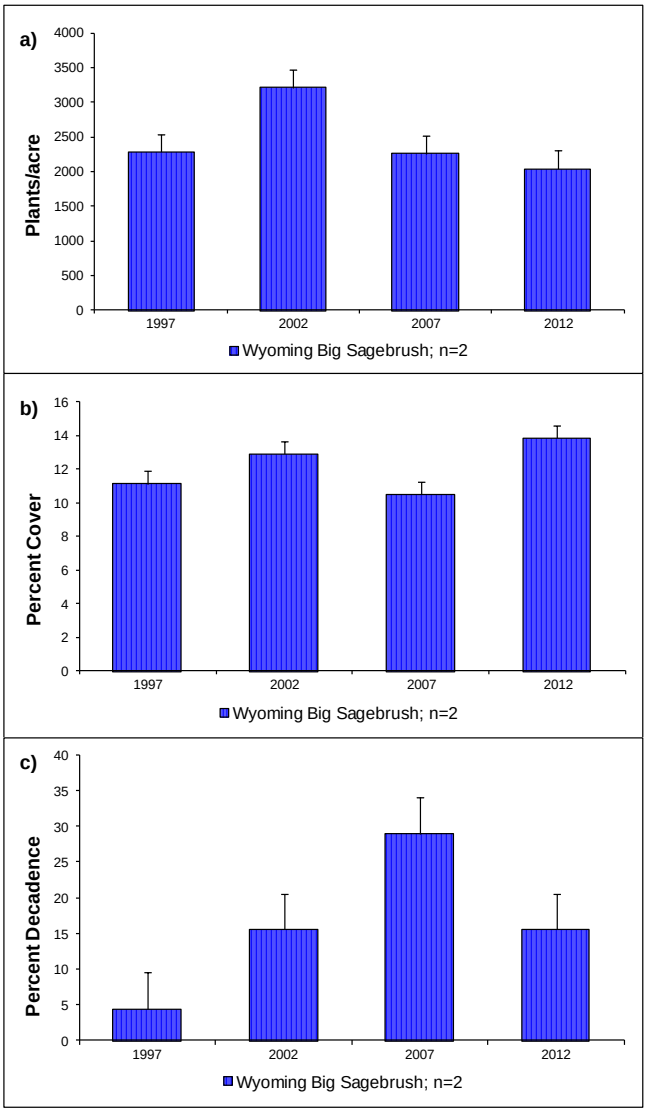


Figure 8. a) Low potential sites mean density of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) by year for WMU 19B, West Desert, Vernon. **b)** Low potential sites mean cover of Wyoming big by year for WMU 19B. **c)** Low potential sites mean decadence of Wyoming big sagebrush by year for WMU 19B.

varied significantly each sample year (Figure 8b). Mean decadence of Wyoming big sagebrush increased significantly each sample from 1997 to 2007, but decreased significantly in 2012 (Figure 8c).

Herbaceous Understory: The low potential median cumulative grass trend has remained stable most sample years, but did increase slightly in 2012 (Figure 9c). Perennial grasses are abundant on these studies, but are dominated by the seeded species crested wheatgrass (*Agropyron cristatum*). The mean sum of nested frequency of perennial grasses has remained high and relatively stable throughout the study years (Figure 7a). The mean cover of perennial grass species has varied little from 1997 to 2007, but was significantly higher in 2012 than in other sample years (Figure 7b). Excluding the Jericho BLM study, annual grass species including cheatgrass (*Bromus tectorum*) are rare within the low-level potential studies. The mean sum of nested frequency of annual grasses has varied significantly each sample year (Figure 7a). The mean cover of annual grasses decreased significantly in 2002, but increased slightly each subsequent sample year (Figure 7b). The weedy perennial species bulbous bluegrass is not present on the low-level potential studies.

The low potential median cumulative forb trend increased in 1989 and has since remained stable (Figure 9c). Perennial forb species are rare on most of the studies. The mean sum of nested frequency and cover of perennial forb species has remained low since 1997 (Figure 7a and Figure 7b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these low potential study areas. The mean abundance of deer pellet groups has been low over the duration of the studies, but abundance was substantially lower in 2012. The decrease in pellet abundance is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk and livestock sign has been low since 1997 (Figure 10c).

Deer Desirable Components Index (DCI): The low potential deer DCI has remained fair-good most sample years, but increased to good in 2012. The preferred browse cover and decadence scores increased in 2012, and are responsible for the increase in deer range ranking (Table 1 and Figure 11).

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	7.6	4.2	3.4	26.1	-2.9	6.8	0.0	**45.2**	Fair-Good
03	8.3	5.2	3.2	24.8	-0.1	4.1	0.0	**45.6**	Fair-Good
08	7.3	3.1	0.9	29.7	-0.5	3.4	0.0	**44.0**	Fair-Good
12	12.6	7.1	0.8	30.0	-0.6	3.2	0.0	**53.1**	Good

Table 1. Low potential scale mean deer DCI scores and rankings (n=3) by year for WMU 19B, West Desert, Vernon. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Discussion: The mean density of Wyoming big sagebrush has generally decreased over the duration of the sample years. However, mean cover of Wyoming big sagebrush has slightly increased over the same duration. Mean decadence of Wyoming big sagebrush has also generally increased. All sagebrush trends imply that on these low-level potential studies sagebrush populations are self-thinning and senescing, and at the same time individual plants within the populations are becoming larger.

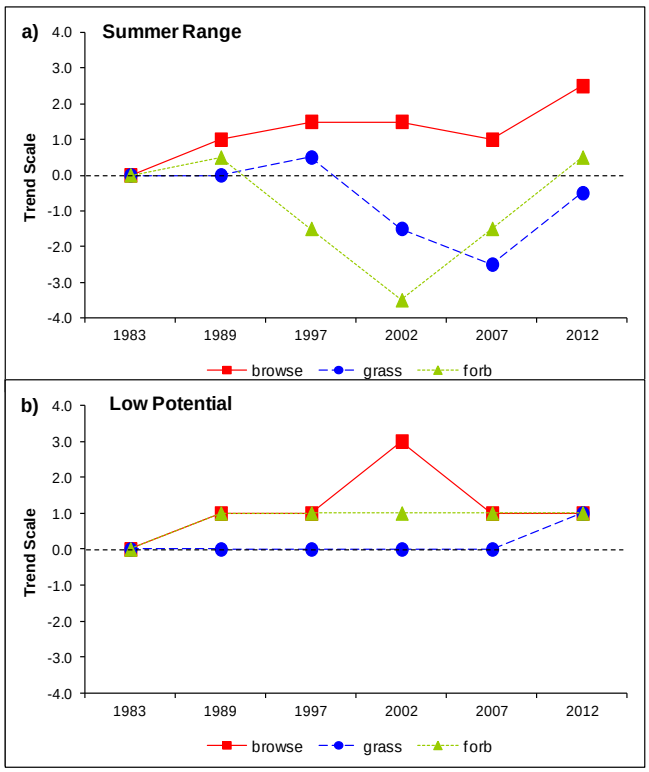


Figure 9. a) Deer summer range sites cumulative median browse, grass and forb trends by year for WMU 19B, West Desert, Vernon. **b)** Low potential sites cumulative median browse, grass, and forb trends by year for WMU 19B.

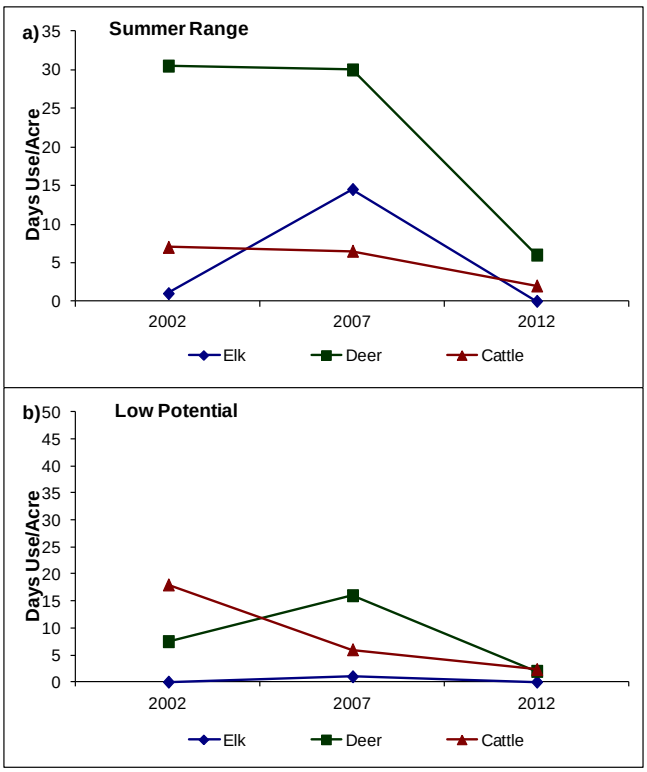


Figure 10. a) Deer summer range sites mean animals days use/acre (n=4) by year for WMU 19B, West Desert, Vernon. **b)** Low potential sites mean animal days use/acre (n=3) by year for WMU 19B.

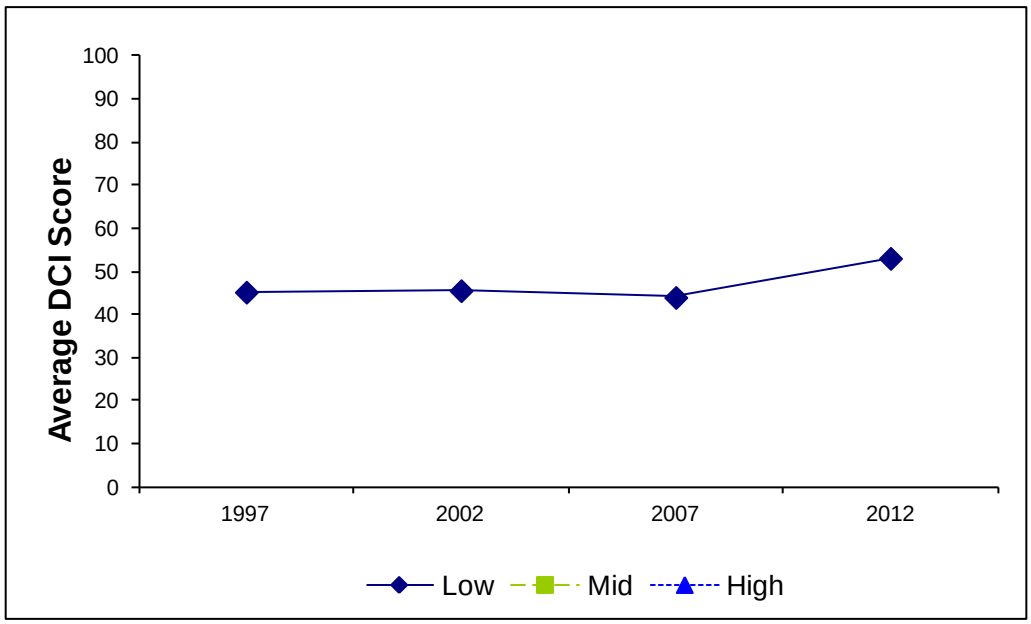
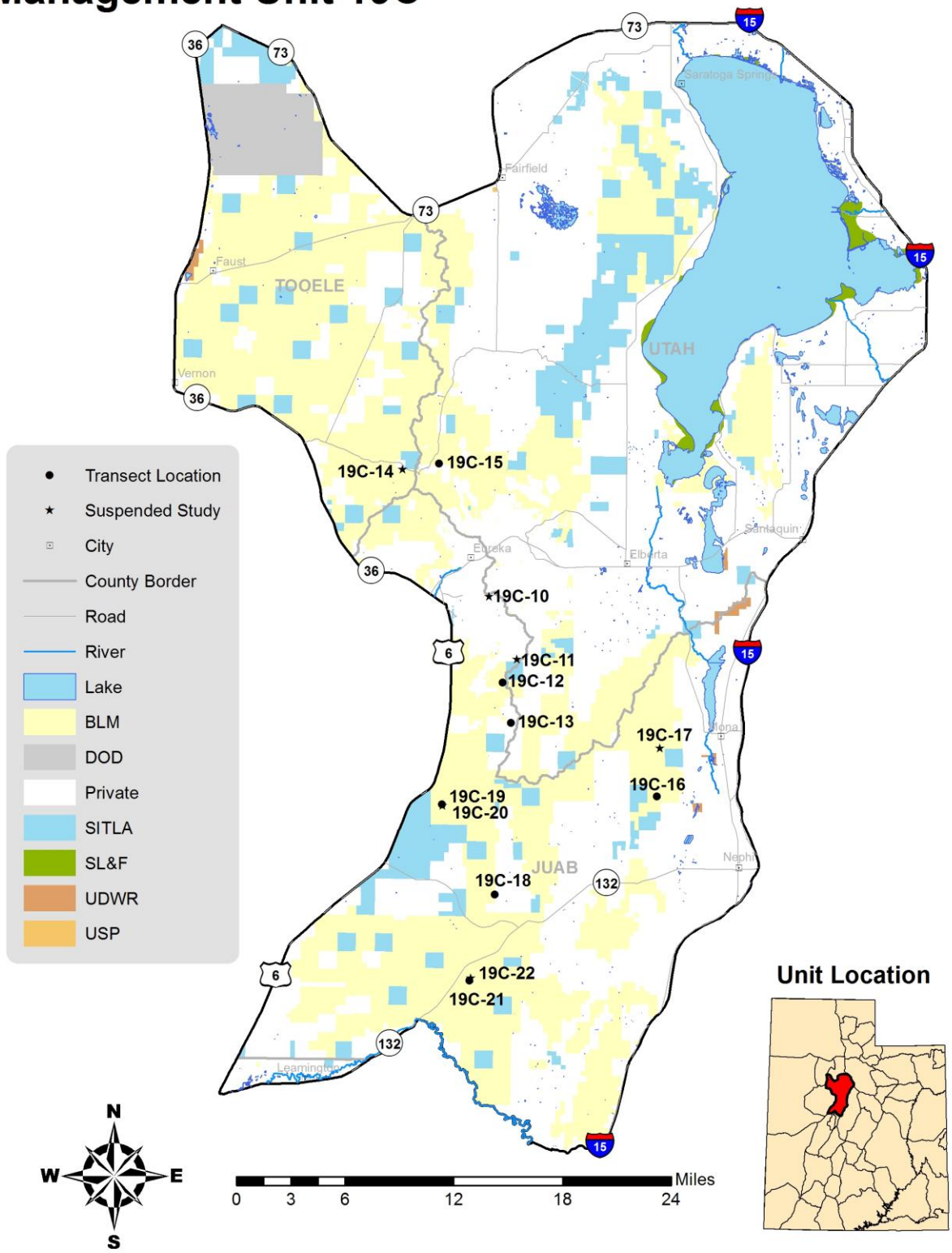


Figure 11. Mean mid-low (n=3) potential scale deer DCI scores by year for WMU 19B, West Desert, Vernon. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Management Unit 19C



MANAGEMENT SUBUNIT 19C - WEST DESERT, TINTIC

Subunit 19B Boundary Description

> **Tooele and Juab Counties** - Boundary begins at the junction of SR-36 and SR-73; east on SR-73 to I-15; south on I-15 to Mills Rd; west on Mills Rd to the Sevier River; northwest following the Sevier River to the SR 132; southwest on this road to Hwy 6; north on this road to SR-36 returning to the beginning point.

Management Unit Description

The 19C Tinitic Subunit encompasses the East Tintic and Lake Mountains. Trend studies are concentrated primarily in the East Tintic Mountains. Two other issues that affect big game in the subunit are the availability of summer range, and wildfires. Due to the relatively low elevation of these desert mountain ranges, there is a lack of quality summer range. Large wildfires burned large areas of this unit between 1996 and 2002. Much of the burned areas have been seeded in restoration projects. The success of these projects in restoring deer winter habitat is in question, as browse re-establishment has been limited. However, the projects have been successful in establishing stands of perennial grasses.

Range Trend Studies

Seven interagency range trend studies were established in Subunit 19C during the summer of 2012. A total of thirteen studies have been established within Subunit 19C since 1983. Nine studies were established in 1983: Sioux Pass (19C-10), Water Canyon (19C-11), Sunrise Canyon (19C-12), Dennis Spring (19C-13), Black Rock Canyon (19R-14), Nephi Dump (19C-16), Old Canyon (19C-17), Furner Valley (19C-18); two studies were established in 1997: Leamington Burn and Chain (19C-21) and Leamington Burn (19C-22); and two were establish in 1998: Paul Bunyon Burn and Chain (19C-20) and Paul Bunyon Burn (19C-19).

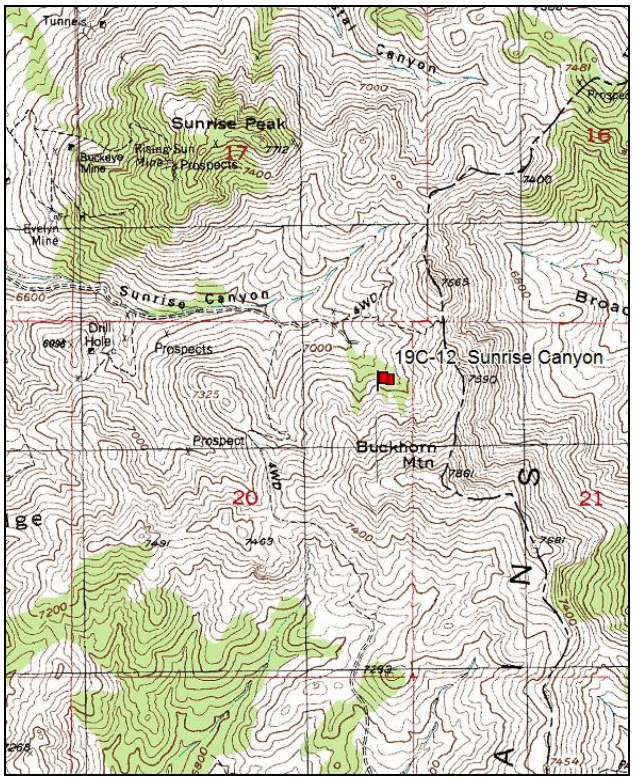
In 1997, one study (Old Canyon) was suspended. In 2002, two studies (Water Canyon and Black Rock Canyon) were suspended. In 2007, one study (Sioux Pass) was suspended. In 2012, two studies (Paul Bunyon Burn and Leamington Burn) were suspended. These studies were suspended for various reasons and if the 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.

SUNRISE CANYON - TREND STUDY NO. 19C-12-12

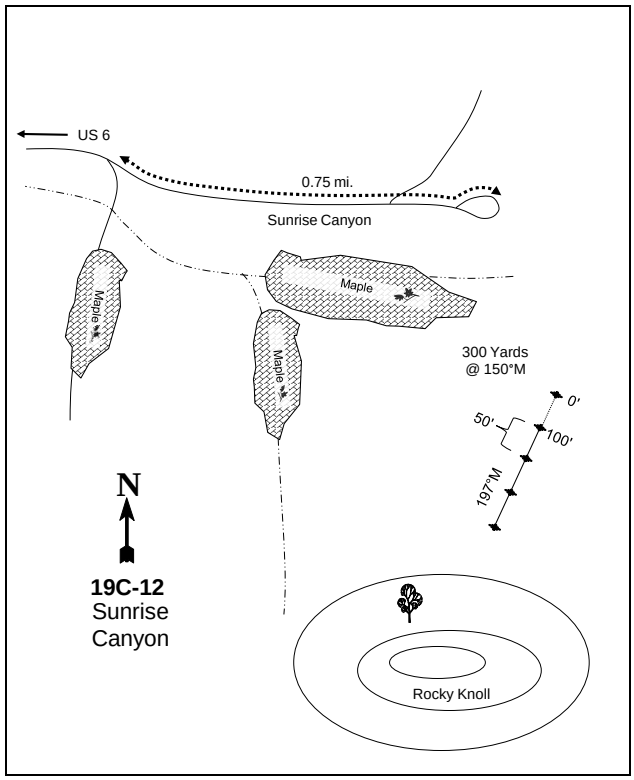
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter/Spring
NRCS Ecological Site Description: Mountain Shallow Loam (Low Sagebrush), R047XA442UT and Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: BLM
Elevation: 7,250 ft. (2,210 m)
Aspect: Northwest
Slope: 44%
Transect bearing: 197° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is on the 3ft mark on belt 3 and on 1ft mark on belt 5. No rebar on belt 4

Directions: From the junction of highway U.S. 6 and U-36, proceed south on U.S. 6 for 6.3 miles to where the Sunrise Seeding road leads off to the east at mile marker 132. Proceed east on this road for 0.7 miles to a fork. Keep left for an additional 0.9 miles to an intersection. Turn right (east) up Sunrise Canyon for 0.85 miles to another fork. Stay left and go 0.75 miles to the end of the road in the bottom of Sunrise Canyon. From this point, the 0-foot mark of the baseline is located on a small ridge at 171°M on the opposite side of a maple clogged draw. Walk on the designated azimuth through the draw to the sagebrush grass ridge. The 0-foot mark, marked by a green fencepost with a red browse tag number 437, is located approximately midway up the slope and in the middle of the ridge.

Map Name: Tintic Mountain



Diagrammatic Sketch:



Township: 11S Range: 2W Section: 20

GPS: NAD 83, UTM 12S 407278 E 4412453 N

SUNRISE CANYON - TREND STUDY NO. 19C-12

Site Information

Site Description: The study is located on deer summer range, and is typical of the higher ridges and slopes in this portion of the East Tintic Mountains. The area is administered by the Bureau of Land Management (BLM) as part of the Diamond Spring allotment. The area is occupied by a sagebrush-grass community. Escape cover is limited to narrow fingers of chokecherry (*Prunus virginiana*) and bigtooth maple (*Acer grandidentatum*) trees in the drainage bottoms. In 1983, numerous does with fawns, as well as a sage-grouse brood, were flushed from the draw immediately below the study. It was further noted that livestock grazing was especially intense in the draws, but much less on the slopes and ridges. In 1989, it was noted that the shrub interspaces were nearly devoid of cover after spring sheep use. A herd of sheep was grazing during the 2002 sampling, and bedding areas were noted in 2012. Numerous livestock and big game trails transect the site. Sheep pellet groups were sampled in high abundance on the site in 2002 and 2007, but in moderate abundance in 2012. In 2007, three deer were seen and a deer carcass was found near the study. Deer and elk pellet groups have been sampled in low abundance since 2002. A small amount of horse sign was sampled in 2007 (Table - Pellet Group Data).

Browse: The browse composition is diverse, but it is composed mostly of low-growing species due to the shallow, rocky soil. Low sagebrush *(Artemisia arbuscula*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provide the majority of the browse cover on the site. Both species provide about the same amount of cover (Table - Browse Trends). Low sagebrush has the highest density population of browse, with the majority of plants classified as mature. Recruitment of young low sagebrush plants has been poor over the course of the study. Decadence of low sagebrush has been low in most years, but was moderately high in 2007. Vigor of the low sagebrush population has been generally good. Utilization of low sagebrush has been mostly light to moderate, but was mostly heavy in 2012. The mountain big sagebrush stand is comprised of a moderately dense stand of mostly mature plants. Recruitment of young mountain big sagebrush plants has been generally good over the course of the study. Decadence and poor vigor of mountain big sagebrush has been moderately high throughout the majority of sample years, though both decreased to low levels in 2012. Utilization of mountain big sagebrush has been mostly light to moderate with some heavy use. It was noted that many of the sagebrush plants of both species were infested by ants in 2012. The study area supports smaller populations of other browse species, including serviceberry (*Amelanchier alnifolia*), true mountain mahogany (*Cercocarpus montanus*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), slenderbush eriogonum (*Eriogonum microthecum*), Oregon grape (*Mahonia repens*), pricklypear (*Opuntia* sp.), Myrtle pachistima (*Pachistima myrsinites*), snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: Perennial grass species are fairly diverse on the site, but are not overly abundant. Bluebunch wheatgrass (*Agropyron spicatum*), mutton bluegrass (*Poa fendleriana*), and Sandberg bluegrass (*P. secunda*) provide are the only common perennial grass species. Cheatgrass (*Bromus tectorum*) was present at a very low frequency in most sample years, but increased substantially in 2012. Cheatgrass still provides limited cover. Forb species are diverse and fairly abundant. The most common species are perennials, and include silvery lupine (*Lupinus argenteus*), sandwort (*Arenaria fendleri*), and Hood's phlox (*Phlox hoodii*). Common houndstongue (*Cynoglossum officinale*), a noxious weed, is present on the site too (Table - Herbaceous Trends).

Soil: The soil is classified in the Wallsburg series, which occur on mountain slopes. The soil is formed from colluvium and residuum derived from quartzite and igneous rocks, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a slightly acidic reaction (pH 6.1) (Table - Soil Analysis Data). Bare ground cover is moderate with a high amount of vegetation, litter, and rock providing protective ground cover (Table - Basic Cover). The slope is terraced by a network of livestock and game trails. The soil erosion condition has been classified as slight since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - slightly up (+1):** Low sagebrush density increased 20% from 7,066 plants/acre to 8,465 plants/acre. Decadence of low sagebrush increased from 0% to 10% of the population, and poor vigor increased from 0% to 60%. Mountain big sagebrush density increased 12% from 1,665 plants/acre to 1,865 plants/acre. Recruitment of young mountain big sagebrush plants decreased from 16% to 7% of the population. Decadence of mountain big sagebrush decreased slightly from 16% to 14%, and poor vigor increased from 0% to 46%.
- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence of low sagebrush increased slightly to 13%, but poor vigor decreased to 9% of the population. Decadence of mountain big sagebrush increased to 30%, but poor vigor decreased to 20% of the population.
- **1997 to 2002 - up (+2):** Low sagebrush density decreased slightly from 6,700 plants/acre to 6,440 plants/acre, and cover decreased from 14% to 13%. Decadence of low sagebrush increased slightly to 16%. Mountain big sagebrush density increased 76%, from 1,720 plants/acre to 3,020 plants/acre, and cover increased from 10% to 15%. Recruitment of young mountain big sagebrush increased from 7% to 15%. Decadence of mountain big sagebrush decreased slightly to 25%, and poor vigor decreased slightly to 17% of the population.
- **2002 to 2007 - down (-2):** Low sagebrush density decreased 44% to 3,580 plants/acre, and cover decreased to 7%. Decadence of low sagebrush increased to 31%, though poor vigor remained similar at 8%. Mountain big sagebrush density decreased 29% to 2,140 plants/acre, and cover decreased to 7%. Recruitment of young mountain big sagebrush plants remained good at 14%. Decadence of mountain big sagebrush decreased to 21%, and poor vigor remained similar at 18%.
- **2007 to 2012 - up (+2):** Density of low sagebrush increased 44% to 5,140 plants/acre, and cover increased to 11%. Recruitment of young low sagebrush plants increased from 2% to 17%. Decadence of low sagebrush decreased to 7%, but poor vigor increased to 18%. Density of mountain big sagebrush increased 79% to 3,820 plants/acre, and cover increased to 12%. Recruitment of young mountain big sagebrush increased to 20%. Decadence of mountain big sagebrush decreased to 7%, and poor vigor decreased to 3% of the population.

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1989 to 1997 - stable (0):** There was little change in the sum of nested frequency of perennial species.
- **1997 to 2002 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 19%, though cover increased slightly from 6% to 7%.
- **2002 to 2007 - down (-2):** The sum of nested frequency of perennial grasses decreased 23%, and cover decreased to 3%.
- **2007 to 2012 - up (+2):** The perennial grass sum of nested frequency increased 35%, and cover increased to 10%. However, cheatgrass increased significantly in nested frequency, and cover increased from near 0% to 2%.

Forb:

- **1983 to 1989 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 16%.
- **1989 to 1997 - stable (0):** The sum of nested frequency of perennial forbs remained similar.
- **1997 to 2002 - stable (0):** The sum of nested frequency of perennial forbs remained similar, but cover increased from 11% to 20%.
- **2002 to 2007 - down (-2):** The sum of nested frequency of perennial forbs decreased 50%, and cover decreased from 20% to 5%.
- **2007 to 2012 - up (+2):** The perennial forb sum of nested frequency increased 82%, and cover increased to 14%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19C, Study no: 12

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron spicatum	abc103	a64	bc138	bc116	ab93	c137	2.02	2.60	1.47	5.40
G	Bromus tectorum (a)	-	-	a15	a7	a5	b104	.04	.01	.01	1.82
G	Carex sp.	1	-	-	4	-	-	-	.06	-	-
G	Koeleria cristata	a3	a-	a-	a-	b19	a-	-	-	.09	-
G	Melica bulbosa	b29	a-	a-	a3	a-	a-	-	.15	-	-
G	Poa fendleriana	b237	b254	b157	b131	a67	a39	3.25	4.26	.93	1.66
G	Poa secunda	a7	a23	a29	a15	a23	b95	.20	.13	.16	2.42
G	Stipa columbiana	3	8	8	-	3	9	.44	-	.03	.07
G	Stipa lettermani	-	-	-	-	3	-	-	-	.03	-
Total for Annual Grasses		0	0	15	7	5	104	0.04	0.01	0.00	1.82
Total for Perennial Grasses		383	349	332	269	208	280	5.92	7.22	2.72	9.56
Total for Grasses		383	349	347	276	213	384	5.97	7.23	2.73	11.38
F	Alyssum alyssoides (a)	-	-	-	-	-	1	-	-	-	.00
F	Antennaria rosea	-	-	10	3	1	3	.04	.03	.00	.00
F	Arabis sp.	b13	ab9	ab3	a-	a-	a1	.01	-	-	.01
F	Arenaria fendleri	c174	c153	b91	ab67	a33	a33	1.93	1.70	.30	.44
F	Astragalus sp.	-	11	3	4	-	2	.01	.03	-	.01
F	Calochortus nuttallii	b6	a-	a-	a-	a-	ab2	-	-	-	.00
F	Castilleja chromosa	4	-	-	-	-	4	-	-	-	.01
F	Chaenactis douglasii	2	2	-	-	-	-	-	-	-	-
F	Chenopodium album (a)	-	-	-	-	9	3	-	-	.04	.00
F	Chenopodium leptophyllum(a)	-	-	-	-	8	9	-	-	.04	.07
F	Chenopodium sp. (a)	-	-	1	-	-	-	.00	-	-	-
F	Cirsium sp.	-	-	-	-	-	1	-	-	-	.03
F	Collinsia parviflora (a)	-	-	27	20	12	14	.06	.08	.04	.03
F	Collomia linearis (a)	-	-	a2	a2	a3	b12	.00	.00	.00	.04
F	Comandra pallida	-	-	-	3	-	3	-	.00	-	.01
F	Cynoglossum officinale	a1	a-	b37	b34	a-	a4	1.76	.23	-	.04
F	Epilobium brachycarpum (a)	-	-	a-	b21	a2	ab14	-	.04	.03	.05
F	Erigeron sp.	a12	b28	a-	a3	a-	a-	-	.01	-	-
F	Eriogonum racemosum	-	-	-	-	1	1	-	-	.00	.00
F	Eriogonum umbellatum	1	4	-	-	-	-	-	-	-	-
F	Galium sp.	a-	a-	a-	ab3	a-	b12	-	.00	-	.07
F	Heuchera parvifolia	3	-	-	-	-	-	-	-	-	-
F	Lactuca serriola (a)	a-	a-	ab7	a-	a2	b18	.02	-	.01	.11
F	Lithospermum ruderale	3	5	1	-	-	-	.00	-	-	-
F	Lomatium sp.	-	2	-	-	-	-	-	-	-	-
F	Lupinus argenteus	a55	ab84	cd120	de154	bc105	e160	6.30	16.26	4.03	11.37
F	Machaeranthera canescens	7	7	3	3	1	-	.00	.01	.00	-
F	Orobanche sp.	-	-	-	-	-	1	-	-	-	.00
F	Petradoria pumila	b25	a4	a-	a-	a-	a-	-	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Phlox hoodii	$_{c}$91	$_{a}$16	$_{b}$47	$_{b}$55	$_{a}$19	$_{bc}$73	.82	1.17	.16	2.01
F	Phlox longifolia	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$4	$_{ab}$6	$_{b}$11	-	.01	.01	.07
F	Polygonum douglasii (a)	-	-	$_{b}$21	$_{a}$4	$_{ab}$9	$_{ab}$17	.07	.01	.04	.03
F	Senecio integerrimus	$_{a}$-	$_{b}$11	$_{a}$-	$_{ab}$5	$_{ab}$3	$_{ab}$2	-	.04	.04	.00
F	Senecio multilobatus	-	-	2	-	6	1	.00	-	.03	.00
F	Taraxacum officinale	-	-	-	3	-	4	-	.01	-	.00
F	Unknown forb-perennial	$_{b}$10	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$-	$_{a}$-	-	.24	-	-
F	Zigadenus paniculatus	3	8	5	-	-	-	.01	-	-	-
Total for Annual Forbs		0	0	58	47	45	88	0.17	0.14	0.21	0.35
Total for Perennial Forbs		410	344	322	351	175	318	10.91	19.78	4.60	14.13
Total for Forbs		410	344	380	398	220	406	11.08	19.93	4.82	14.49

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

BROWSE TRENDS--
Management unit 19C, Study no: 12

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Acer grandidentatum	1	4	3	3	-	.21	.01	.38
B	Amelanchier alnifolia	1	0	1	0	-	-	-	-
B	Artemisia arbuscula	61	57	44	50	14.27	12.99	7.06	11.30
B	Artemisia tridentata vaseyana	48	53	56	60	10.08	15.05	7.37	11.73
	Cercocarpus montanus	1	0	0	0	-	-	-	-
B	Chrysothamnus nauseosus albicaulis	1	2	1	3	-	-	.15	.15
B	Chrysothamnus viscidiflorus viscidiflorus	36	38	38	36	1.12	2.57	1.61	2.83
	Eriogonum microthecum	27	21	19	16	-	-	-	-
B	Ephedra nevadensis	0	0	0	0	-	-	.38	-
B	Eriogonum microthecum	27	21	19	16	.49	.47	.40	.52
B	Mahonia repens	8	8	10	9	.48	.73	.26	1.02
B	Opuntia sp.	2	4	3	1	.63	.63	.15	.15
B	Pachistima myrsinites	1	0	12	0	-	-	1.29	-
B	Symphoricarpos oreophilus	10	9	6	7	.06	.52	.48	.62
B	Tetradymia canescens	2	2	1	6	.03	.15	.03	.38
Total for Browse		226	219	213	207	27.18	33.35	19.22	29.11

CANOPY COVER, LINE INTERCEPT--
Management unit 19C, Study no: 12

Species	Percent Cover		
	'02	'07	'12
Acer grandidentatum	-	.06	.23
Artemisia arbuscula	21.98	11.06	10.98
Artemisia tridentata vaseyana	21.38	12.81	11.86
Chrysothamnus nauseosus albicaulis	.70	.43	.58
Chrysothamnus viscidiflorus viscidiflorus	3.53	1.85	3.01
Eriogonum microthecum	.01	.18	.48
Mahonia repens	1.96	.35	.71
Opuntia sp.	.61	-	.11
Pachistima myrsinites	-	2.33	-
Symphoricarpos oreophilus	.36	.01	.61
Tetradymia canescens	-	-	.03

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19C, Study no: 12

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia arbuscula	-	1.1	1.1
Artemisia tridentata vaseyana	0.7	1.4	1.6

BASIC COVER--
Management unit 19C, Study no: 12

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	2.75	9.25	39.82	52.60	29.46	48.43
Rock	28.50	24.75	20.16	21.08	21.32	23.82
Pavement	4.75	7.25	7.75	7.15	7.24	2.74
Litter	48.00	40.50	39.36	24.07	35.20	39.25
Cryptogams	0	0	.16	.18	.01	.06
Bare Ground	16.00	18.25	13.54	14.30	15.21	15.39

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 12, Sunrise Canyon

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
7.5	6.1	54.4	23.1	22.6	4.7	23.1	358.4	0.6

PELLET GROUP DATA--
Management unit 19C, Study no: 12

Type	Quadrat Frequency			
	'97	'02	'07	'12
Sheep	6	13	13	8
Horse	-	-	-	-
Rabbit	-	-	-	1
Elk	-	-	7	3
Deer	10	4	2	2

Days use per acre (ha)		
'02	'07	'12
41 (102)	71 (175)	32 (78)
-	5 (12)	-
-	-	-
-	6 (15)	2 (5)
7 (17)	6 (15)	11 (28)

BROWSE CHARACTERISTICS--
Management unit 19C, 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)
Acer grandidentatum									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**20**	100	0	-	-	0	0	0	-/-
02	**120**	83	17	-	20	0	0	0	-/-
07	**140**	14	86	-	-	86	0	14	20/17
12	**80**	50	50	-	-	25	0	0	13/16
Amelanchier alnifolia									
83	**66**	100	0	-	-	0	0	0	-/-
89	**66**	100	0	-	-	0	0	0	-/-
97	**20**	0	100	-	-	0	0	0	25/11
02	**0**	0	0	-	-	0	0	0	-/-
07	**20**	100	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/13
Artemisia arbuscula									
83	**7066**	0	100	0	-	0	0	0	10/18
89	**8465**	9	81	10	333	50	0	60	15/21
97	**6700**	5	82	13	200	20	1	9	12/22
02	**6440**	3	81	16	40	4	9	8	11/22
07	**3580**	2	67	31	280	45	13	8	10/21
12	**5140**	17	76	7	120	28	54	18	9/22
Artemisia tridentata vaseyana									
83	**1665**	16	68	16	-	4	0	0	24/34
89	**1865**	7	79	14	66	32	4	46	22/32
97	**1720**	7	63	30	220	8	5	20	26/38
02	**3020**	15	60	25	120	5	13	17	26/39
07	**2140**	14	64	21	860	46	9	18	25/40
12	**3820**	20	72	7	120	26	7	3	20/30

		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									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**20**	100	0	-	-	0	0	0	14/2
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	79/87
12	**0**	0	0	-	-	0	0	0	21/23
Chrysothamnus nauseosus albicaulis									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**20**	0	100	0	-	0	0	0	38/26
02	**60**	0	100	0	-	0	0	0	21/20
07	**20**	0	0	100	-	0	0	100	56/62
12	**60**	0	67	33	-	0	33	0	18/19
Chrysothamnus viscidiflorus viscidiflorus									
83	**1333**	0	100	0	-	0	0	0	11/9
89	**1532**	48	52	0	-	4	0	9	5/7
97	**2900**	16	83	1	-	10	3	0	11/11
02	**2040**	2	95	3	20	7	0	.98	11/15
07	**1620**	9	91	0	20	48	12	0	12/14
12	**1440**	4	93	3	20	1	0	1	11/14
Eriogonum microthecum									
83	**2066**	0	100	0	-	0	0	0	9/8
89	**1865**	46	54	0	66	4	0	0	7/5
97	**1020**	10	90	0	40	2	0	0	5/7
02	**460**	13	87	0	-	4	13	0	4/8
07	**500**	20	76	4	40	20	8	0	6/9
12	**480**	4	96	0	-	8	0	0	5/7
Mahonia repens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**660**	9	91	-	-	0	0	0	5/7
02	**780**	0	100	-	-	0	0	0	5/8
07	**1720**	15	85	-	20	0	0	1	4/5
12	**1220**	2	98	-	-	7	0	0	7/7
Opuntia sp.									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**60**	67	33	0	-	0	0	0	9/52
02	**680**	0	100	0	-	0	0	0	6/13
07	**100**	20	60	20	-	0	0	20	7/11
12	**20**	0	100	0	-	0	0	0	6/16

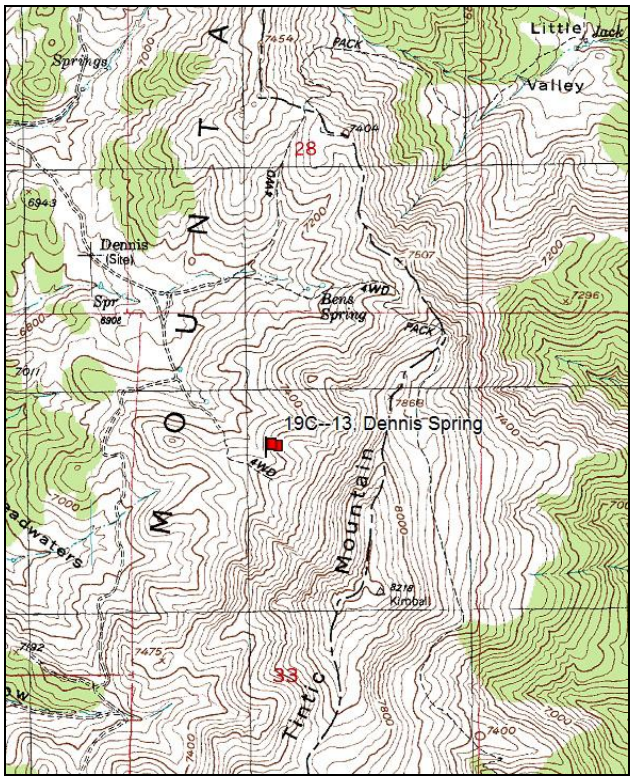
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Pachistima myrsinites									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**20**	0	100	0	-	0	0	0	-/-
02	**0**	0	0	0	-	0	0	0	-/-
07	**680**	0	82	18	140	18	0	15	7/22
12	**0**	0	0	0	-	0	0	0	-/-
Symphoricarpos oreophilus									
83	**199**	100	0	0	-	33	33	0	-/-
89	**66**	0	100	0	-	0	0	0	6/2
97	**280**	0	100	0	40	7	7	7	9/11
02	**200**	20	70	10	40	0	0	10	18/26
07	**140**	14	86	0	-	14	14	29	13/36
12	**360**	33	67	0	-	11	0	0	8/11
Tetradymia canescens									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**60**	0	100	0	-	0	0	0	9/9
02	**60**	0	67	33	-	0	0	33	10/11
07	**60**	0	0	100	20	0	0	0	14/10
12	**180**	0	100	0	-	0	0	0	12/14

DENNIS SPRING - TREND STUDY NO. 19C-13-12

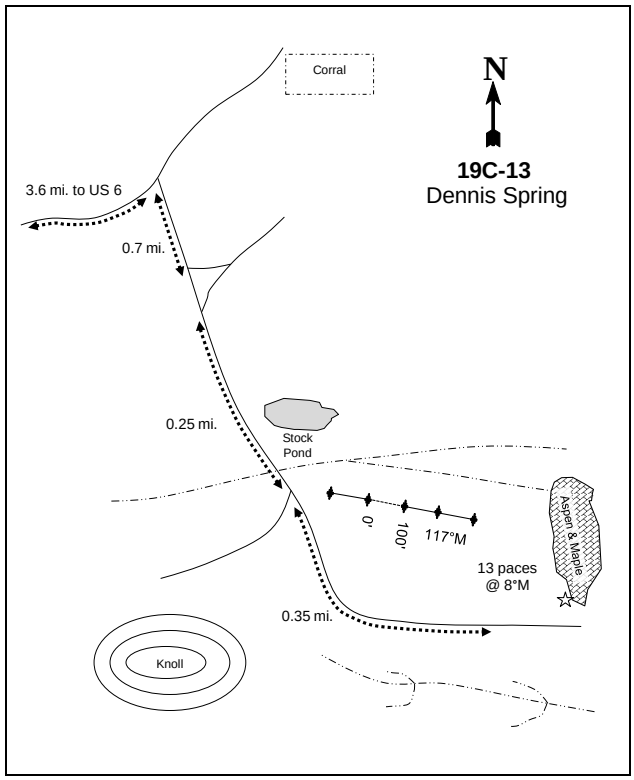
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Spring/Fall
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: Private
Elevation: 7,390 ft. (2,252 m)
Aspect: Northwest
Slope: 25%
Transect bearing: 117° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)
Note: Rebar is on the 1ft mark on belt 2 and belt 5

Directions: From mile marker 130 on Highway U.S. 6, proceed east for 1.6 miles to a fork and go left. Proceed 2 miles on the "Dennis Road" up Copperpolis Creek to a fork. Turn right (to the southeast) and travel uphill for 0.7 miles to another fork. Turn right again for 0.25 miles to where there is a fork turning off sharply to the right and a stock pond on the left. Continue straight ahead (on the left fork) for an additional 0.35 miles to where the road ends on top of a small ridge. At the point, there will be an aspen-maple stand to your immediate left-front at the head of a small drainage. Just behind you, there should be a knoll. From the front-rightmost maple tree of the clump to your front, walk 13 paces at 8°M to the 300-foot stake. The 0-foot stake is marked with a red browse tag number 3945, is located in the approximate middle of a triangle formed by three boulders. All plot markers consists of consists of steel fenceposts 15" to 20" in height.

Map Name: Tintic Mountain



Diagrammatic Sketch:



Township: 11S Range: 2W Section: 33

GPS: NAD 83, UTM 12S 408019 E 4408894 N

DENNIS SPRING - TREND STUDY NO. 19C-13

Site Information

Site Description: The study samples deer summer range near the bottom of a swale, approximately one-quarter mile from Dennis Spring on land administered by the Bureau of Land Management (BLM) as part of the Diamond Spring allotment. The plant community is dominated by a moderately tall mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) population interspersed with lower growing shrubs. Except for a few isolated aspen (*Populus tremuloides*) clones and patches of bigtooth maple (*Acer grandidentatum*), the area is devoid of tree cover. A wildfire burned through the area in 2001, greatly reducing the browse component. No information was available for the wildfire. Mountain big sagebrush has reestablished well since the fire. Deer and elk pellet groups have been sampled in low abundance since 2002. Sheep pellet groups have been sampled in low to moderate abundance since 2002 (Table - Pellet Group Data). Mormon crickets (*Anabrus simplex*) were also abundant in 2002 and appeared to have utilized many of the herbaceous plants.

Browse: Mountain big sagebrush is the preferred browse species and provides nearly all of the browse cover on the site (Table - Browse Trends). The mountain big sagebrush stand is a dense population of mostly mature plants. The fire removed most of the mature plants from the site, but recruitment of young sagebrush plants was high following the fire and sagebrush began to reestablish quickly. Density of sagebrush has steadily increased since the fire, and was higher in 2012 than any prior sample years. The sagebrush population is healthy with low decadence and good vigor. Utilization of sagebrush has been mostly light throughout the course of the study. Other browse species sampled on the site include stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), snowberry (*Symphoricarpos oreophilus*), Oregon grape (*Mahonia repens*), Myrtle pachistima (*Pachistima myrsinites*), Woods rose (*Rosa woodsii*), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses on the site are diverse, but have not been particularly abundant throughout the study years. Common perennial species include subalpine needlegrass (*Stipa columbiana*), bottlebrush squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), slender wheatgrass (*A. trachycaulum*), and crested wheatgrass (*A. cristatum*). Cheatgrass (*Bromus tectorum*) has been common on the site, but has fluctuated in frequency and cover. Forb species are diverse, but have only been moderately abundant since the fire. The most abundant perennial species include silvery lupine (*Lupinus argenteus*), ballhead waterleaf (*Hydrophyllum capitatum*), and longleaf phlox (*Phlox longifolia*). Common houndstongue (*Cynoglossum officinale*), a noxious weed, has been sampled in many of the study years in low frequency and cover. Annual forb species are common and have provided a large portion of the forb cover at times (Table - Herbaceous Trends).

Soil: The soil is classified as a Wallsburg-Yeates Hollow complex, likely as part of the Wallsburg component, which occurs on mountain slopes. These soils are formed from alluvium derived from limestone, sandstone, or quartzite, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a moderately acidic soil reaction (pH 5.9) (Table - Soil Analysis Data). Bare ground cover is moderate, though with a high amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2002 and 2012, but moderate in 2007.

Trend Assessments

Browse:

- **1983 to 1989 - up (+2):** Sagebrush density increased from 1,199 plants/acre to 8,532 plants/acre. Much of the increase was due to an increase in recruitment of young sagebrush plants from 6% to 61% of the population. Decadence of sagebrush decreased from 17% to 1% of the population.

- **1989 to 1997 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Recruitment of young sagebrush plants decreased to just 1% of the population. Decadence of sagebrush increased to 11%, and poor vigor increased from 0% to 8%.
- **1997 to 2002 - slightly down (-1):** Sagebrush density increased 45% following the fire from 4,920 plants/acre to 7,120 plants/acre, but cover decreased from 32% to 1%. The population has been converted from a mature, dense-canopied population to one with an open canopy composed completely of young, vigorous plants. The density of young sagebrush plants is high, so the sagebrush component should reestablish quickly.
- **2002 to 2007 - up (+2):** Sagebrush density increased 21% to 8,580 plants/acre, and cover increased to 19%. Recruitment remained very high at 55% of the population.
- **2007 to 2012 - up (+2):** The density of sagebrush increased 40% to 12,020 plants/acre, and cover increased to 36%. Recruitment of young sagebrush plants decreased to 9% of the population.

Grass:

- **1983 to 1989 - up (+2):** The sum of nested frequency of perennial grasses increased 22%.
- **1989 to 1997 - up (+2):** The sum of nested frequency of perennial grasses increased 38%.
- **1997 to 2002 - down (-2):** The sum of nested frequency of perennial grasses decreased 45%, but cover increased from 3% to 4%. Cheatgrass increased significantly in nested frequency, but cover remained less than 1%.
- **2002 to 2007 - up (+2):** The sum of nested frequency of perennial grasses increased 67%, but cover remained similar at 4%. Cheatgrass nested frequency remained similar, but cover increased from 1% to 4%.
- **2007 to 2012 - up (+2):** The sum of nested frequency of perennial grasses increased 49%, and cover increased to 14%. Cheatgrass decreased significantly in nested frequency, and cover decreased to near 0%.

Forb:

- **1983 to 1989 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1989 to 1997 - down (-2):** The sum of nested frequency of perennial forbs decreased 20%.
- **1997 to 2002 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 19%, and cover decreased slightly from 10% to 9%.
- **2002 to 2007 - down (-2):** The sum of nested frequency of perennial forbs decreased 50%, and cover decreased to 2%.
- **2007 to 2012 - up (+2):** The sum of nested frequency of perennial forbs increased 81%, and cover increased to 4%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19C, Study no: 13

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	a-	a-	a4	a1	ab16	b33	.00	.15	.21	.91
G	Agropyron spicatum	bc72	c80	ab47	a31	ab39	abc69	.32	.54	1.07	3.25
G	Agropyron trachycaulum	a-	a-	a-	ab8	b12	ab8	-	.21	.28	.33
G	Bromus inermis	-	-	a3	a2	b15	b20	.00	.15	.14	.95
G	Bromus japonicus (a)	-	-	-	-	-	-	.00	-	-	-
G	Bromus tectorum (a)	-	-	a26	b129	b148	a28	.41	.71	3.86	.09
G	Oryzopsis hymenoides	-	-	-	-	1	1	-	-	.03	.03

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Poa fendleriana	a-	ab3	b9	b8	b9	ab5	.21	.27	.19	.06
G	Poa secunda	b45	b32	a6	a1	a-	a7	.04	.00	-	.19
G	Sitanion hystrix	a12	ab23	bc43	a3	c50	abc37	.59	.20	.77	2.36
G	Stipa columbiana	a-	b19	d105	cd64	bc33	d105	1.50	2.38	.52	5.11
G	Stipa comata	a-	a-	a-	a-	b19	a5	-	-	.45	.18
G	Stipa lettermani	-	-	-	2	6	7	-	.01	.04	.53
Total for Annual Grasses		0	0	26	129	148	28	0.42	0.70	3.86	0.09
Total for Perennial Grasses		129	157	217	120	200	297	2.69	3.94	3.71	13.92
Total for Grasses		129	157	243	249	348	325	3.11	4.65	7.57	14.01
F	Agoseris glauca	a5	a-	a2	a3	a4	b16	.00	.04	.01	.09
F	Arabis sp.	ab7	b9	a-	a-	a-	a-	-	-	-	-
F	Arenaria fendleri	2	1	-	-	-	1	-	-	-	.03
F	Artemisia ludoviciana	-	-	-	-	1	3	-	-	.03	.15
F	Aster sp.	a2	b33	a-	a1	a1	a-	-	.00	.00	-
F	Astragalus convallarius	b18	ab7	a3	ab12	ab6	ab5	.01	.31	.04	.09
F	Astragalus sp.	-	-	3	-	-	-	.00	-	-	-
F	Calochortus nuttallii	1	-	1	1	-	2	.00	.00	-	.00
F	Chenopodium album (a)	-	-	b83	c142	a6	a2	.40	1.41	.02	.01
F	Chenopodium leptophyllum(a)	-	-	-	-	6	-	-	-	.01	-
F	Cirsium sp.	3	3	2	2	-	-	.00	.03	-	-
F	Collinsia parviflora (a)	-	-	b190	a19	a41	a48	1.08	.06	.14	.09
F	Collomia linearis (a)	-	-	5	-	1	-	.01	-	.00	-
F	Comandra pallida	-	2	2	-	-	1	.00	-	-	.00
F	Crepis acuminata	b23	c142	b33	a-	a1	ab15	.25	.00	.03	.13
F	Cymopterus sp.	-	-	2	-	-	-	.00	-	-	-
F	Cynoglossum officinale	b34	b32	b39	a10	a-	a2	.76	.19	-	.03
F	Epilobium brachycarpum (a)	-	-	-	3	-	7	-	.00	-	.02
F	Erigeron sp.	-	-	3	3	-	-	.03	.00	-	-
F	Eriogonum racemosum	b14	ab10	a-	ab2	a-	b14	-	.00	-	.05
F	Gayophytum ramosissimum(a)	-	-	a-	b28	a7	a3	-	.25	.01	.00
F	Geranium sp.	3	3	-	-	-	-	-	-	-	-
F	Hackelia patens	7	-	-	-	-	3	-	-	-	.06
F	Hydrophyllum capitatum	a-	a-	a-	c62	b38	b18	-	3.67	1.18	.37
F	Lactuca serriola (a)	a-	a-	a4	b122	a-	a2	.01	1.11	-	.01
F	Lathyrus brachycalyx	ab18	ab15	b18	ab17	a2	ab5	.25	.46	.15	.06
F	Lupinus argenteus	d208	c147	c140	b47	a8	a10	7.32	1.29	.11	.15
F	Machaeranthera canescens	-	2	2	-	9	3	.00	-	.04	.00
F	Mertensia sp.	-	-	-	-	3	1	-	-	.00	.00
F	Microsteris gracilis (a)	-	-	32	14	20	30	.09	.22	.04	.07
F	Orobanche sp.	-	-	-	-	-	2	-	-	-	.15
F	Penstemon sp.	-	-	-	3	3	3	-	.01	.03	.03
F	Phlox longifolia	a79	ab96	a76	b133	a81	b145	.22	2.54	.47	2.00
F	Polygonum douglasii (a)	-	-	a20	b83	b100	a47	.06	.81	.36	.18
F	Senecio integerrimus	a-	a-	a-	b29	a15	a8	-	.32	.08	.19

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Senecio multilobatus	a-	a-	b44	a-	a1	a-	.45	-	.00	-
F	Solidago sp.	b56	a-	a-	a-	a-	a-	-	-	-	-
F	Streptanthus cordatus	-	-	5	-	-	-	.03	-	-	-
F	Taraxacum officinale	ab3	ab6	b15	ab2	a-	a-	.05	.03	-	-
F	Trifolium sp.	ab14	bc23	c37	abc22	a3	abc20	.10	.22	.01	.13
F	Veronica biloba (a)	-	-	a-	a-	a-	b14	-	-	-	.24
F	Viguiera multiflora	-	-	1	-	-	12	.00	-	-	.07
F	Viola sp.	a-	a1	a-	a-	a-	b29	-	-	-	.17
Total for Annual Forbs		0	0	334	411	181	153	1.66	3.87	0.60	0.63
Total for Perennial Forbs		497	532	428	349	176	318	9.55	9.17	2.21	3.99
Total for Forbs		497	532	762	760	357	471	11.21	13.05	2.80	4.63

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

BROWSE TRENDS--
Management unit 19C, Study no: 13

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
	Acer grandidentatum	1	0	0	0	-	-	-	-
B	Amelanchier alnifolia	2	0	0	1	-	-	-	.03
B	Artemisia tridentata vaseyana	91	70	74	99	32.23	1.43	18.88	36.22
B	Chrysothamnus nauseosus albicaulis	7	1	0	0	.69	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	80	83	60	66	2.67	2.71	3.35	2.76
B	Juniperus osteosperma	2	0	0	0	1.12	-	-	-
B	Mahonia repens	29	28	26	30	1.33	.86	1.43	2.54
B	Pachistima myrsinites	0	0	3	2	-	.03	.15	.38
B	Purshia tridentata	0	0	0	0	.03	-	-	-
B	Rosa woodsii	5	8	6	7	.06	.09	.33	.06
B	Symphoricarpos oreophilus	55	29	17	22	2.23	.43	1.24	2.25
B	Tetradymia canescens	6	11	6	4	.21	.53	.18	-
Total for Browse		278	230	192	231	40.60	6.10	25.57	44.26

CANOPY COVER, LINE INTERCEPT--
Management unit 19C, Study no: 13

Species	Percent Cover		
	'02	'07	'12
Artemisia tridentata vaseyana	1.41	35.98	46.79
Chrysothamnus viscidiflorus viscidiflorus	2.46	5.25	2.09
Mahonia repens	.53	2.58	2.51
Pachistima myrsinites	-	.08	-
Rosa woodsii	.03	.11	.21
Symphoricarpos oreophilus	1.13	1.61	2.23
Tetradymia canescens	.20	.33	.31

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19C, Study no: 13

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	-	1.8	2.0

BASIC COVER--
Management unit 19C, Study no: 13

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	1.00	10.75	47.86	28.06	37.88	55.02
Rock	6.00	7.25	3.45	6.38	4.74	6.50
Pavement	.50	0	1.26	3.86	2.77	.95
Litter	68.50	57.50	54.12	22.89	28.39	52.94
Cryptogams	0	0	.04	.85	0	0
Bare Ground	24.00	24.50	17.09	50.06	22.95	22.64

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 13, Dennis Spring

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.5	5.9	48.4	27.1	24.6	5.2	52.0	553.6	0.5

PELLET GROUP DATA--
Management unit 19C, Study no: 13

Type	Quadrat Frequency				Days use per acre (ha)		
	'97	'02	'07	'12	'02	'07	'12
Sheep	8	6	8	2	13 (33)	20 (50)	9 (22)
Rabbit	3	1	1	-	-	-	-
Horse	-	-	1	-	-	-	-
Elk	4	-	8	-	-	7 (17)	-
Deer	14	4	4	1	7 (18)	1 (3)	2 (5)
Cattle	1	-	-	1	-	-	-

BROWSE CHARACTERISTICS--
Management unit 19C, Study no: 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)
Acer grandidentatum									
83	**0**	0	0	-	-	0	0	0	-/-
89	**199**	100	0	-	-	0	0	0	-/-
97	**20**	100	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Amelanchier alnifolia									
83	**0**	0	0	0	-	0	0	0	-/-
89	**66**	0	0	100	-	0	100	0	-/-
97	**40**	100	0	0	-	0	0	0	-/-
02	**0**	0	0	0	-	0	0	0	-/-
07	**0**	0	0	0	-	0	0	0	-/-
12	**20**	0	100	0	-	0	0	0	9/13
Artemisia tridentata vaseyana									
83	**1198**	6	78	17	-	28	0	0	32/29
89	**8531**	61	38	1	1533	0	0	0	17/20
97	**4920**	1	88	11	40	.81	0	8	34/36
02	**7120**	100	0	0	1020	0	0	0	8/11
07	**8580**	55	45	0	24400	1	0	.23	26/34
12	**12020**	9	91	0	-	.83	0	0	26/31
Chrysothamnus nauseosus albicaulis									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**200**	10	50	40	-	70	0	30	44/38
02	**20**	100	0	0	-	0	100	0	-/-
07	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	36/28
Chrysothamnus viscidiflorus viscidiflorus									
83	**15265**	12	88	0	-	0	0	0	15/13
89	**9531**	17	27	57	133	31	45	.69	12/8
97	**5560**	15	85	1	100	12	1	.71	10/10
02	**4700**	20	79	0	-	6	.85	.42	8/10
07	**2500**	11	80	9	500	26	3	10	14/19
12	**3100**	3	97	1	80	0	0	0	10/12

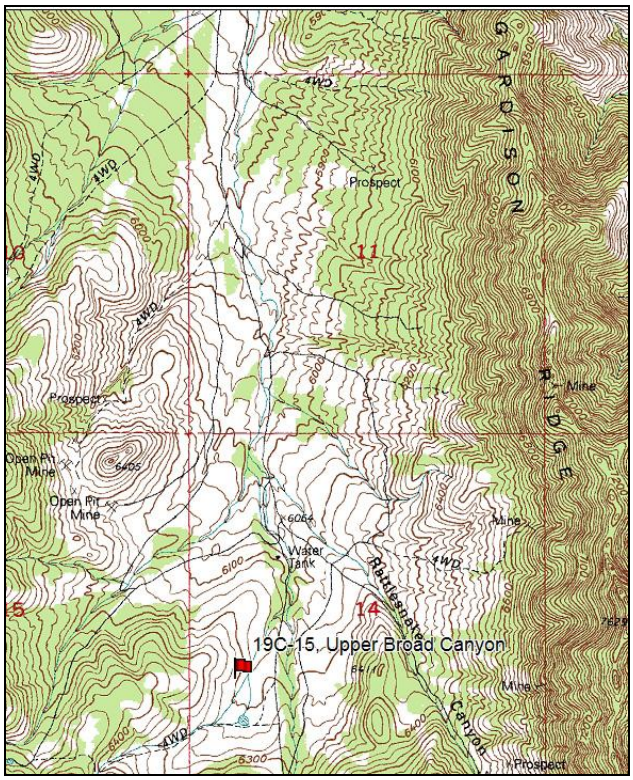
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Juniperus osteosperma									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**40**	100	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Mahonia repens									
83	**333**	0	100	0	-	0	0	0	4/6
89	**532**	75	25	0	-	25	0	0	5/3
97	**4540**	7	93	0	20	0	0	0	4/5
02	**6340**	0	98	1	-	0	0	5	3/5
07	**7880**	0	100	0	-	0	0	0	5/7
12	**6320**	0	100	0	-	0	0	0	5/5
Pachistima myrsinites									
83	**133**	100	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**60**	33	67	-	-	33	0	33	5/9
12	**40**	0	100	-	-	0	0	0	7/14
Rosa woodsii									
83	**533**	0	100	0	-	0	0	0	12/3
89	**399**	67	0	33	-	17	17	0	-/-
97	**180**	78	22	0	20	0	0	0	-/-
02	**260**	100	0	0	-	0	0	8	-/-
07	**220**	27	73	0	-	9	0	0	12/16
12	**480**	83	17	0	-	0	0	0	7/9
Symphoricarpos oreophilus									
83	**799**	8	92	0	-	25	17	8	23/21
89	**1265**	11	5	84	-	16	84	0	17/14
97	**2540**	13	87	1	20	5	.78	.78	12/20
02	**1160**	69	31	0	20	2	2	0	11/24
07	**400**	10	90	0	-	25	0	10	13/27
12	**700**	6	94	0	-	0	0	0	8/16
Tetradymia canescens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**220**	18	82	-	-	0	0	0	15/16
02	**400**	25	75	-	-	0	0	0	9/14
07	**240**	33	67	-	-	8	0	0	12/26
12	**100**	0	100	-	-	0	0	0	8/14

UPPER BROAD CANYON - TREND STUDY NO. 19C-15-12

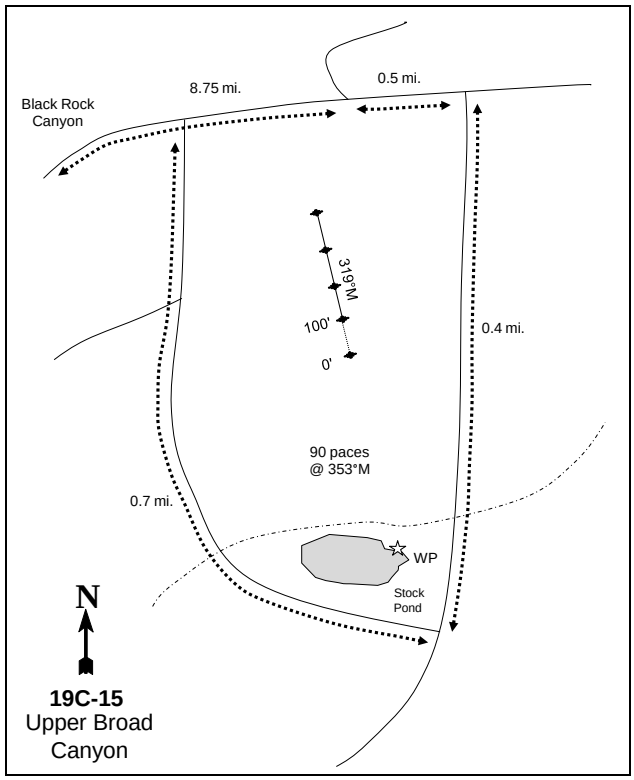
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Spring/Fall
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: BLM
Elevation: 6,250 ft. (1,905 m)
Aspect: Southeast
Slope: 15-20%
Transect bearing: 319° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: Rebar is on the 1ft mark on belt 1, 1ft mark on belt 2, 2ft mark on belt 3, 5ft mark on belt 5

Directions: From Highway U-36 between Vernon and Tintic Junction, proceed east on the Black Rock Canyon Road for 9.2 miles, to the road junction in Broad Canyon within Utah County. At this point, take the right fork (east) and travel an additional 0.5 miles to another fork. Turn right and travel 0.4 miles to another fork. Turn left and travel approximately 0.1 miles to where there is a stock pond surrounded by a fence on the west side of the road. From the northwest corner of the stock pond, walk 90 paces at 353 degrees magnetic toward a large juniper at the base of the hill. At the point, there will be a green steel fencepost, 15 inches high with a red browse tag, number 3935, attached, which marks the 0-foot end of the frequency baseline.

Map Name: Boulder Peak



Diagrammatic Sketch:



Township: 9S Range: 3W Section: 14

GPS: NAD 83, UTM 12S 401604 E 4431971 N

UPPER BROAD CANYON - TREND STUDY NO. 19C-15

Site Information

Site Description: The study is located on transitional deer range that is administered by the Bureau of Land Management (BLM) as part of the Broad Canyon allotment. The vegetation in the area is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community intermixed with smaller densities of antelope bitterbrush (*Purshia tridentata*). A wildfire burned through the surrounding area in either 2000 or 2001, but left the study intact. There are obvious signs of livestock trailing to a stock pond located 600 feet to the south. Wildlife pellet groups are frequent, especially deer. Two antler sheds were found within the transect in 1983, and in 2002 four bucks and a couple of does were seen just north of the study. Deer pellet groups were sampled in moderate abundance in 2002 and 2007, but low abundance in 2012. Sheep pellet groups have been sampled in low to moderate abundance since 2002 (Table - Pellet Group Data).

Browse: The dominant key browse species are mountain big sagebrush and antelope bitterbrush, with sagebrush providing the majority of the browse cover on the site (Table - Browse Trends). The sagebrush stand is comprised of a scattered population of mature and decadent plants. Recruitment of young sagebrush plants has been relatively poor. Poor vigor has been high in the population throughout the study years, and it was noted that many of the plants were chlorotic in several sample years. Utilization of sagebrush has varied from light to moderate most sample years, but had heavy use in 1983. The bitterbrush population is comprised of a small population of mostly mature plants with a prostrate growth form. Recruitment of young bitterbrush plants has been minimal over the course of the study. Decadence and poor vigor of bitterbrush has been generally low, but poor vigor was moderate in 2012. Utilization of bitterbrush has been mostly moderate to heavy (Table - Browse Characteristics). Singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) are scattered across the study in low densities, but do not appear to be expanding on the site (Table - Point-Quarter Tree Data).

Herbaceous Understory: Perennial grasses are abundant on the site, but are dominated by just a few species. The dominant grasses are bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*), and these species provide nearly all of the grass cover on the site. Less abundant perennials include crested wheatgrass (*Agropyron cristatum*) and bottlebrush squirreltail (*Sitanion hystrix*). Crested wheatgrass occurs frequently in the drainage at the base of the site. Cheatgrass (*Bromus tectorum*) is present, but has accounted for a small proportion of grass cover. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2012 at moderate frequency and cover. Perennial forb species are rare, and the forb component is dominated by annual species (Table - Herbaceous Trends).

Soil: The study lies within the Lodar-Rock outcrop complex, which occur on hills. Soils in this series formed in residuum and colluvium from limestone, and are characterized as shallow and somewhat excessively drained (Soil Survey Staff 2011). The soil has a clay loam texture with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). There is an abundance of rocks and pavement, both on and below the soil surface, and provide a large portion of protective ground cover. Bare ground cover is low (Table - Basic Cover). The soil erosion condition was classified as stable in 2002 and 2012, and slight in 2007.

Trend Assessments

Browse:

- **1983 to 1989 - slightly down (-1):** The density of mountain big sagebrush increased 9% from 2,231 plants/acre to 2,432 plants/acre. However, decadence increased from 27% to 44% of the sagebrush population, and the proportion of plants exhibiting poor vigor increased from 25% to 93%.
- **1989 to 1997 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence and poor vigor of sagebrush returned to 1983 levels at 29% and 34%, respectively.

- **1997 to 2002 - stable (0):** The density of mountain big sagebrush increased slightly from 2,060 plants/acre to 2,100 plants/acre, but cover decreased from 9% to 7%. Decadence increased to 47%, but poor vigor deceased 18%.
- **2002 to 2007 - down (-2):** The density of mountain big sagebrush decreased 26% to 1,560 plants/acre, and cover decreased to 6%. Sagebrush decadence remained stable at 47%, but poor vigor increased to 45% of the population.
- **2007 to 2012 - stable (0):** Density of mountain big sagebrush remained similar at 1,540 plants/acre, and cover remained similar at 6%. Decadence of sagebrush decreased to 27%, and poor vigor decreased to 35%.

Grass:

- **1983 to 1989 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1989 to 1997 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1997 to 2002 - slightly up (+1):** The sum of nested frequency of perennial grasses remained similar, but there was a significant decrease in the nested frequency of cheatgrass. Cheatgrass cover decreased from 1% to near 0%.
- **2002 to 2007 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased from 18% to 27%. Cheatgrass increased significantly in nested frequency, but cover remained less than 1%.
- **2007 to 2012 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover decreased to 18%. Cheatgrass increased significantly in nested frequency, but cover remained less than 1%.

Forb:

- **1983 to 1989 - stable (0):** Perennial forb species are very rare on the site.
- **1989 to 1997 - stable (0):** Perennial forb species are very rare on the site.
- **1997 to 2002 - stable (0):** Perennial forb species are very rare on the site.
- **2002 to 2007 - stable (0):** Perennial forb species are very rare on the site.
- **2007 to 2012 - stable (0):** Perennial forb species are very rare on the site.

Trend Summary

HERBACEOUS TRENDS--
Management unit 19C, Study no: 15

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	ab12	c83	b40	ab16	ab14	a10	.79	1.12	.68	.27
G	Agropyron spicatum	ab189	a147	b202	b204	ab195	ab196	14.03	12.96	15.57	10.31
G	Bromus carinatus	-	-	-	-	3	-	-	-	.15	-
G	Bromus tectorum (a)	-	-	d212	a17	b94	c158	1.23	.05	.47	.84
G	Oryzopsis hymenoides	b30	a10	a1	a-	a2	a3	.00	-	.30	.06
G	Poa bulbosa	a-	a-	a-	a-	a-	b39	-	-	-	1.09
G	Poa fendleriana	-	-	4	-	-	-	.01	-	-	-
G	Poa secunda	a212	ab259	ab261	b282	b287	b277	5.13	4.10	10.05	6.55
G	Sitanion hystrix	b34	a17	a3	a3	a3	a-	.03	.00	.03	-
Total for Annual Grasses		0	0	212	17	94	158	1.23	0.05	0.47	0.84
Total for Perennial Grasses		477	516	511	505	504	525	19.99	18.20	26.79	18.29
Total for Grasses		477	516	723	522	598	683	21.23	18.25	27.26	19.14
F	Agoseris glauca	-	-	2	1	3	2	.00	.00	.00	.00

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Alyssum alyssoides (a)	-	-	$_{c}$328	$_{a}$11	$_{b}$234	$_{c}$307	1.34	.02	.78	1.82
F	Antennaria rosea	13	33	19	29	18	31	.12	.31	.15	.61
F	Arabis sp.	4	3	5	-	-	-	.01	-	-	-
F	Calochortus nuttallii	$_{b}$11	$_{b}$7	$_{a}$-	$_{a}$-	$_{b}$12	$_{a}$-	-	-	.03	-
F	Chaenactis douglasii	12	6	-	-	-	3	-	-	-	.00
F	Cirsium sp.	-	-	1	-	-	4	.00	-	-	.03
F	Collinsia parviflora (a)	-	-	$_{ab}$16	$_{a}$-	$_{b}$25	$_{a}$7	.03	-	.06	.01
F	Comandra pallida	-	-	-	-	-	3	-	-	-	.00
F	Delphinium nuttallianum	4	-	-	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$-	-	-	.05	-
F	Draba sp. (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$11	$_{b}$20	-	-	.05	.04
F	Epilobium brachycarpum (a)	-	-	$_{b}$14	$_{a}$-	$_{a}$-	$_{ab}$3	.03	-	-	.00
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{a}$1	$_{a}$5	$_{b}$24	-	.00	.01	.14
F	Lomatium sp.	-	-	$_{b}$12	$_{a}$-	$_{c}$30	$_{b}$9	.03	-	.21	.03
F	Microsteris gracilis (a)	-	-	$_{b}$59	$_{a}$-	$_{a}$8	$_{a}$5	.12	-	.01	.01
F	Phlox longifolia	-	-	-	1	-	1	-	.00	-	.00
F	Ranunculus testiculatus (a)	-	-	$_{c}$135	$_{a}$12	$_{c}$114	$_{b}$63	.70	.02	.31	.14
F	Tragopogon dubius (a)	6	1	-	-	-	-	-	-	-	-
F	Unknown forb-perennial	4	-	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	3	13	6	1	2	3	.01	.03	.01	.03
Total for Annual Forbs		6	1	552	24	407	429	2.24	0.05	1.29	2.18
Total for Perennial Forbs		51	62	45	32	65	56	0.18	0.35	0.40	0.73
Total for Forbs		57	63	597	56	472	485	2.42	0.40	1.70	2.91

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

BROWSE TRENDS--
Management unit 19C, Study no: 15

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Amelanchier utahensis	2	2	2	2	-	-	-	-
B	Artemisia tridentata vaseyana	69	68	59	57	8.61	7.26	5.50	6.28
B	Eriogonum microthecum	1	1	1	0	-	-	-	-
B	Grayia spinosa	0	0	0	1	-	-	-	.00
B	Gutierrezia sarothrae	86	57	43	59	1.20	.68	.78	1.33
B	Juniperus osteosperma	0	1	1	1	.00	-	-	-
B	Pinus monophylla	0	0	0	2	.85	.00	.03	.78
B	Purshia tridentata	12	11	9	8	1.91	1.92	2.01	2.75
Total for Browse		170	140	115	130	12.58	9.88	8.34	11.16

CANOPY COVER, LINE INTERCEPT--
Management unit 19C, Study no: 15

Species	Percent Cover		
	'02	'07	'12
Artemisia tridentata vaseyana	6.18	7.93	8.73
Eriogonum microthecum	-	.08	-
Gutierrezia sarothrae	.83	.91	1.03
Pinus monophylla	.83	.90	1.29
Purshia tridentata	2.54	2.46	2.76

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19C, Study no: 15

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	1.8	1.4	1.7
Purshia tridentata	2.7	2.2	0.8

POINT-QUARTER TREE DATA--
Management unit 19C, Study no: 15

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	32	25	28
Pinus monophylla	73	49	47

Average diameter (in)		
'02	'07	'12
1.8	5.1	3.3
1.8	3.4	3.6

BASIC COVER--
Management unit 19C, Study no: 15

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	0	5.25	34.31	27.71	35.45	34.40
Rock	11.75	17.25	19.31	19.66	17.38	24.03
Pavement	28.00	24.75	12.09	13.53	13.80	9.87
Litter	49.50	38.50	28.56	28.13	21.09	26.23
Cryptogams	.50	2.50	3.05	4.07	4.90	1.53
Bare Ground	10.25	11.75	14.59	16.81	16.55	12.15

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 15, Upper Broad Canyon

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.6	7.1	42.4	29.1	28.6	3.0	7.1	166.4	0.6

PELLET GROUP DATA--
Management unit 19C, Study no: 15

Type	Quadrat Frequency			
	'97	'02	'07	'12
Sheep	12	6	-	8
Rabbit	7	3	9	1
Deer	17	15	7	2
Cattle	-	3	-	-

Days use per acre (ha)		
'02	'07	'12
19 (48)	3 (8)	12 (30)
-	-	-
22 (55)	30 (74)	3 (8)
-	-	-

BROWSE CHARACTERISTICS--
Management unit 19C, 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 utahensis									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**40**	0	100	-	-	50	0	0	12/12
02	**40**	0	100	-	-	100	0	0	11/16
07	**40**	0	100	-	-	50	0	0	22/23
12	**40**	0	100	-	-	0	50	0	20/21
Artemisia tridentata vaseyana									
83	**2231**	12	61	27	-	10	69	25	24/23
89	**2432**	5	51	44	99	38	26	93	16/23
97	**2060**	8	63	29	20	42	9	34	22/35
02	**2100**	3	50	47	-	17	0	18	21/34
07	**1560**	3	50	47	-	35	24	45	22/39
12	**1540**	8	65	27	400	42	8	35	19/35
Cercocarpus ledifolius									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/8
Eriogonum microthecum									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**20**	0	100	0	-	0	0	0	5/8
02	**20**	0	100	0	-	0	0	0	4/5
07	**20**	0	0	100	-	0	0	100	7/9
12	**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)
Grayia spinosa									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**0**	0	0	0	-	0	0	0	-/-
02	**0**	0	0	0	-	0	0	0	-/-
07	**0**	0	0	0	-	0	0	0	-/-
12	**40**	0	0	100	-	0	0	100	-/-
Gutierrezia sarothrae									
83	**5166**	24	76	0	2066	0	0	0	8/8
89	**7998**	27	70	3	799	0	0	0	8/12
97	**6760**	20	80	1	20	0	0	0	7/7
02	**2500**	2	74	24	-	.80	0	10	5/8
07	**1360**	4	96	0	40	0	0	0	7/10
12	**3420**	46	54	1	3980	0	0	.58	6/8
Juniperus osteosperma									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	0	-/-
07	**20**	100	0	-	-	0	0	0	-/-
12	**20**	100	0	-	-	0	0	0	-/-
Pinus monophylla									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	80	0	0	0	-/-
07	**0**	0	0	-	40	0	0	0	-/-
12	**40**	100	0	-	20	0	0	0	-/-
Purshia tridentata									
83	**299**	0	89	11	-	0	100	11	11/29
89	**332**	40	50	10	-	20	60	0	10/18
97	**380**	5	84	11	-	16	68	0	18/34
02	**360**	0	78	22	-	28	39	11	20/46
07	**220**	0	100	0	-	36	45	0	24/56
12	**240**	0	83	17	-	42	25	25	28/51
Ribes sp.									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	14/33
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

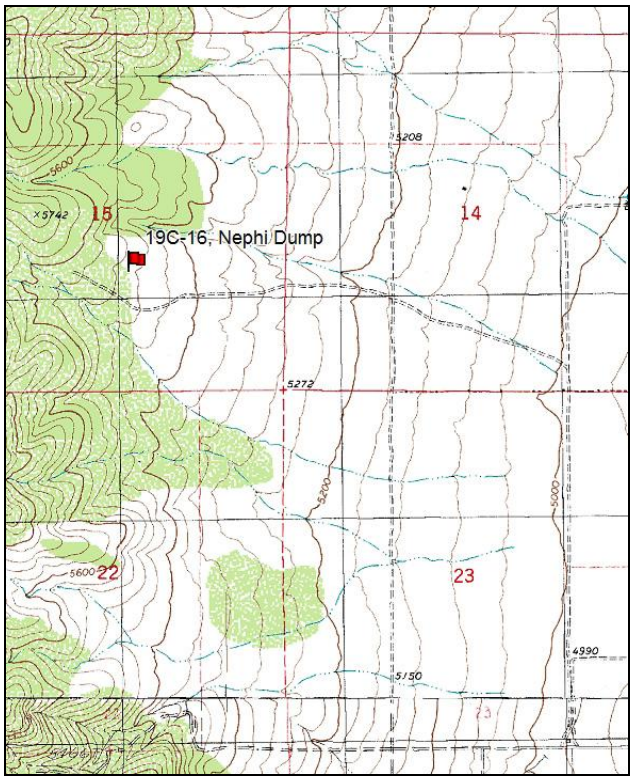
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	14/65
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

NEPHI DUMP - TREND STUDY NO. 19C-16-12

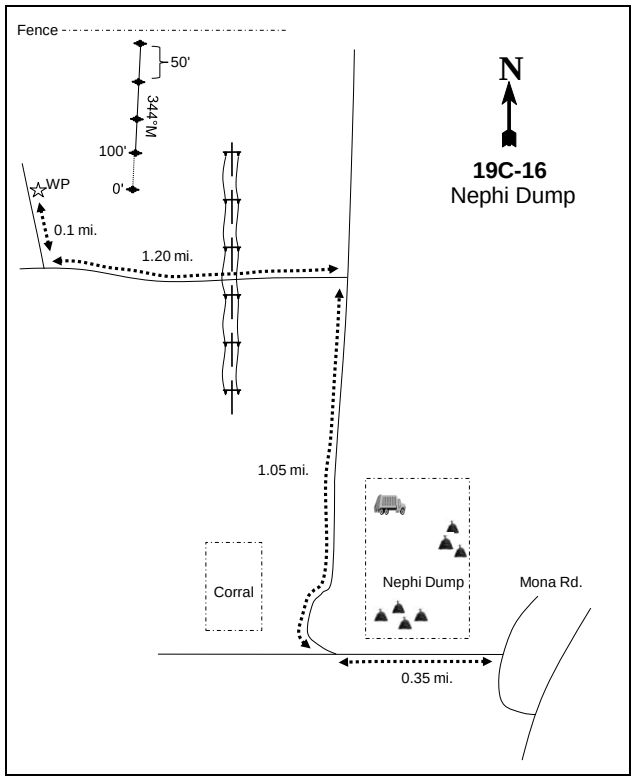
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter/Spring
NRCS Ecological Site Description: Upland Loam (Mountain Big Sagebrush), R028AY310UT
Land Ownership: BLM
Elevation: 5,500 ft. (1,676 m)
Aspect: East
Slope: 5-10%
Transect bearing: 344° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (29ft)

Directions: From the Nephi City Dump, travel north on a gravel road for 1.05 miles and then turn left (west) just after passing through a cattle guard. Travel west for 1.25 miles and turn right (north) onto a faint road and go 0.1 miles. At this point, there is a small stockpile and a short red steel stake. From here, walk east a short distance to the 0-foot mark of the frequency baseline, marked by a steel fencepost with a red browse tag, number 3942, attached.

Map Name: Slate Jack Canyon



Diagrammatic Sketch:



Township: 12S Range: 1W Section: 15

GPS: NAD 83, UTM 12S 420980 E 4402330 N

NEPHI DUMP - TREND STUDY NO. 19C-16

Site Information

Site Description: This study samples deer winter range located northwest of Nephi on the east side of Long Ridge. The area is administered by the Bureau of Land Management as part of the Nephi Bench allotment. It supports a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community interspersed with Utah juniper (*Juniperus osteosperma*). The study is located within an area of approximately 40 acres that was not burned by the extensive fires of 1996; however, much of the surrounding vegetation was burned in 1986 and 1996. Deer pellet groups were sampled in moderate abundance in 2002, but have been sampled in low abundance since 2007. Cattle also graze the area, and cattle sign has been sampled in low to moderate abundance since 2002 (Table - Pellet Group Data).

Browse: The preferred browse species is mountain big sagebrush, which provides the majority of the browse cover on the site (Table - Browse Trends). Identification of this species has been problematic due to differing growth forms. It is likely that a minor component of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) is also present, but all sagebrush was classified as mountain big sagebrush for the purpose of this study. The sagebrush stand is comprised of a moderately dense stand of mature and decadent plants. Recruitment of young sagebrush plants has been poor over the course of the study. Decadence of sagebrush has been high, and poor vigor has fluctuated from low to moderate rates. Utilization has been mostly light to moderate. Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) was present on the site at the outset of the study, but has not been sampled in density since 2002 (Table - Browse Characteristics). Density of Utah juniper trees has not increased since 2002, but the average diameter of trees has increased steadily (Table - Point-Quarter Tree Data).

Herbaceous Understory: Perennial grasses are abundant on the site, but are dominated by just a few species. The dominant perennial grasses include crested wheatgrass (*Agropyron cristatum*), Sandberg bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Agropyron spicatum*). Cheatgrass (*Bromus tectorum*) is common, and at times has been the dominant grass species in cover. Perennial forb species are rare on the site, and the forb component is dominated by annual species. Pale alyssum (*Alyssum alyssoides*) and bur buttercup (*Ranunculus testiculatus*) are the dominant forb species (Table - Herbaceous Trends).

Soil: The soil is classified as a Pibler gravelly fine sandy loam, which occurs on alluvial fans. These soils are formed from alluvium derived from limestone, quartzite, sandstone, and igneous rocks, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 6.9) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of vegetation, litter, and pavement cover providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1983 to 1989 - slightly down (-1):** Sagebrush density decreased 19% from 3,397 plants/acre to 2,765 plants/acre. Decadence of sagebrush increased from 26% to 39%, and poor vigor increased from 8% to 18% of the population. Density of cliffrose decreased 20% from 166 plants/acre to 132 plants/acre. Decadence of cliffrose increased from 0% to 25%.
- **1989 to 1997 - stable (0):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Decadence of sagebrush decreased to 20%, but plants displaying poor vigor continued to increase to 28% of the population. Cliffrose decadence increased from 25% to 50% of the population.

- **1997 to 2002 - stable (0):** Sagebrush density increased 16% from 1,920 plants/acre to 2,220 plants/acre, but cover decreased slightly from 11% to 9%. Decadence increased to 44%, but poor vigor decreased to 15%. No cliffrose plants were sampled.
- **2002 to 2007 - down (-2):** Sagebrush density decreased 22% to 1,740 plants/acre, and cover decreased to 6%. Decadence of sagebrush increased to 47%, and plants displaying poor vigor increased to 28% of the population.
- **2007 to 2012 - stable (0):** Density of sagebrush decreased 9% to 1,580 plants/acre, but cover increased to 9%. Decadence of sagebrush decreased to 30%, and poor vigor decreased to 9% of the population.

Grass:

- **1983 to 1989 - up (+2):** The sum of nested frequency of perennial grasses increased 57%.
- **1989 to 1997 - up (+2):** The sum of nested frequency of perennial grasses increased 65%.
- **1997 to 2002 - stable (0):** The sum of nested frequency of perennial grasses remained similar, and cover increased slightly from 15% to 16%.
- **2002 to 2007 - slightly down (-1):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 18%. However, cheatgrass increased significantly in nested frequency, and cover increased from 3% to 10%. Cheatgrass was the dominant grass species in cover.
- **2007 to 2012 - slightly up (+1):** The perennial grass sum of nested frequency remained similar, but cover increased to 21%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 2%.

Forb:

- **1983 to 1989 - stable (0):** The sum of nested frequency of perennial forbs increased, but perennial forb species remain rare on the site.
- **1989 to 1997 - stable (0):** The sum of nested frequency of perennial forbs increased, but perennial forb species remain rare on the site.
- **1997 to 2002 - slightly up (+1):** The sum of nested frequency of perennial forbs increased, and cover increased from less than 1% to 2%. Perennial forbs remain rare on the site.
- **2002 to 2007 - stable (0):** The sum of nested frequency and cover of perennial forb species remained similar.
- **2007 to 2012 - stable (0):** The perennial forb sum of nested frequency and cover remained similar.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19C, 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
97	14.8	8.4	2.3	29.5	-3.4	0.6	0.0	**52.2**	Fair
02	11.3	1.8	0.5	30.0	-2.1	3.2	0.0	**44.6**	Poor
07	7.9	0.9	0.0	30.0	-7.9	2.9	0.0	**33.9**	Very Poor-Poor
12	11.2	6.0	0.0	30.0	-1.8	2.6	0.0	**48.0**	Poor

Trend Summary

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

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	a7	a17	b143	b133	b118	b127	9.05	8.84	5.11	7.96
G	Agropyron intermedium	-	-	-	2	-	-	-	.03	-	-
G	Agropyron spicatum	a10	ab30	ab33	ab38	c80	bc58	1.42	1.89	3.52	4.16
G	Bromus japonicus (a)	-	-	b22	b15	b31	a-	.12	.05	.16	-
G	Bromus tectorum (a)	-	-	ab183	a163	c309	b202	4.46	2.77	10.37	2.40
G	Oryzopsis hymenoides	1	5	-	4	-	2	-	.03	.00	.16
G	Poa bulbosa	-	-	-	-	5	-	-	-	.01	-
G	Poa pratensis	3	-	-	-	-	-	-	-	-	-
G	Poa secunda	a103	bc149	ab161	bc182	cd204	d226	4.20	5.09	8.74	8.63
G	Sitanion hystrix	9	8	8	4	11	7	.07	.21	.24	.07
Total for Annual Grasses		0	0	205	178	340	202	4.58	2.83	10.53	2.40
Total for Perennial Grasses		133	209	345	363	418	420	14.75	16.11	17.65	21.00
Total for Grasses		133	209	550	541	758	622	19.34	18.94	28.18	23.41
F	Agoseris glauca	-	-	-	1	-	3	-	.00	-	.01
F	Allium sp.	-	-	-	-	-	1	-	-	-	.00
F	Alyssum alyssoides (a)	-	-	c264	a151	b215	bc220	3.04	.37	.88	.74
F	Astragalus calycosus	-	3	-	-	-	-	-	-	-	-
F	Astragalus cibarius	a-	a-	a-	a-	b11	ab6	-	-	.69	.15
F	Astragalus eurekensis	a-	a2	a10	b31	a7	ab15	.07	1.23	.04	.24
F	Calochortus nuttallii	a2	a6	b18	a1	a4	a1	.10	.00	.02	.00
F	Camelina microcarpa (a)	-	-	10	-	7	-	.02	-	.02	-
F	Castilleja linariaefolia	-	1	1	1	-	8	.01	.00	-	.06
F	Chorispora tenella (a)	-	-	4	6	-	-	.03	.30	-	-
F	Cirsium sp.	-	-	-	-	-	4	-	-	-	.06
F	Collinsia parviflora (a)	-	-	-	6	4	2	-	.01	.01	.00
F	Comandra pallida	2	1	-	-	-	-	-	-	-	-
F	Cymopterus sp.	-	-	-	6	2	1	-	.03	.03	.00
F	Holosteum umbellatum (a)	-	-	a-	a-	b40	b40	-	-	.11	.10
F	Lactuca serriola (a)	a-	ab2	b9	a-	a-	a-	.02	-	-	-
F	Microsteris gracilis (a)	-	-	3	2	5	12	.00	.01	.01	.02
F	Phlox austromontana	-	2	1	1	-	1	.00	.03	-	.00
F	Phlox hoodii	-	-	-	-	2	-	-	-	.00	-
F	Phlox longifolia	a-	b13	b17	c40	c58	c59	.04	.27	.33	.38
F	Ranunculus testiculatus (a)	-	-	b189	b199	c278	a97	1.19	2.71	4.44	.33
F	Senecio multilobatus	-	-	5	1	-	-	.01	.00	-	-
F	Sisymbrium altissimum (a)	-	-	-	1	2	-	-	.00	.03	-
F	Sphaeralcea coccinea	-	1	1	-	-	-	.00	-	-	-
F	Tragopogon dubius (a)	-	3	2	-	-	-	.03	-	-	-
F	Unknown forb-annual (a)	-	-	4	-	-	-	.01	-	-	-
F	Unknown forb-perennial	2	-	-	-	-	-	-	-	-	-
F	Vicia americana	a-	a-	a2	a-	ab11	b17	.03	-	.33	.39

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Zigadenus paniculatus	-	1	4	-	-	-	.01	-	-	-
Total for Annual Forbs		0	5	485	365	551	371	4.36	3.41	5.50	1.22
Total for Perennial Forbs		6	30	59	82	95	116	0.29	1.59	1.46	1.32
Total for Forbs		6	35	544	447	646	487	4.65	5.01	6.96	2.54

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

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

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia tridentata vaseyana	65	71	64	60	10.92	9.01	6.35	8.92
B	Cercocarpus montanus	0	1	0	0	-	-	-	-
B	Chrysothamnus nauseosus	2	1	1	0	.79	.98	.63	-
B	Chrysothamnus viscidiflorus stenophyllus	40	46	39	40	5.49	4.12	3.50	2.57
B	Cowania mexicana stansburiana	2	0	0	0	.78	-	-	-
B	Gutierrezia sarothrae	34	19	7	3	.69	.15	.04	.00
B	Juniperus osteosperma	1	1	1	1	3.40	.68	2.25	5.96
Total for Browse		144	139	112	104	22.08	14.94	12.78	17.47

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

Species	Percent Cover	
	'07	'12
Artemisia tridentata vaseyana	7.59	9.73
Chrysothamnus nauseosus	.31	-
Chrysothamnus viscidiflorus stenophyllus	5.44	3.75
Juniperus osteosperma	6.58	9.61

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

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	2.2	1.9	2.0
Cercocarpus montanus	-	3.0	-

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

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	52	43	43

Average diameter (in)		
'02	'07	'12
3.9	7.5	9.2

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

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	.25	5.00	38.75	41.17	47.71	42.11
Rock	13.25	13.00	9.50	10.58	8.03	7.84
Pavement	10.00	16.75	18.19	12.17	12.38	11.64
Litter	59.00	50.75	39.46	30.07	31.27	42.80
Cryptogams	4.00	4.50	3.96	14.77	4.36	2.81
Bare Ground	13.50	10.00	7.75	16.69	11.03	9.94

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 16, Nephi Dump

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.1	6.9	42.0	27.4	30.6	2.9	7.7	284.8	0.7

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

Type	Quadrat Frequency			
	'97	'02	'07	'12
Rabbit	22	5	51	8
Elk	-	-	1	-
Deer	17	12	8	3
Cattle	8	1	9	8

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	-	
31 (76)	18 (45)	1 (2)
7 (16)	24 (59)	17 (41)

BROWSE CHARACTERISTICS--
Management unit 19C, Study no: 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)
Artemisia tridentata vaseyana									
83	**3397**	9	65	26	-	36	0	8	22/24
89	**2765**	0	61	39	-	35	14	18	34/30
97	**1920**	5	75	20	60	38	0	28	24/33
02	**2220**	1	55	44	-	32	9	15	24/31
07	**1740**	0	53	47	20	24	14	28	30/36
12	**1580**	0	70	30	-	8	0	9	29/38
Cercocarpus montanus									
83	**0**	0	0	0	-	0	0	0	-/-
89	**0**	0	0	0	-	0	0	0	-/-
97	**0**	0	0	0	-	0	0	0	-/-
02	**20**	0	0	100	-	0	0	100	-/-
07	**0**	0	0	0	-	0	0	0	-/-
12	**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)
Chrysothamnus nauseosus									
83	**99**	0	100	0	-	0	0	0	26/27
89	**99**	0	100	0	-	33	0	0	19/22
97	**40**	0	0	100	-	0	0	0	-/-
02	**20**	0	0	100	-	0	0	0	42/74
07	**20**	0	0	100	-	0	0	100	23/66
12	**0**	0	0	0	-	0	0	0	-/-
Chrysothamnus viscidiflorus stenophyllus									
83	**398**	8	75	17	-	0	0	0	18/20
89	**732**	0	95	5	-	0	0	5	13/14
97	**1780**	2	89	9	-	0	0	2	17/18
02	**2380**	3	75	23	-	0	0	7	16/22
07	**1820**	0	44	56	20	2	0	14	16/24
12	**1600**	1	75	24	260	3	0	1	12/19
Cowania mexicana stansburiana									
83	**166**	0	100	0	-	40	0	0	27/25
89	**132**	0	75	25	-	0	100	25	22/25
97	**40**	0	50	50	-	0	100	0	64/66
02	**0**	0	0	0	-	0	0	0	58/37
07	**0**	0	0	0	-	0	0	0	53/58
12	**0**	0	0	0	-	0	0	0	-/-
Gutierrezia sarothrae									
83	**1166**	29	71	0	-	0	0	0	15/15
89	**2532**	5	89	5	-	0	0	3	10/9
97	**1920**	21	78	1	120	0	0	1	11/11
02	**680**	3	59	38	-	0	0	38	7/8
07	**140**	0	100	0	20	0	0	0	9/10
12	**60**	0	100	0	-	0	0	0	8/10
Juniperus osteosperma									
83	**33**	100	0	-	-	0	0	0	-/-
89	**66**	100	0	-	-	0	0	0	-/-
97	**20**	0	100	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	0	-/-
07	**20**	0	100	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	-/-
Leptodactylon pungens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	10/18
12	**0**	0	0	-	-	0	0	0	-/-

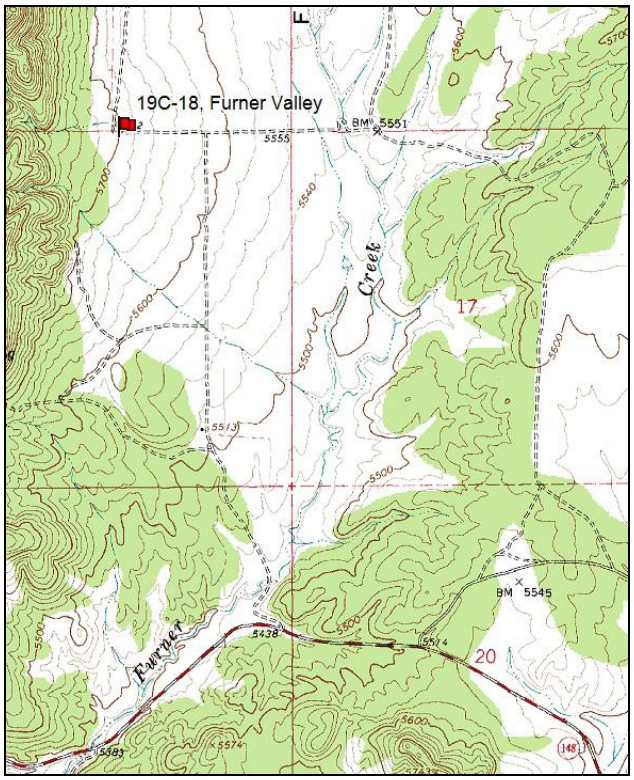
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Purshia tridentata									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	11/16
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

FURNER VALLEY - TREND STUDY NO. 19C-18-12

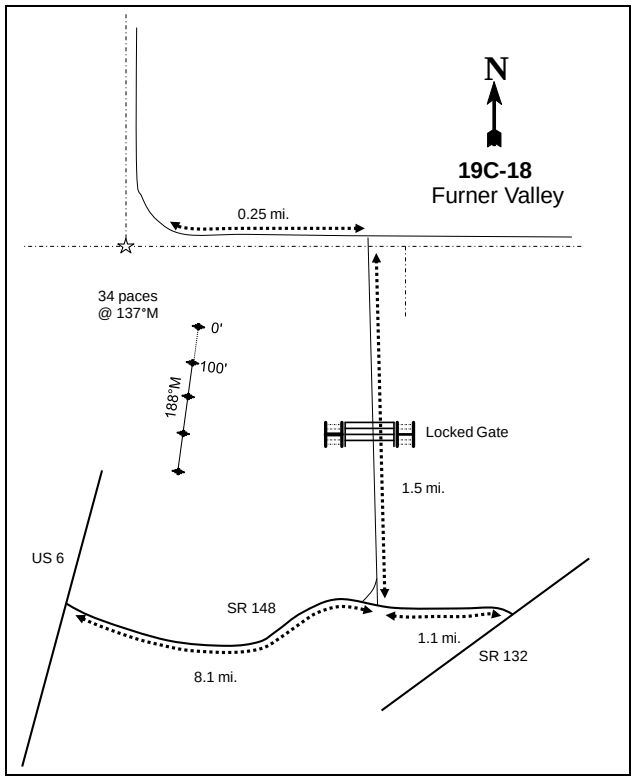
Vegetation Type: Mountain Big Sagebrush and Antelope Bitterbrush
Range Type: Crucial Deer Winter/Spring, Substantial Elk Year-long
NRCS Ecological Site Description: Upland Loam (Mountain Big Sagebrush), R028AY310UT
Land Ownership: BLM
Elevation: 5,700 ft. (1,737 m)
Aspect: East
Slope: 8%
Transect bearing: 188° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions: From a point on Hwy U-148, located 8.1 miles east of the junction of Hwy U -148 and U.S. 6, proceed north on the dirt road to Furner Valley for 1.5 miles. At this point, there is a "T" intersection with cropland immediately to the north. Turn left (west) for 0.25 miles, to where the road turns north again at a right angle. Stop! From the corner of the fence, walk 34 paces at 137°M to the 0-foot marker of the frequency baseline, a green steel fencepost 15" high with a red browse tag, number 3936, attached.

Map Name: Furner Ridge



Diagrammatic Sketch:



Township: 13S Range: 2W Section: 18

GPS: NAD 83, UTM 12S 406477 E 4393624 N

FURNER VALLEY - TREND STUDY NO. 19C-18

Site Information

Site Description: The study samples deer winter range on the west side of Furner Valley. The area is administered by the Bureau of Land Management (BLM) as part of the Furner Dog Valley allotment. The vegetation type is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass, with antelope bitterbrush (*Purshia tridentata*) as a sub-dominant shrub. Immediately west of the study is a mature stand of singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*), and a few mature trees are scattered over the site. The study was mowed or aerated between the 2002 and 2007 readings, thinning the browse cover substantially. The area is in close proximity to a large dryland farm, which may attract deer in the spring. Deer pellet groups were sampled in moderate abundance in 2002, but have been sampled in low abundance since 2007. Horse sign was sampled in low abundance in 2007, but more moderate abundance in 2012. Cattle sign was sampled in low abundance in 2002 and 2007, but high abundance in 2012. Sheep pellet groups was sampled in low abundance in 2002 (Table - Pellet Group Data). In 1989, when conditions were dry, it was observed that cattle had made considerable use of the new bitterbrush growth by mid-summer when the study was read.

Browse: Mountain big sagebrush and antelope bitterbrush are the preferred browse species, and they provide the majority of the browse cover on the site (Table - Browse Trends). The treatment reduced densities of both species, but had a greater impact on the sagebrush population. The mountain big sagebrush stand is comprised of a scattered population of mostly mature plants. Recruitment of young sagebrush plants was good in several years, but has been generally poor. Decadence and poor vigor of sagebrush has typically been high in the population. Utilization of sagebrush has been mostly light to moderate. The bitterbrush stand is comprised of a moderately dense population of very large, mature plants. Recruitment of young bitterbrush plants has been poor over the course of the study. Decadence and poor vigor of bitterbrush have been generally low in the population. Utilization of bitterbrush has been moderate to heavy throughout the sample years (Table - Browse Characteristics). Utah juniper trees are also scattered throughout the study, but do not appear to be increasing on the site (Table - Point-Quarter Tree Data).

Herbaceous Understory: Perennial grasses are common in the understory, and provide the majority of the grass cover. Needle-and-thread (*Stipa comata*) is the most abundant perennial grass, and bottlebrush squirreltail (*Sitanion hystrix*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Oryzopsis hymenoides*) are also relatively common. Cheatgrass (*Bromus tectorum*) is also common on the site, and at times has been the dominant grass species in cover. Perennial forb species are relatively diverse, but provide very little cover. The majority of the forb cover is provided by annual species. The most abundant forb is pale alyssum (*Alyssum alyssoides*). Musk thistle (*Carduus nutans*), a noxious annual, was sampled in one quadrat in 1997 (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant cobbly loam, which occurs on alluvial fans. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and somewhat excessively drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover is moderate, with vegetation, litter, and pavement providing the majority of the protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2002 and 2012, but was slight in 2007.

Trend Assessments

Browse:

- **1983 to 1989 - down (-2):** Sagebrush density decreased 8% from 2,798 plants/acre to 2,565 plants/acre. Decadence of sagebrush increased from 48% to 75% , and poor vigor increased from 6% to 52% of the population. Young recruitment remained low at 4% of the population. Bitterbrush

density decreased 25%, from 399 plants/acre to 298 plants/acre. Decadence of bitterbrush increased from 0% to 33% of the population. Recruitment of young bitterbrush plants increased slightly from 8% to 11% of the population.

- **1989 to 1997 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1997; therefore, trend was determined using other parameters. Recruitment of young sagebrush plants increased to 16% of the population. Decadence of sagebrush decreased to 27%, and poor vigor decreased to 24%. Recruitment of young bitterbrush plants decreased to just 3% of the population, but decadence decreased to 10%.
- **1997 to 2002 - stable (0):** Sagebrush density decreased 6% from 2,100 plants/acre to 1,980 plants/acre, and cover decreased from 11% to 9%. Recruitment of young sagebrush plants increased to 24% of the population. Decadence remained relatively stable at 25%, and poor vigor decreased to 10% of the population. Bitterbrush density decreased 10% from 580 plants/acre to 520 plants/acre, but cover increased from 5% to 9%.
- **2002 to 2007 - down (-2):** Due to the mowing treatment, sagebrush density decreased to 900 plants/acre, and cover decreased to 1%. Recruitment of young sagebrush plants decreased to 11% of the population. Decadence increased to 49%, and poor vigor increased to 53% of the population. Bitterbrush density decreased 12% to 460 plants/acre, and cover decreased to 4%. Bitterbrush plants displaying poor vigor increased from 4% of the population to 30%.
- **2007 to 2012 - stable (0):** Density of sagebrush and bitterbrush remained the same at 900 plants/acre and 460 plants/acre, respectively. Cover of sagebrush increased to 3%, and cover of bitterbrush increased to 7%. Recruitment of young sagebrush plants decreased to just 4% of the population. Decadence of sagebrush decreased to 16%, but poor vigor remained high in 47% of the population. Poor vigor of bitterbrush decreased to 17% of the population.

Grass:

- **1983 to 1989 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 19%.
- **1989 to 1997 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1997 to 2002 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased from 9% to 14%. Cheatgrass nested frequency remained similar, but cover decreased from 5% to 2%.
- **2002 to 2007 - stable (0):** The sum of nested frequency of perennial grasses increased 18%, but cover decreased to 12%. Cheatgrass also increased significantly in nested frequency, and cover increased to 10%.
- **2007 to 2012 - slightly up (+1):** The perennial grass sum of nested frequency remained similar, but cover increased to 17%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 1%.

Forb:

- **1983 to 1989 - up (+2):** The sum of nested frequency of perennial forbs increased 81%.
- **1989 to 1997 - stable (0):** The sum of nested frequency of perennial forbs remained similar. Musk thistle was sampled for the first time.
- **1997 to 2002 - down (-2):** The sum of nested frequency of perennial forbs decreased almost 88%, and cover decreased from 2% to less than 1%.
- **2002 to 2007 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased by 45%, but perennial forbs were already rare on the site.
- **2007 to 2012 - stable (0):** Perennial forb species remain rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 19C, 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	21.1	8.5	6.0	18.1	-4.0	3.6	-2.0	**51.3**	Poor-Fair
02	25.1	10.0	6.2	27.6	-1.8	1.6	0.0	**68.6**	Good
07	7.4	10.0	1.5	23.2	-7.7	0.5	0.0	**34.8**	Very Poor-Poor
12	14.9	12.7	2.0	30.0	-4.8	0.7	0.0	**55.5**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 19C, Study no: 18

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
G	Agropyron cristatum	-	-	2	1	-	3	.15	.03	-	.18
G	Agropyron smithii	-	-	-	8	7	8	-	.04	.07	.15
G	Agropyron spicatum	10	12	4	19	10	19	.06	1.00	.54	1.18
G	Bromus japonicus (a)	-	-	-	4	-	-	-	.01	-	-
G	Bromus tectorum (a)	-	-	$_{a}$219	$_{a}$241	$_{b}$303	$_{a}$266	5.28	2.36	10.33	6.44
G	Oryzopsis hymenoides	$_{bc}$40	$_{c}$58	$_{ab}$20	$_{bc}$38	$_{ab}$23	$_{a}$14	.82	1.77	.73	.62
G	Poa fendleriana	-	2	-	-	-	-	-	-	-	-
G	Poa pratensis	3	4	-	-	-	-	-	-	-	-
G	Poa secunda	$_{a}$7	$_{a}$6	$_{b}$37	$_{b}$41	$_{b}$60	$_{c}$117	.47	1.11	1.58	3.32
G	Sitanion hystrix	$_{c}$107	$_{b}$70	$_{bc}$82	$_{a}$25	$_{bc}$76	$_{a}$7	1.28	.49	2.21	.10
G	Sporobolus cryptandrus	-	-	4	2	3	-	.15	.00	.03	-
G	Stipa comata	$_{a}$111	$_{bc}$178	$_{ab}$172	$_{bc}$180	$_{cd}$192	$_{d}$228	5.96	9.34	6.40	11.66
G	Unknown grass - perennial	-	-	3	-	-	-	.15	-	-	-
Total for Annual Grasses		0	0	219	245	303	266	5.28	2.37	10.33	6.44
Total for Perennial Grasses		278	330	324	314	371	396	9.06	13.80	11.58	17.22
Total for Grasses		278	330	543	559	674	662	14.34	16.18	21.92	23.67
F	Alyssum alyssoides (a)	-	-	$_{b}$305	$_{c}$333	$_{c}$351	$_{a}$249	2.28	5.83	7.39	2.61
F	Antennaria rosea	-	-	2	-	-	-	.00	-	-	-
F	Arabis sp.	5	-	-	-	-	-	-	-	-	-
F	Astragalus calycosus	$_{a}$5	$_{a}$13	$_{b}$30	$_{ab}$23	$_{ab}$14	$_{ab}$13	.40	.30	.09	.15
F	Astragalus sp.	-	-	7	4	-	-	.09	.03	-	-
F	Astragalus utahensis	-	-	-	-	-	-	-	-	.00	-
F	Calochortus nuttallii	6	-	3	3	-	2	.04	.00	-	.03
F	Carduus nutans (a)	-	-	2	-	-	-	.00	-	-	-
F	Castilleja sp.	$_{a}$-	$_{a}$-	$_{b}$9	$_{a}$1	$_{a}$-	$_{a}$-	.17	.03	-	-
F	Caulanthus crassicaulis	$_{b}$34	$_{b}$20	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
F	Chaenactis douglasii	2	4	10	-	-	-	.04	-	-	-
F	Crepis acuminata	-	-	2	-	-	1	.03	-	-	.00
F	Erodium cicutarium (a)	-	-	-	-	11	-	-	-	.24	-
F	Ipomopsis aggregata	2	-	-	-	-	-	-	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'83	'89	'97	'02	'07	'12	'97	'02	'07	'12
F	Linum lewisii	$_{c}$33	$_{c}$52	$_{bc}$31	$_{a}$3	$_{ab}$11	$_{a}$-	.16	.04	.08	-
F	Lithospermum incisum	$_{b}$11	$_{b}$8	$_{ab}$1	$_{ab}$2	$_{a}$-	$_{a}$-	.01	.00	-	-
F	Lygodesmia grandiflora	5	8	-	8	2	3	-	.04	.00	.03
F	Machaeranthera canescens	-	1	-	-	-	-	-	-	-	-
F	Microsteris gracilis (a)	-	-	-	-	3	-	-	-	.00	-
F	Oenothera sp.	1	5	6	3	-	-	.01	.03	-	-
F	Phlox austromontana	$_{a}$3	$_{b}$19	$_{a}$6	$_{a}$6	$_{a}$3	$_{a}$2	.19	.18	.00	.03
F	Phlox longifolia	$_{a}$10	$_{b}$36	$_{ab}$36	$_{ab}$25	$_{a}$7	$_{ab}$22	.13	.10	.01	.07
F	Ranunculus testiculatus (a)	-	-	-	-	3	2	-	-	.03	.00
F	Senecio multilobatus	$_{a}$4	$_{a}$16	$_{b}$44	$_{a}$1	$_{a}$2	$_{a}$1	.39	.00	.03	.03
F	Sphaeralcea coccinea	-	-	-	3	6	1	-	.00	.01	.00
F	Streptanthus cordatus	$_{a}$-	$_{b}$13	$_{b}$14	$_{a}$1	$_{a}$1	$_{a}$-	.11	.00	.00	-
F	Tragopogon dubius (a)	$_{b}$17	$_{ab}$7	$_{ab}$7	$_{ab}$6	$_{ab}$4	$_{a}$-	.09	.05	.01	-
F	Unknown forb-perennial	-	3	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	$_{a}$-	$_{b}$21	$_{a}$3	$_{a}$2	$_{a}$1	$_{a}$-	.00	.01	.00	-
Total for Annual Forbs		17	7	314	339	372	251	2.38	5.88	7.68	2.61
Total for Perennial Forbs		121	219	204	85	47	45	1.80	0.80	0.26	0.36
Total for Forbs		138	226	518	424	419	296	4.18	6.69	7.94	2.98

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

BROWSE TRENDS--
Management unit 19C, Study no: 18

Type	Species	Strip Frequency				Average Cover %			
		'97	'02	'07	'12	'97	'02	'07	'12
B	Artemisia tridentata vaseyana	66	60	31	33	11.05	9.38	1.44	3.15
B	Chrysothamnus viscidiflorus viscidiflorus	1	2	1	1	-	-	-	-
B	Gutierrezia sarothrae	59	55	45	0	1.29	.96	.96	-
B	Juniperus osteosperma	4	5	4	4	2.74	4.59	4.90	4.58
B	Leptodactylon pungens	0	1	1	1	-	.00	.03	.15
B	Opuntia sp.	1	1	1	1	.00	.03	-	-
B	Purshia tridentata	25	23	19	20	4.83	8.89	3.70	7.30
Total for Browse		156	147	102	60	19.93	23.88	11.04	15.20

CANOPY COVER, LINE INTERCEPT--
Management unit 19C, Study no: 18

Species	Percent Cover	
	'07	'12
Artemisia tridentata vaseyana	2.58	5.05
Gutierrezia sarothrae	.85	-
Juniperus osteosperma	7.55	9.30
Leptodactylon pungens	-	.15
Purshia tridentata	6.43	10.26

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 19C, Study no: 18

Species	Average leader growth (in)		
	'02	'07	'12
Artemisia tridentata vaseyana	2.6	2.5	0.7
Purshia tridentata	1.4	3.0	0.3

POINT-QUARTER TREE DATA--
Management unit 19C, Study no: 18

Species	Trees per Acre		
	'02	'07	'12
Juniperus osteosperma	35	36	40

Average diameter (in)		
'02	'07	'12
3.4	5	3.8

BASIC COVER--
Management unit 19C, Study no: 18

Cover Type	Average Cover %					
	'83	'89	'97	'02	'07	'12
Vegetation	2.00	7.25	34.52	46.75	37.59	39.49
Rock	1.75	1.50	1.52	2.01	1.04	1.72
Pavement	1.00	20.50	8.73	7.61	9.66	7.02
Litter	52.25	41.25	40.31	36.43	44.88	48.18
Cryptogams	0	3.75	1.25	11.40	1.11	.37
Bare Ground	43.00	25.75	22.77	20.70	15.25	20.38

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 18, Furner Valley

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.7	7.1	54.4	23.1	22.6	2.4	10.5	160.0	0.6

PELLET GROUP DATA--
Management unit 19C, Study no: 18

Type	Quadrat Frequency			
	'97	'02	'07	'12
Sheep	2	2	-	-
Rabbit	12	21	85	8
Horse	-	2	10	2
Elk	1	-	1	-
Deer	11	12	1	1
Cattle	2	2	5	5

Days use per acre (ha)		
'02	'07	'12
4 (10)	-	-
-	-	-
5 (13)	20 (50)	22 (54)
-	-	-
36 (89)	1 (3)	4 (10)
6 (14)	10 (25)	39 (97)

BROWSE CHARACTERISTICS--
Management unit 19C, 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)
Artemisia tridentata vaseyana									
83	**2798**	4	49	48	-	38	56	6	24/31
89	**2565**	4	21	75	333	21	0	52	24/28
97	**2100**	16	57	27	60	10	0	24	33/48
02	**1980**	24	51	25	120	14	4	10	31/43
07	**900**	11	40	49	100	9	11	53	19/27
12	**900**	4	80	16	-	36	2	47	22/36
Chrysothamnus viscidiflorus viscidiflorus									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**20**	0	100	-	-	0	0	0	16/26
02	**40**	0	100	-	-	0	0	0	7/14
07	**40**	50	50	-	-	0	0	0	9/21
12	**20**	0	100	-	-	0	0	0	7/20
Gutierrezia sarothrae									
83	**699**	0	91	9	-	10	10	52	7/6
89	**1565**	11	81	8	66	0	0	2	9/8
97	**5000**	24	76	0	40	0	0	0	10/10
02	**3820**	3	84	14	-	0	0	9	7/10
07	**2160**	13	81	6	400	0	0	6	8/13
12	**0**	0	0	0	-	0	0	0	-/-
Juniperus osteosperma									
83	**33**	100	0	-	-	0	0	0	-/-
89	**33**	100	0	-	-	0	0	0	-/-
97	**80**	25	75	-	-	0	0	0	-/-
02	**100**	0	100	-	20	0	0	0	-/-
07	**100**	0	100	-	-	0	0	0	-/-
12	**80**	25	75	-	-	0	0	25	-/-
Leptodactylon pungens									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**0**	0	0	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	0	9/16
07	**60**	33	67	-	-	0	0	0	4/12
12	**20**	0	100	-	-	0	0	100	12/26

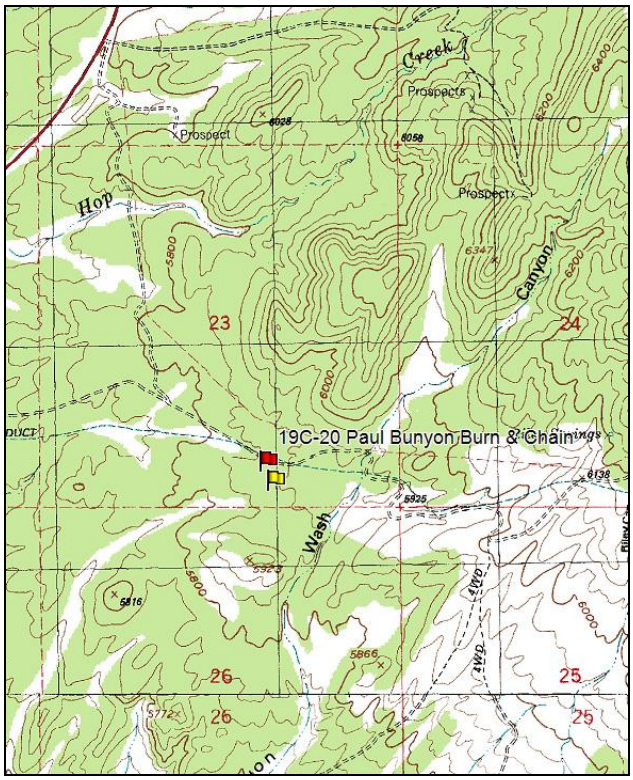
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Opuntia sp.									
83	**0**	0	0	-	-	0	0	0	-/-
89	**0**	0	0	-	-	0	0	0	-/-
97	**20**	0	100	-	-	0	0	0	3/3
02	**20**	0	100	-	-	0	0	0	5/7
07	**20**	0	100	-	-	0	0	0	4/10
12	**40**	0	100	-	-	0	0	0	5/13
Purshia tridentata									
83	**399**	8	92	0	-	50	0	0	29/42
89	**298**	11	56	33	-	67	22	0	23/37
97	**580**	3	86	10	-	59	17	3	34/58
02	**520**	0	92	8	-	58	15	4	46/81
07	**460**	0	96	4	-	13	17	30	33/63
12	**460**	4	91	4	-	35	52	17	33/67

PAUL BUNYON BURN AND CHAIN - TREND STUDY NO. 19C-20-12

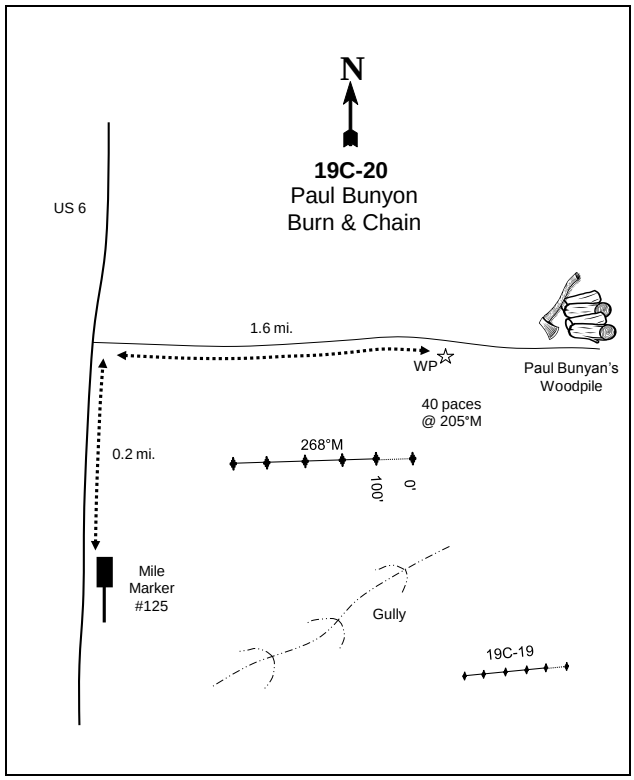
Vegetation Type: Perennial Grass
Range Type: Crucial Deer Winter/Spring,
NRCS Ecological Site Description: Upland Gravelly Loam (Wyoming Big Sagebrush), R028AY307UT
Land Ownership: BLM
Elevation: 5,900 ft. (1,798 m)
Aspect: West
Slope: 5%
Transect bearing: 268° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)

Directions: From Hwy 6, go 0.2 miles north of mile marker 125. Turn right heading toward the Paul Bunyan Woodpile. Drive 1.6 miles to a four foot tall witness post on the right side of the road. The 0-foot stake for this study is 40 paces at 205 degrees magnetic from the witness post. The site is marked by short green fenceposts. The 0-foot stake is marked by browse tag 74.

Map Name: McIntyre



Diagrammatic Sketch:



Township: 12S Range: 3W Section: 23

GPS: NAD 83, UTM 12S 401867 E 4401625 N

PAUL BUNYON BURN AND CHAIN - TREND STUDY NO. 19C-20

Site Information

Site Description: The study monitors a burned and seeded pinyon-juniper woodland on land administered by the Bureau of Land Management as part of the Riley Spring allotment. This study was part of the extensive Leamington burn complex which affected approximately 138,340 acres of mostly pinyon-juniper rangelands in 1996. Seed was applied aerially and the area was chained one-way with an Ely chain to help cover the seed and enhance establishment of the seeded species. A seed dribbler was used to apply fourwing saltbush (*Atriplex canescens*) seed during the chaining. Due to low browse cover, the area is of very little use for wintering big game. Deer and elk pellet groups have been sampled in minimal abundance. Rabbit pellet quadrat frequency was high in 2007, but low in other sample years (Table - Pellet Group Data).

Browse: Browse species are very rare on the site. Seeded fourwing saltbush provides the majority of the limited browse cover (Table - Browse Trends). Density of fourwing saltbush has decreased since the seeding project. Health of the sampled fourwing saltbush plants has been poor with high decadence and poor vigor in many of the sample years. Utilization of fourwing saltbush has been mostly light, but was very heavy in 2007. Other palatable browse species are present at low densities. These include Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), antelope bitterbrush (*Purshia tridentata*), green ephedra (*Ephedra viridis*), and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses dominate the vegetation on the site. The most abundant species are seeded perennial species including crested wheatgrass (*Agropyron cristatum*), Russian wildrye (*Elymus junceus*), and elongated wheatgrass (*Agropyron elongatum*). Native perennial species such as bluebunch wheatgrass (*A. spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*) occur less frequently. Cheatgrass (*Bromus tectorum*) is common on the site. Perennial forb species are rare on the site and provide limited cover. Annual forb species dominate the forb component on the site (Table - Herbaceous Trends). Musk thistle (*Carduus nutans*), a noxious weed, was present in 2007, but was not abundant and was not sampled in any quadrats (Table - Herbaceous Trends).

Soil: The soil is classified as a Jericho gravelly fine sandy loam, which occurs on alluvial fans. These soils are formed from alluvium derived from igneous rock, and are characterized as a shallow soil over a duripan and well drained (Soil Survey Staff 211). The soil texture is a sandy clay loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is moderately high on the site. Vegetation, litter, and pavement provide the majority of the protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2002.

Trend Assessments

Browse:

- **1998 to 1999 - stable (0):** Fourwing saltbush density decreased 14% from 280 plants/acre to 240 plants/acre, but cover remained similar at around 1%. Recruitment of young saltbush plants decreased from 50% to 25% of the population.
- **1999 to 2002 - down (-2):** Fourwing saltbush density decreased 33% to 160 plants/acre, and cover decreased to well below 1%. There was no new recruitment of young saltbush plants sampled. Decadence of fourwing saltbush increased from 8% to 63%, and poor vigor increased from 0% to 63%.
- **2002 to 2007 - down (-2):** Fourwing saltbush density decreased 75% to 40 plants/acre, and cover was minimal. Decadence and poor vigor decreased slightly, but both remained high at 50% of the population.
- **2007 to 2012 - stable (0):** Density of fourwing saltbush remained very low at 60 plants/acre. White rubber rabbitbrush increased from 20 plants/acre to 80 plants/acre.

Grass:

- **1998 to 1999 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 16%, and cover decreased from 15% to 12%.
- **1999 to 2002 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 10%, and cover increased to 20%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 5% to 2%.
- **2002 to 2007 - up (+2):** The sum of nested frequency of perennial grasses increased 36%, though cover remained similar at 19%.
- **2007 to 2012 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased to 24%.

Forb:

- **1998 to 1999 - stable (0):** Perennial forb species are very rare on the site.
- **1999 to 2002 - stable (0):** Perennial forb species are very rare on the site.
- **2002 to 2007 - stable (0):** Perennial forb species are very rare on the site.
- **2007 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19C, study no: 20

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
98	0.8	0.0	0.0	29.1	-3.3	0.5	0.0	**27.1**	Fair
99	0.9	0.0	0.0	23.7	-4.0	0.1	0.0	**20.7**	Poor
02	0.6	0.0	0.0	30.0	-1.6	0.5	0.0	**29.5**	Fair
07	0.2	0.0	0.0	30.0	-1.7	0.4	0.0	**28.9**	Fair
12	1.7	0.0	0.0	30.0	-1.9	0.3	0.0	**30.1**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 19C, Study no: 20

Type	Species	Nested Frequency					Average Cover %				
		'98	'99	'02	'07	'12	'98	'99	'02	'07	'12
G	Agropyron cristatum	$_{a}$133	$_{a}$139	$_{ab}$158	$_{b}$193	$_{b}$179	7.22	8.46	12.64	10.59	14.26
G	Agropyron elongatum	52	44	47	36	50	2.69	2.12	2.34	2.20	3.11
G	Agropyron spicatum	$_{a}$9	$_{a}$13	$_{a}$14	$_{ab}$17	$_{b}$37	.56	.78	1.44	.66	3.25
G	Bromus japonicus (a)	-	-	-	1	-	-	-	-	.00	-
G	Bromus tectorum (a)	$_{c}$270	$_{c}$265	$_{ab}$124	$_{b}$166	$_{a}$100	4.39	5.38	2.13	2.21	2.57
G	Elymus junceus	$_{b}$78	$_{a}$24	$_{a}$33	$_{b}$78	$_{a}$39	3.87	.45	3.65	5.00	3.20
G	Oryzopsis hymenoides	-	-	2	6	5	-	-	.06	.01	.33
G	Poa secunda	-	7	-	-	5	-	.02	-	-	.00
G	Sitanion hystrix	$_{ab}$4	$_{a}$4	$_{a}$-	$_{b}$15	$_{ab}$9	.21	.01	.00	.13	.19
Total for Annual Grasses		270	265	124	167	100	4.39	5.38	2.13	2.22	2.57
Total for Perennial Grasses		276	231	254	345	324	14.56	11.86	20.16	18.61	24.37
Total for Grasses		546	496	378	512	424	18.95	17.24	22.29	20.82	26.95
F	Alyssum alyssoides (a)	-	-	-	10	3	-	-	-	.30	.00
F	Alyssum desertorum (a)	$_{a}$13	$_{a}$27	$_{b}$122	$_{c}$298	$_{c}$300	.19	.10	.38	6.78	1.70

Type	Species	Nested Frequency					Average Cover %				
		'98	'99	'02	'07	'12	'98	'99	'02	'07	'12
F	Antennaria rosea	-	-	3	-	-	-	-	.00	-	-
F	Astragalus calycosus	10	6	7	1	11	.09	.04	.04	.15	.10
F	Calochortus nuttallii	2	-	-	-	-	.00	-	-	.00	-
F	Chaenactis douglasii	4	-	1	2	-	.03	-	.00	.03	-
F	Cryptantha sp.	3	7	-	1	-	.00	.01	-	.00	-
F	Descurainia pinnata (a)	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$28	$_{b}$15	-	-	-	.13	.03
F	Gilia sp. (a)	3	1	-	5	-	.00	.00	-	.01	-
F	Lactuca serriola (a)	$_{b}$35	$_{b}$49	$_{a}$11	$_{a}$12	$_{a}$5	.58	.36	.19	.03	.04
F	Lesquerella sp.	1	-	1	-	-	.01	-	.00	-	-
F	Lomatium sp.	3	-	-	1	-	.03	-	-	.00	-
F	Phlox hoodii	2	-	2	-	8	.00	-	.15	-	.03
F	Phlox longifolia	$_{a}$-	$_{a}$-	$_{b}$11	$_{ab}$4	$_{ab}$5	-	-	.02	.01	.01
F	Ranunculus testiculatus (a)	-	-	-	8	5	-	-	-	.01	.04
F	Salsola iberica (a)	$_{a}$1	$_{ab}$14	$_{b}$21	$_{a}$-	$_{a}$-	.03	.09	.22	-	-
F	Senecio multilobatus	-	-	-	1	-	-	-	-	.00	-
F	Sisymbrium altissimum (a)	$_{b}$20	$_{a}$2	$_{a}$-	$_{b}$22	$_{a}$-	.32	.07	-	.07	-
F	Streptanthus cordatus	9	-	1	-	-	.06	-	.01	-	-
F	Tragopogon dubius (a)	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$1	$_{b}$9	-	-	-	.00	.02
F	Zigadenus paniculatus	-	-	-	1	-	-	-	-	.00	-
Total for Annual Forbs		72	93	154	384	337	1.13	0.63	0.79	7.36	1.83
Total for Perennial Forbs		34	13	26	11	24	0.25	0.05	0.23	0.21	0.14
Total for Forbs		106	106	180	395	361	1.38	0.68	1.03	7.58	1.98

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

BROWSE TRENDS--
Management unit 19C, Study no: 20

Type	Species	Strip Frequency					Average Cover %				
		'98	'99	'02	'07	'12	'98	'99	'02	'07	'12
B	Atriplex canescens	14	11	8	2	3	.63	.73	.48	.15	.71
B	Chrysothamnus nauseosus albicaulis	0	0	0	1	3	-	-	-	-	.68
	Chrysothamnus viscidiflorus viscidiflorus	1	0	1	1	1					
	Ephedra viridis	0	1	0	0	0					
Total for Browse		15	12	9	4	7	0.63	0.73	0.48	0.15	1.39

CANOPY COVER, LINE INTERCEPT--
Management unit 19C, Study no: 20

Species	Percent Cover	
	'07	'12
Atriplex canescens	.21	2.66
Chrysothamnus nauseosus albicaulis	-	.95

BASIC COVER--
Management unit 19C, Study no: 20

Cover Type	Average Cover %				
	'98	'99	'02	'07	'12
Vegetation	21.46	24.41	24.92	27.09	30.46
Rock	4.19	4.36	3.43	2.34	2.78
Pavement	17.03	16.23	20.65	16.91	13.14
Litter	13.75	26.82	37.07	35.23	35.74
Cryptogams	0	0	0	.31	.06
Bare Ground	49.65	32.64	30.29	29.33	26.56

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 20, Paul Bunyon Burn and Chain

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.9	7.0	48.4	25.1	26.6	2.7	8.9	134.4	0.6

PELLET GROUP DATA--
Management unit 19C, Study no: 20

Type	Quadrat Frequency				
	'98	'99	'02	'07	'12
Rabbit	3	8	13	76	5
Horse	-	-	1	-	-
Elk	-	8	-	-	4
Deer	-	-	3	2	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
-	-	-
-	-	-
-	-	-

BROWSE CHARACTERISTICS--
Management unit 19C, Study no: 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)
Artemisia tridentata wyomingensis									
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	9/10
Atriplex canescens									
98	**280**	50	50	0	20	0	0	0	31/35
99	**240**	25	67	8	20	0	0	0	28/31
02	**160**	0	38	63	-	13	0	63	36/43
07	**40**	0	50	50	-	0	100	50	54/66
12	**60**	0	100	0	-	0	0	33	54/75

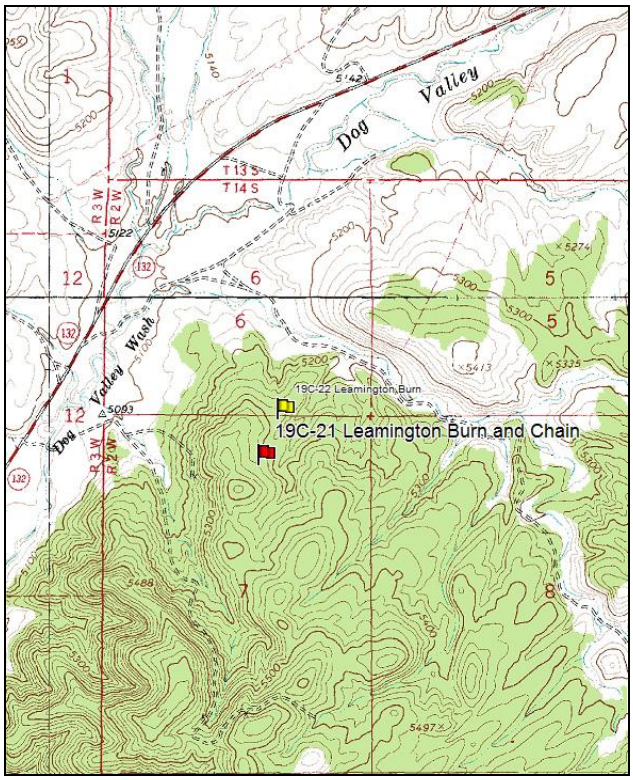
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus albicaulis									
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	33/60
07	**20**	0	100	-	-	0	0	0	20/39
12	**80**	25	75	-	-	75	0	25	29/45
Chrysothamnus viscidiflorus viscidiflorus									
98	**20**	0	100	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**20**	0	100	-	-	0	0	0	16/31
07	**20**	0	100	-	-	0	0	0	20/36
12	**20**	0	100	-	-	0	0	0	28/54
Cowania mexicana stansburiana									
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	30/33
07	**0**	0	0	-	-	0	0	0	36/42
12	**0**	0	0	-	-	0	0	0	53/73
Ephedra viridis									
98	**0**	0	0	-	-	0	0	0	-/-
99	**20**	100	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	22/30
07	**0**	0	0	-	-	0	0	0	30/42
12	**0**	0	0	-	-	0	0	0	37/56
Juniperus osteosperma									
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Purshia tridentata									
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	17/25
02	**0**	0	0	-	-	0	0	0	21/28
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

LEAMINGTON BURN AND CHAIN - TREND STUDY NO. 19C-21-12

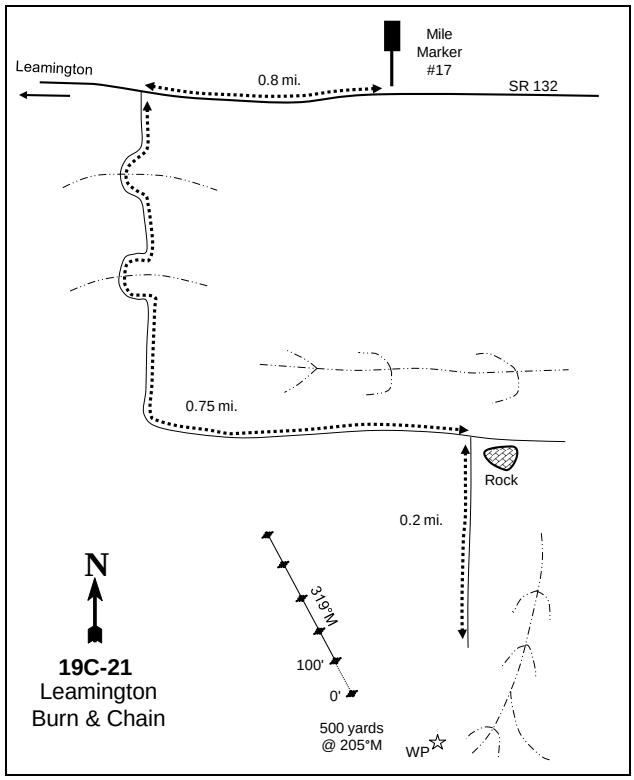
Vegetation Type: Perennial Grass
Range Type: Crucial Deer Winter/Spring, Substantial Elk Year-long
NRCS Ecological Site Description: Upland Shallow Hardpan (Pinyon-Utah Juniper), R028AY320UT or Upland Shallow Hardpan (Mountain Big Sagebrush), R028AY322UT
Land Ownership: BLM
Elevation: 5,300 ft. (1,615 m)
Aspect: Northeast
Slope: 13%
Transect bearing: 322° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: Rebar is on the 3ft mark on belt 4

Directions: From Nephi, drive about 17.1 miles on SR 132. Drive west 0.8 miles past mile marker 17 to a faint road on the left. Drive 0.75 miles past a water trough to a gully with a large boulder by the road. Go up the gully 0.2 miles to where it forks. Park here where the drainage divides and walk up the middle ridge about 500 yards at a bearing of 205 degrees magnetic to a witness post. The 0-foot stake is 20 feet from the witness post at about 319 degrees magnetic. The study is marked by 12-18 inch, green, steel fenceposts.

Map Name: Sage Valley



Diagrammatic Sketch:



Township: 14S Range: 2W Section: 6

GPS: NAD 83, UTM 12S 404313 E 4385970 N

LEAMINGTON BURN AND CHAIN - TREND STUDY NO. 19C-21

Site Information

Site Description: The study was established to monitor a burned, seeded, and chained area on land administered by the Bureau of Land Management (BLM) as part of the Rocky Ford allotment. The area is approximately 17 miles west of Nephi and 1 mile south of SR-132. The area burned during the summer of 1996 and is part of the Leamington burn complex, which burned 138,340 acres. Seed was applied aerially and the study was chained one-way with an Ely chain to cover the seed and enhance establishment of seeded species. Fourwing saltbush (*Atriplex canescens*) seed was also applied with a seed dribbler. Wildlife use has been limited in all sample years. Deer and elk pellet groups have been sampled in low abundance since 2002. Cattle sign has been sampled in low abundance since 2002 (Table - Pellet Group Data). Cattle were grazing during the 2002. Cattle use was much higher in the bottoms below the study.

Browse: Browse is limited, with fourwing saltbush, Nevada ephedra (*Ephedra nevadensis*), antelope bitterbrush (*Purshia tridentata*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) occurring in low densities. Broom snakeweed (*Gutierrezia sarothrae*) also occurs in low density on the site (Table - Browse Characteristics).

Herbaceous Understory: Perennial grass species dominate the vegetation on the site. Crested wheatgrass (*Agropyron spicatum*) is the most abundant perennial grass, but other common perennial species include elongated wheatgrass (*A. elongatum*), bluebunch wheatgrass (*A. spicatum*), smooth brome (*Bromus inermis*), Russian wildrye (*Elymus junceus*), Indian ricegrass (*Oryzopsis hymenoides*), and Sandberg bluegrass (*Poa secunda*). Cheatgrass (*Bromus tectorum*) is also common on the site, and has been the most abundant grass in cover at times. Perennial forb species are rare on the site and provide limited cover. Alfalfa (*Medicago sativa*) and small burnet (*Sanguisorba minor*) were seeded on the site, but have not been sampled since 2002. Annual forb species typically dominate the forb component on the site. Musk thistle (*Carduus nutans*), a noxious weed, was sampled in 1997 (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant-Reywat complex, likely as part of the Borvant component, which occurs on alluvial fans. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and somewhat excessively drained (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 7.0). Bare ground cover is moderately high. Vegetation, litter, and rock provide the majority of the protective cover on the site (Table - Basic Cover). The soil erosion condition was classified as stable in 2002 and 2007, but was moderate in 2012.

Trend Assessments

Browse:

- **1997 to 1998 - stable (0):** Browse species are very rare on the site.
- **1998 to 1999 - stable (0):** Browse species are very rare on the site.
- **1999 to 2002 - stable (0):** Browse species are very rare on the site.
- **2002 to 2007 - stable (0):** Browse species are very rare on the site.
- **2007 to 2012 - stable (0):** Browse species are very rare on the site.

Grass:

- **1997 to 1998 - up (+2):** The sum of nested frequency of perennial grasses increased 56%, cover increased from 7% to 19%. However, cheatgrass also increased significantly in nested frequency, cover increased from 1% to 10%.
- **1998 to 1999 - down (-2):** The sum of nested frequency of perennial grasses decreased 28%, and cover decreased to 13%. Cheatgrass did not change significantly in nested frequency, and cover remained high at 9%.

- **1999 to 2002 - up (+2):** The sum of nested frequency of perennial grasses increased 38%, and cover increased to 16%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 5%.
- **2002 to 2007 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased slightly to 17%.
- **2007 to 2012 - up (+2):** The perennial grass sum of nested frequency increased 40%, and cover increased to 25%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 5% to 2%.

Forb:

- **1997 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 1999 - stable (0):** Perennial forb species are very rare on the site.
- **1999 to 2002 - stable (0):** Perennial forb species are very rare on the site.
- **2002 to 2007 - stable (0):** Perennial forb species are very rare on the site.
- **2007 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 19C, study no: 21

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	0.0	0.0	0.0	14.6	-1.0	1.9	-2.0	**13.5**	Poor
98	0.0	0.0	0.0	30.0	-7.4	2.4	0.0	**25.0**	Poor-Fair
99	0.0	0.0	0.0	25.8	-7.0	0.3	0.0	**19.1**	Poor
02	0.2	0.0	0.0	30.0	-3.5	0.5	0.0	**27.1**	Fair
07	0.2	0.0	0.0	30.0	-3.5	0.5	0.0	**27.2**	Fair
12	1.8	0.0	0.0	30.0	-1.1	0.6	-2.0	**29.3**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 19C, Study no: 21

Type	Species	Nested Frequency						Average Cover %					
		'97	'98	'99	'02	'07	'12	'97	'98	'99	'02	'07	'12
G	Agropyron cristatum	$_{a}$144	$_{a}$152	$_{a}$130	$_{a}$132	$_{a}$165	$_{b}$220	3.69	6.94	5.96	5.63	7.93	14.61
G	Agropyron elongatum	$_{a}$39	$_{bc}$96	$_{ab}$74	$_{c}$113	$_{ab}$58	$_{a}$31	.98	4.71	2.33	4.30	2.61	2.22
G	Agropyron intermedium	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$5	$_{a}$20	$_{b}$85	-	-	-	.03	.13	1.62
G	Agropyron spicatum	27	47	31	47	47	44	1.25	3.46	2.72	3.67	3.35	2.60
G	Bromus inermis	$_{a}$9	$_{ab}$30	$_{ab}$20	$_{b}$39	$_{ab}$16	$_{b}$36	.22	.73	.65	.24	.15	.25
G	Bromus japonicus (a)	-	-	-	3	-	-	-	-	-	.03	-	-
G	Bromus tectorum (a)	$_{a}$98	$_{cd}$318	$_{d}$351	$_{c}$294	$_{cd}$326	$_{b}$174	1.35	9.86	9.38	4.69	4.65	1.47
G	Dactylis glomerata	18	28	10	-	-	-	.70	.65	.09	-	-	-
G	Elymus cinereus	-	-	-	-	-	3	-	-	-	-	.00	.41
G	Elymus junceus	$_{a}$-	$_{ab}$22	$_{a}$3	$_{b}$27	$_{b}$36	$_{ab}$9	-	.91	.15	.67	.69	.19
G	Oryzopsis hymenoides	26	28	25	17	21	18	.37	1.47	.95	.35	1.02	.58
G	Poa fendleriana	4	-	-	-	1	3	.01	-	-	-	.03	.15
G	Poa secunda	$_{a}$4	$_{abc}$19	$_{ab}$11	$_{bc}$38	$_{c}$46	$_{d}$128	.06	.58	.05	.61	.58	1.73
G	Stipa comata	-	-	-	-	3	2	-	-	-	-	.03	.18
G	Vulpia octoflora (a)	-	-	-	-	1	-	-	-	-	-	.00	-

Type	Species	Nested Frequency						Average Cover %					
		'97	'98	'99	'02	'07	'12	'97	'98	'99	'02	'07	'12
Total for Annual Grasses		98	318	351	297	327	174	1.35	9.86	9.38	4.73	4.66	1.47
Total for Perennial Grasses		271	422	304	418	413	579	7.30	19.46	12.91	15.55	16.56	24.55
Total for Grasses		369	740	655	715	740	753	8.66	29.33	22.29	20.28	21.22	26.03
F	Alyssum desertorum (a)	$_{a}$-	$_{a}$2	$_{a}$4	$_{a}$10	$_{b}$253	$_{b}$280	-	.00	.00	.03	1.39	1.09
F	Astragalus beckwithii	3	-	-	5	-	2	.00	-	-	.04	-	.03
F	Astragalus calycosus	$_{ab}$12	$_{ab}$7	$_{b}$14	$_{ab}$1	$_{a}$-	$_{ab}$6	.12	.09	.07	.00	-	.21
F	Astragalus eurekensis	-	-	-	-	-	1	-	-	-	-	-	.00
F	Astragalus sp.	6	6	3	-	8	-	.18	.19	.03	-	.07	-
F	Calochortus nuttallii	-	-	-	-	1	-	.00	-	-	-	.00	-
F	Camelina microcarpa (a)	-	2	-	-	1	-	-	.03	-	-	.00	-
F	Carduus nutans (a)	$_{b}$16	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	.04	-	-	-	-	-
F	Chaenactis douglasii	$_{b}$10	$_{ab}$10	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	.32	.24	-	-	-	-
F	Collinsia parviflora (a)	-	-	-	-	-	3	-	-	-	-	-	.00
F	Convolvulus arvensis	-	-	-	-	-	7	-	-	-	-	-	.01
F	Cryptantha sp.	1	-	-	-	1	5	.00	-	-	-	.00	.01
F	Descurainia pinnata (a)	$_{ab}$15	$_{a}$1	$_{a}$-	$_{a}$-	$_{b}$32	$_{a}$2	.10	.02	-	-	1.00	.03
F	Draba sp. (a)	-	1	1	-	5	9	-	.00	.00	-	.01	.02
F	Gilia sp. (a)	$_{b}$23	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	.92	-	-	-	-	-
F	Lactuca serriola (a)	$_{a}$-	$_{b}$15	$_{b}$30	$_{a}$-	$_{a}$-	$_{a}$-	-	.38	.53	-	-	-
F	Lesquerella sp.	5	4	-	-	-	-	.01	.16	-	-	-	-
F	Medicago sativa	1	4	1	1	-	-	.11	.29	.01	.03	-	-
F	Nicotiana attenuata (a)	1	-	-	-	-	-	.00	-	-	-	-	-
F	Phlox hoodii	-	1	1	4	3	1	-	.00	.00	.18	.15	.03
F	Phlox longifolia	4	-	3	-	-	3	.01	-	.00	-	-	.00
F	Ranunculus testiculatus (a)	$_{a}$7	$_{a}$-	$_{a}$-	$_{b}$52	$_{c}$196	$_{ab}$28	.02	-	-	.24	.84	.06
F	Salsola iberica (a)	-	-	1	-	-	-	-	-	.00	-	-	-
F	Sanguisorba minor	2	3	2	-	-	-	.15	.18	.03	-	-	-
F	Senecio multilobatus	-	2	-	-	-	-	-	.03	-	-	-	-
F	Sisymbrium altissimum (a)	-	-	1	-	5	-	-	-	.03	-	.06	-
F	Streptanthus cordatus	$_{b}$8	$_{a}$-	$_{a}$-	$_{a}$-	$_{ab}$7	$_{a}$-	.02	-	-	-	.01	-
F	Tragopogon dubius (a)	$_{a}$-	$_{a}$-	$_{ab}$4	$_{a}$-	$_{a}$-	$_{b}$8	-	-	.00	-	-	.05
Total for Annual Forbs		62	21	41	62	492	330	1.09	0.44	0.58	0.27	3.31	1.26
Total for Perennial Forbs		52	37	24	11	20	25	0.95	1.19	0.16	0.25	0.24	0.30
Total for Forbs		114	58	65	73	512	355	2.05	1.63	0.74	0.52	3.55	1.56

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

BROWSE TRENDS--
Management unit 19C, Study no: 21

Type	Species	Strip Frequency						Average Cover %					
		'97	'98	'99	'02	'07	'12	'97	'98	'99	'02	'07	'12
B	Atriplex canescens	0	1	1	1	1	2	.03	-	-	.15	.00	.41
B	Chrysothamnus nauseosus albicaulis	0	0	0	0	1	1	-	-	-	-	.15	1.00
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	0	0	0	0						
B	Ephedra nevadensis	0	1	0	1	0	0	-	-	-	.00	-	-
B	Gutierrezia sarothrae	16	11	22	19	13	4	.07	.59	.52	.31	.19	.01
B	Purshia tridentata	0	1	1	0	1	0						
Total for Browse		16	15	24	21	16	7	0.10	0.59	0.52	0.46	0.35	1.41

CANOPY COVER, LINE INTERCEPT--
Management unit 19C, Study no: 21

Species	Percent Cover	
	'07	'12
Atriplex canescens	.06	.76
Chrysothamnus nauseosus albicaulis	-	1.04
Gutierrezia sarothrae	.11	.18

BASIC COVER--
Management unit 19C, Study no: 21

Cover Type	Average Cover %					
	'97	'98	'99	'02	'07	'12
Vegetation	10.43	34.11	25.44	24.21	27.25	31.78
Rock	16.54	20.72	15.36	20.31	17.49	17.15
Pavement	13.43	10.18	3.30	5.80	7.74	5.29
Litter	9.42	27.58	21.86	30.73	36.31	40.67
Cryptogams	1.96	0	0	.01	.19	.41
Bare Ground	39.39	27.02	21.77	29.36	17.11	24.26

SOIL ANALYSIS DATA --

Management unit 19C, Study no: 21, Leamington Burn and Chain

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.8	7.0	46.0	33.1	20.9	3.0	12.3	195.2	0.9

PELLET GROUP DATA--
Management unit 19C, Study no: 21

Type	Quadrat Frequency					
	'97	'98	'99	'02	'07	'12
Rabbit	2	3	11	5	66	15
Elk	1	4	2	-	3	3
Deer	3	-	1	2	2	2
Cattle	-	-	4	2	1	-

Days use per acre (ha)		
'02	'07	'12
-	-	-
3 (8)	2 (5)	8 (20)
1 (2)	2 (5)	-
9 (21)	14 (34)	12 (30)

BROWSE CHARACTERISTICS--
Management unit 19C, Study no: 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)
Artemisia tridentata vaseyana									
97	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	17/24
07	**0**	0	0	-	-	0	0	0	36/45
12	**0**	0	0	-	-	0	0	0	38/62
Atriplex canescens									
97	**0**	0	0	-	20	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	34/41
99	**20**	0	100	-	-	0	100	0	31/28
02	**20**	0	100	-	-	0	0	0	26/30
07	**20**	0	100	-	-	0	0	0	56/67
12	**40**	0	100	-	-	0	50	0	48/52
Chrysothamnus nauseosus albicaulis									
97	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	23/20
99	**0**	0	0	0	-	0	0	0	27/26
02	**0**	0	0	0	-	0	0	0	12/12
07	**20**	0	0	100	-	0	0	0	36/50
12	**20**	0	100	0	-	0	0	0	30/45
Chrysothamnus viscidiflorus viscidiflorus									
97	**0**	0	0	-	-	0	0	0	-/-
98	**20**	100	0	-	-	0	0	100	-/-
99	**0**	0	0	-	-	0	0	0	18/31
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	10/17
12	**0**	0	0	-	-	0	0	0	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)
Ephedra nevadensis									
97	**0**	0	0	-	-	0	0	0	-/-
98	**20**	100	0	-	-	0	0	0	16/22
99	**0**	0	0	-	-	0	0	0	11/28
02	**20**	0	100	-	-	0	0	0	19/28
07	**0**	0	0	-	-	0	0	0	20/35
12	**0**	0	0	-	-	0	0	0	27/43
Gutierrezia sarothrae									
97	**500**	0	100	0	-	0	0	0	-/-
98	**400**	0	100	0	20	0	0	0	12/18
99	**820**	12	88	0	20	0	0	0	11/16
02	**680**	6	79	15	-	0	0	12	6/10
07	**480**	21	58	21	160	0	0	17	10/16
12	**100**	20	80	0	-	0	0	0	7/12
Juniperus osteosperma									
97	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Leptodactylon pungens									
97	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**0**	0	0	-	-	0	0	0	7/12
12	**0**	0	0	-	-	0	0	0	7/13
Purshia tridentata									
97	**0**	0	0	-	-	0	0	0	-/-
98	**20**	100	0	-	-	0	0	0	-/-
99	**20**	100	0	-	-	0	0	0	-/-
02	**0**	0	0	-	-	0	0	0	-/-
07	**20**	0	100	-	-	0	100	0	12/24
12	**0**	0	0	-	-	0	0	0	-/-

SUMMARY
WILDLIFE MANAGEMENT UNIT 19C - WEST DESERT, NORTH TINTIC

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which inlude **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. Seven interagency range trend studies were sampled in Unit 19C during the summer of 2012.

Five studies [Sunrise Canyon (19C-12), Dennis Spring (19C-13), Upper Broad Canyon (19C-15), Nephi Dump (19C-16), and Furner Valley (19C-18)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush communities that support other important browse species. Two studies [Paul Bunyon Burn and Chain (19C-20) and Leamington Burn and Chain (19C-21)] are categorized as low potential sites for deer winter range, and sample burned sagebrush communities that are now dominated by seeded perennial grasses.

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 North Central division (Division 3). The South Central division had a historic annual mean precipitation of 16.51 inches from 1895 to 2012. The mean annual PDSI of the North Central division displays a cycle of several wet years followed by several drought years over the course of study years (Figure 1 and Figure 2) (Time Series Data 2013).

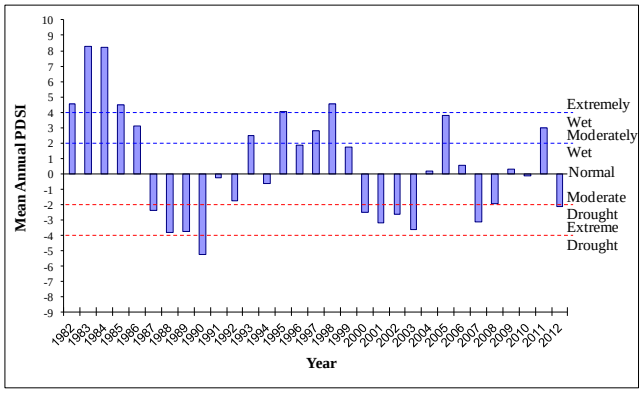


Figure 1. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the North Central division (Division 3). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

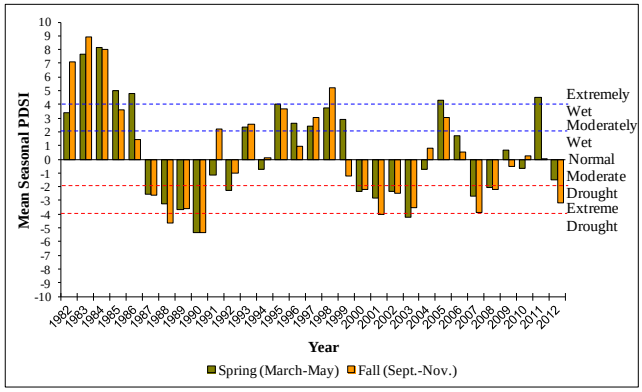


Figure 2. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the North Central division (Division 3). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

The 1961-1990 mean annual precipitation was 12-14 in. on the Leamington Burn and Chain study; 14-16 in. on the Nephi Dump, Furner Valley, and Paul Bunyon Burn and Chain studies; 16-18 in. on the Upper Broad Canyon study; 18-20 in. on the Sunrise Canyon study; and 20-24 in. on the Dennis Spring study (PRISM Climate Group 2011).

Mid-Level Potential Deer Range

Browse: The mid-level potential site cumulative median browse trend decreased slightly in 1989, but decreased further in 2007 (Figure 6a). Mountain big sagebrush is a primary browse species on all of the mid-level potential studies. The mean density of mountain big sagebrush increased significantly in 2002, and increased significantly again in 2012 (Figure 4a). The mean cover of mountain big sagebrush decreased significantly in 2002, but increased significantly in 2012 returning to 1997 levels (Figure 4b). Most of the changes in the mean density and cover of mountain big sagebrush are due to a fire on the Dennis Spring study in 2001. Cover of sagebrush was initially reduced on the Dennis Spring study following the fire, but a large number of young plants increased the density to beyond pre-fire levels. This site has continued to increase in density and cover since 2002. A mowing treatment between 2002 and 2007 on the Furner Valley study reduced the sagebrush density and cover on that site.

Herbaceous Understory: The mid-level potential median cumulative grass trend increased slightly in 1989, then increased slightly again in 2012 (Figure 6b). Perennial grass species are typically diverse and abundant on these study sites. The mean sum of nested frequency and cover of perennial grasses has

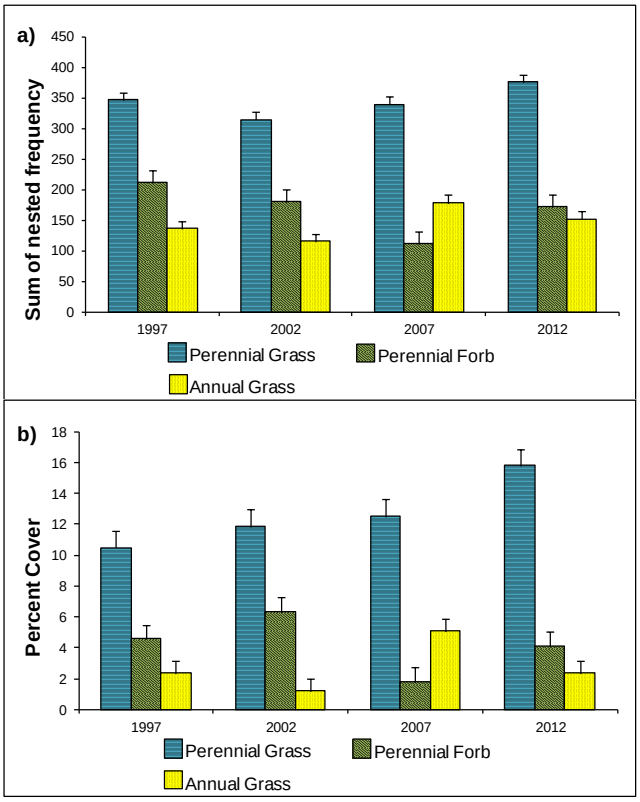


Figure 3. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, and annual grass sum of nested frequency by year for WMU 19C, West Desert, North Tintic. **b)** Mid-level potential sites mean perennial grass (-POBU), perennial forb, and annual grass cover by year for WMU 19C.

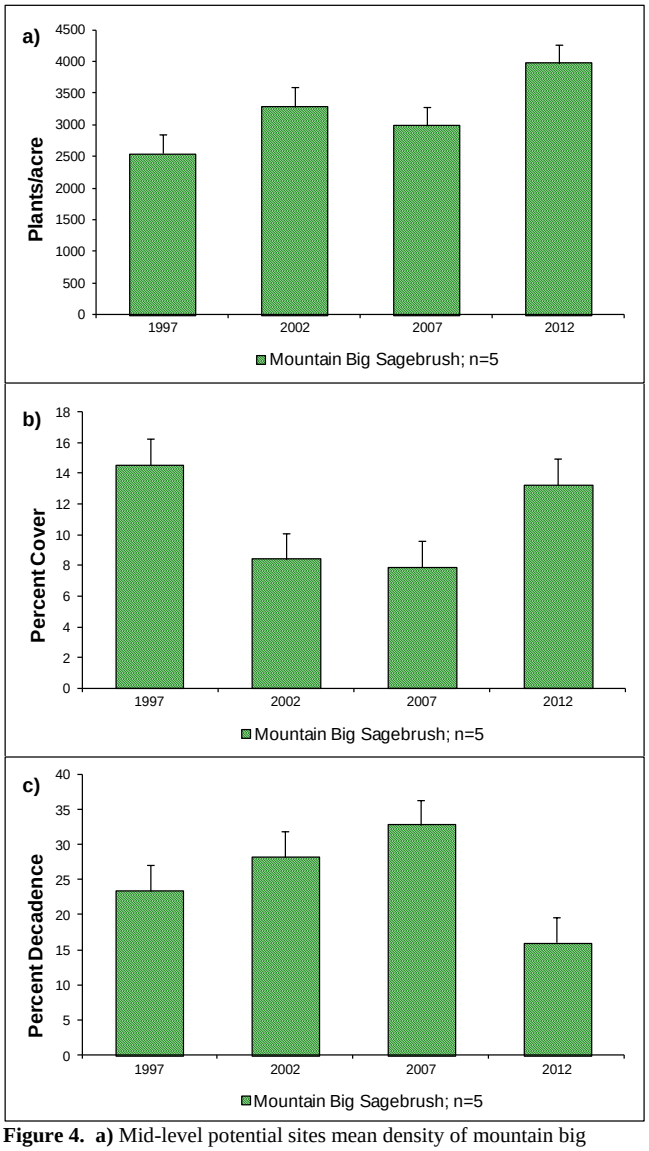


Figure 4. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) by year for WMU 19C, West Desert, North Tintic. **b)** Mid-level potential sites mean cover of mountain big sagebrush by year for WMU 19C. **c)** Mid-level potential mean decadence of mountain big sagebrush by year for WMU 19C.

steadily increased since 1997 (Figure 3a and Figure 3b). Most of the increase in cover of perennial grasses is due to increases on the Dennis Spring and Furner Valley studies following the wildfire and treatment on those sites. Annual grass species including cheatgrass (*Bromus tectorum*) are common on these study sites, but typically occur in low frequency and cover (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend has decreased slightly in 2007 (Figure 6b). Perennial forb species are limited on many of the sites, but are common on the Sunrise Canyon and Dennis Spring studies. The mean sum of nested frequency and cover of perennial forb species was significantly lower in 2007 than the other sample years (Figure 3a and Figure 3b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these mid-level potential study areas, but wildlife use is generally fairly low. The mean abundance of deer pellet groups was moderate on most studies in 2002, but has decreased in each subsequent sample year. The mean abundance of elk pellet groups has been generally low since 1997 (Figure 8). Cattle sign was only sampled on the Furner Valley study, but occurred in high abundance on the site in 2012.

Deer Desirable Components Index (DCI): The mid-level potential deer DCI was poor in 2007, but has been poor-fair to fair in the other sample years. Most of the decrease in score is due to decreases in preferred browse cover from the mower treatment on the Furner Valley study (Table 1 and Figure 7).

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
97	15.5	8.0	4.0	25.9	-2.8	1.5	-0.7	**51.6**	Poor-Fair
02	15.1	4.8	2.6	29.2	-1.3	1.8	0.0	**52.2**	Fair
07	7.4	5.2	0.9	27.7	-5.3	1.4	0.0	**37.3**	Poor
12	11.3	8.8	1.6	30.0	-2.4	1.6	0.0	**50.9**	Poor-Fair

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=5) by year for WMU 19C, West Desert, Tintic. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Discussion: The sagebrush on these mid-level potential communities appears to be recovering well from the disturbances that have occurred. Weedy annual species and bulbous bluegrass are present on the studies, but do not appear to be limiting potential on these studies.

Low Potential Deer Range

Browse: These studies were established on reseeded areas following the Leamington Burn Complex fire in 1996. Browse species are very limited on the studies.

Herbaceous Understory: The low potential median cumulative grass trend has steadily increased since 2002 (Figure 6b). The mean sum of nested frequency and cover of perennial grasses has increased over the course of the study years (Figure 5a and Figure 5b). Annual grass species including cheatgrass (*Bromus tectorum*) are common, but have decreased on both study sites over the duration of the study years (Figure 5a and Figure 5b).

The low potential median cumulative forb trend has remained stable since the outset of the studies (Figure 6b). Perennial forb species are rare on both of the studies. The mean sum of nested frequency and cover of perennial forb species has remained low since 1998 (Figure 5a and Figure 5b).

Occupancy: Animal use is low on these sites with very few pellet groups sampled.

Deer Desirable Components Index (DCI): The low potential deer DCI has remained poor-fair to fair throughout the sample years. Almost all of the score is provided by perennial grass species (Table 2 and Figure 7).

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	0.4	0.0	0.0	29.6	-5.3	1.4	0.0	**26.1**	Poor-Fair
02	0.4	0.0	0.0	30.0	-2.6	0.5	0.0	**28.3**	Fair
07	0.2	0.0	0.0	30.0	-2.6	0.5	0.0	**28.1**	Fair
12	1.8	0.0	0.0	30.0	-1.5	0.4	-1.0	**29.7**	Fair

Table 2. Low potential scale mean deer DCI scores and rankings (n=2) by year for WMU 19C, West Desert, North Tintic. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Discussion: Browse species are extremely limited on these burned studies. Perennial grasses have reestablished well and provide some forage value. However, animal use is very low and it is doubtful that these studies will be important range for big game until browse species have reestablished.

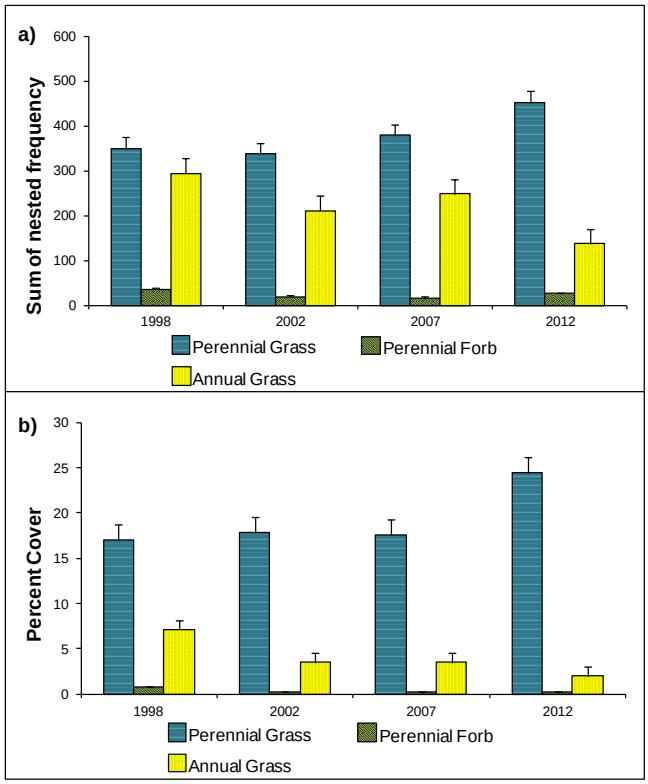


Figure 5. a) Low potential sites mean perennial grass, perennial forb, and annual grass sum of nested frequency by year for WMU 19C, West Desert, North Tintic. **b)** Low potential sites mean perennial grass, perennial forb, and annual grass cover by year for WMU 19C.

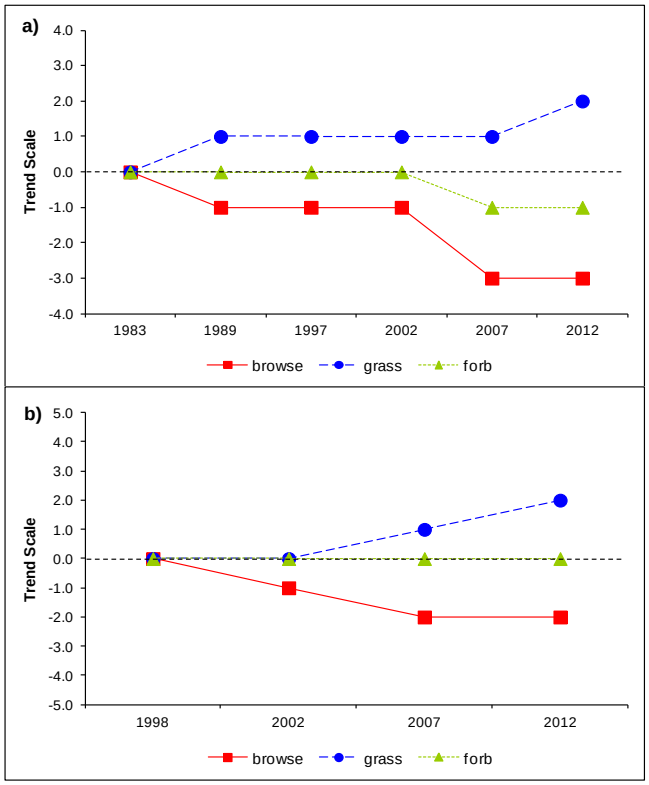


Figure 6. a) Mid-level potential sites cumulative median browse, grass, and forb trends by year for WMU 19C, West Desert, North Tintic. **b)** Low potential sites cumulative median browse, grass, and forb trends by year for WMU 19C.

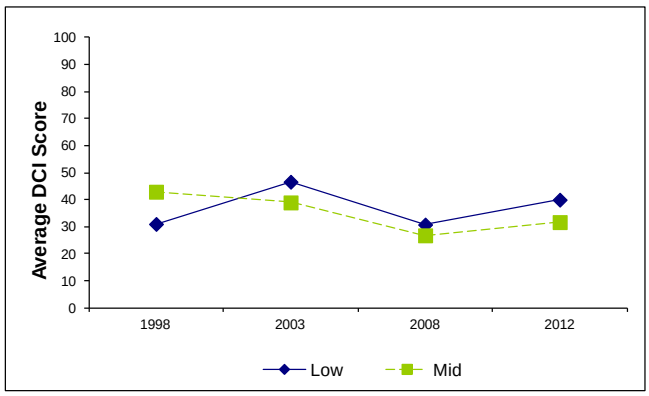


Figure 7. Mean mid-level (n=5) and low (n=2) potential scale deer DCI scores by year for WMU 19C, West Desert, North Tintic. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

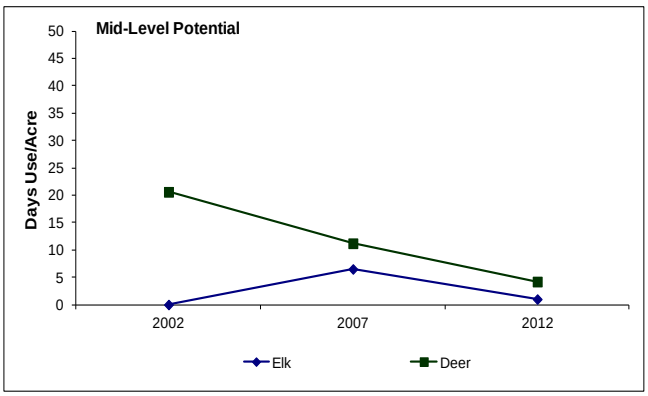
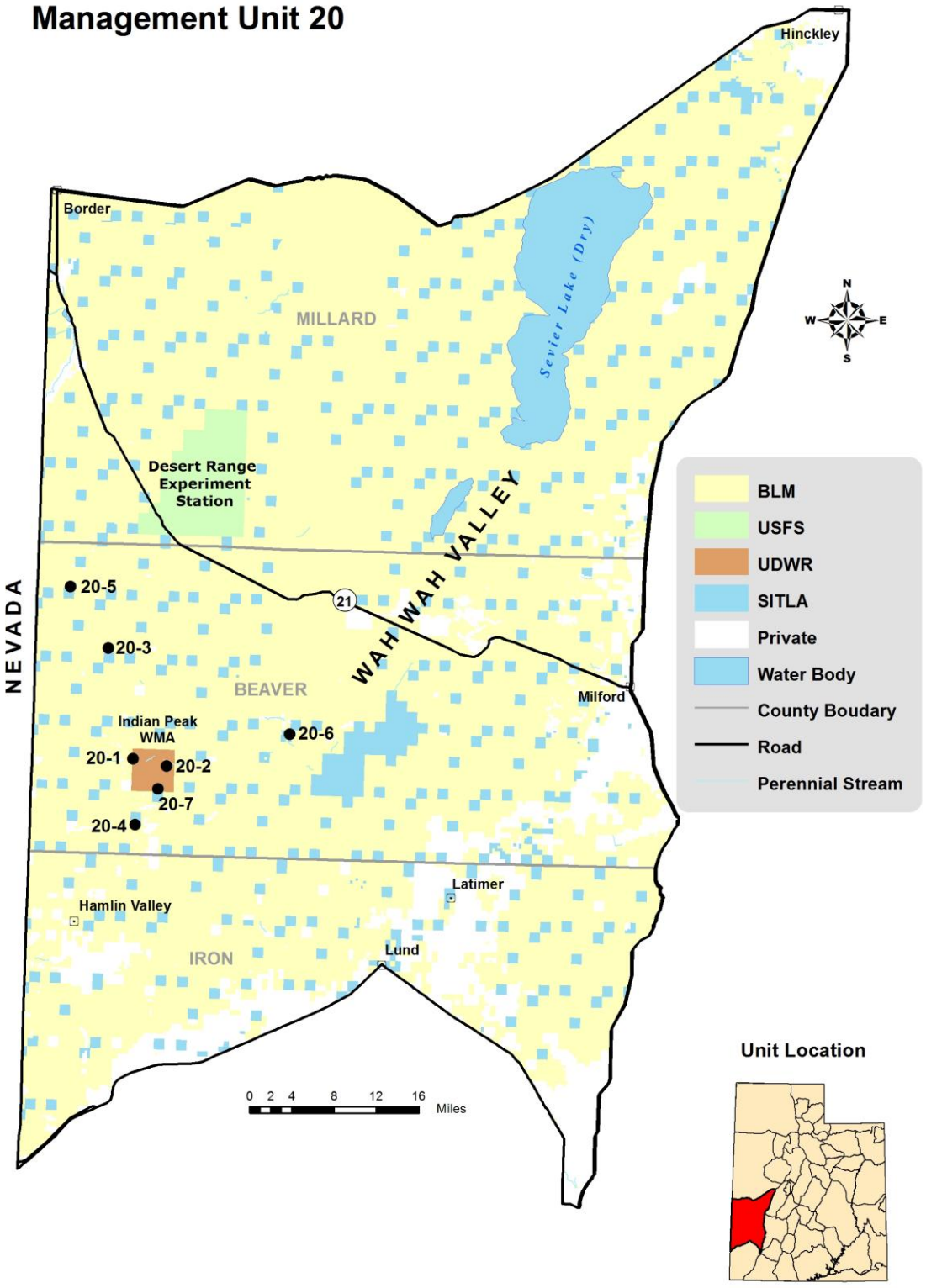


Figure 8. Mid-level potential sites mean animal days use/acre (n=5) by year for WMU 19C, West Desert, North Tintic.


Management Unit 20
Hinckley
Border
MILLARD
Sevier Lake (Dry)
Desert Range Experiment Station
WAH WAH VALLEY
21
NEVADA
20-5
20-3
BEAVER
Milford
Indian Peak WMA
20-6
20-1
20-2
20-7
20-4
Latimer
Hamlin Valley
IRON
Lund
0 2 4 8 12 16
Miles
N
W
E
S
BLM
USFS
UDWR
SITLA
Private
Water Body
County Boudary
Road
Perennial Stream
Unit Location

WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

Boundary Description

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

Management Unit Description

The Southwest Desert unit covers a large arid area along the Nevada border, although much of this is cold-desert valley bottoms and is not suitable habitat for mule deer. The Wah Wah, Needle, and San Francisco ranges provide approximately 937,449 acres of summer range for deer. However, most is lower quality summer range consisting of mountain brush types. There is little quality summer range due to the lack of aspen (*Populus tremuloides*) on these mountains. Winter range is estimated at 251,382 acres. Summer range for elk is estimated at only 68,239 acres with 123,046 acres of winter range (DWR 1998). All three mountains run north and south, with their drainages flowing to the east and west. With similar steep and rugged topography, the upper areas are quite susceptible to erosion of unprotected soils from high intensity summer storms. Gentle rolling slopes, foothills, and benches dominate below 7,500 feet (2,286 m). The elevation on the unit ranges from 4,700 feet (1,433 m) at the hardpan in Wah Wah Valley to 9,790 feet (2,984 m) at Indian Peak.

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

The big game range was inventoried by Coles and Pederson (1970) in 1969. The whole area is considered only marginal deer habitat due to the lack of good summer range. The composition of vegetation of nearly all of the area classified as deer range is typical of winter ranges throughout the state. Of the four vegetation types, Coles and Pederson (1970) recognized pinyon-juniper woodland as the most prevalent, covering 74% of the deer range. Sagebrush was second, covering 19% of the range. The grass-shrub type and seeded areas cover 4% and 3% of the range, respectively. The grass-shrub type is the most productive and in the most demand by both livestock and deer. Despite a scarcity of forbs which makes it poor summer range, most deer use the browse-shrub type extensively year-round. Rehabilitation projects, covering 21,882 acres (8,856 ha) of former pinyon and juniper range, have increased overall production. This has been due mostly to the establishment of healthy stands of seeded perennial grasses. Livestock and elk populations have benefitted most from these seeded areas. Deer may also have benefitted, but to a lesser extent due to the limited success of forb and browse establishment. The best seeding treatments for deer have been in the Indian Peaks area, where bitterbrush is common.

Competition among feral horses, livestock, and big game for the herbaceous vegetation around seeps, springs, and creeks is a problem. Because the forbs and succulent grasses typical of the summer diet of mule deer and elk are scarce throughout the range, the limited riparian areas where they do occur are vital. Unfortunately, livestock and feral horses also prefer these areas and use them extensively. Feral horses are especially

detrimental because of their tendency to trample vegetation and compact soils, which results in reduced forage production and erosion problems.

Range Trend Studies

Because of the limitations in this WMU as big game range, it had been given a low priority. Two permanent trend monitoring studies were established in 1985, Upper Indian Peak (20-1) and Lower Indian Peak (20-2). These studies were both on DWR lands in the Indian Peak Wildlife Management Area. Due to increasing competition with deer, elk, and wild horses, three additional trend studies were established in 1998 and one in 1999. These include: Mountain Home Seeding (20-3), Upper Hamblin Valley (20-5), Wah Wah Pass (20-6), and South Spring (20-7).

Seven interagency range trend studies were sampled in Unit 20 during the summer of 2012. A total of eight studies have been established within Unit 20 since 1985. Two studies were established in 1985: Upper Indian Peak (20-1) and Lower Indian Peak (20-2); three studies were established in 1998: Mountain Home Seeding (20-3), Upper Hamblin Valley (20-5), and Wah Wah Pass (20-6); two studies were established in 1999: South Spring (20-7) and Indian Peaks Willow (20R-2); and one study was established in 2012: Merrill's Camp (20-4). Because of the limitations in this WMU as big game range, it had been given a low priority. Upper Indian Peak and Lower Indian Peak are both on DWR lands in the Indian Peak Wildlife Management Area. The Mountain Home Seeding, Upper Hamblin Valley, Wah Wah Pass, and South Spring were established due to increasing competition with deer, elk, and wild horses.

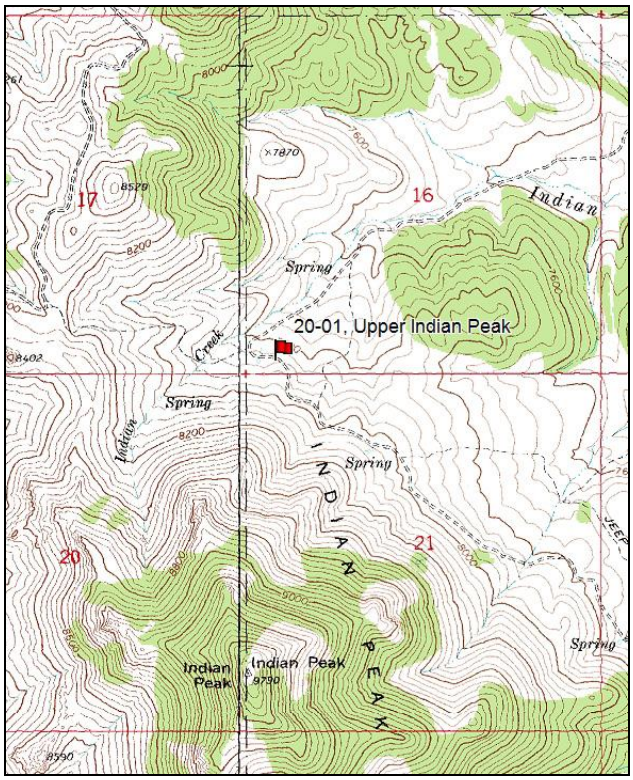
In 2003, one study (Indian Peaks Willow) was suspended. This study was suspended for various reasons and if the need arises in the future this study can be sampled again. To access maps, discussions, and data tables for suspended studies see: http://www.wildlife.utah.gov/range.

UPPER INDIAN PEAK - TREND STUDY NO. 20-1-12

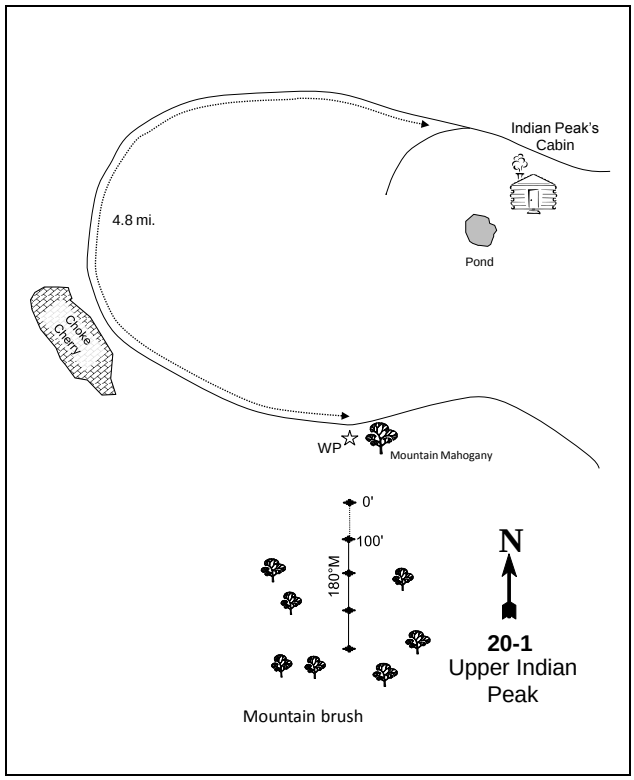
Vegetation Type: Mixed Mountain Brush
Range Type: Crucial Deer Summer
NRCS Ecological Site Description: Mountain Stony Loam (Browse), R047XA460UT
Land Ownership: UDWR
Elevation: 7,860 ft. (2,396 m)
Aspect: North
Slope: 20-30%
Transect bearing: 180° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions: From the Indian Peaks state cabin, travel west 0.4 miles to a fork. Turn left and cross the stream. Turn right at the fork on the other side of the stream at 0.1 miles. Stay right at all other forks and drive 4.8 miles to a curlleaf mahogany on the west side of the road and the witness post. It is 2.4 miles from the last fork to the witness post. The 0-foot baseline stake is 15 feet south of the mahogany. The study is marked by 2-3 foot tall steel rebar.

Map Name: Buckhorn Spring



Diagrammatic Sketch:



Township: 29S Range: 18W Section: 16

GPS: NAD 83, UTM 12S 248615 E 4240757 N

UPPER INDIAN PEAK - TREND STUDY NO. 20-1

Site Information

Site Description: This study samples an area of mixed mountain brush northeast of Indian Peak on land that is administered by the Utah Division of Wildlife Recourses (DWR). This limited mountain brush range type is important to the resident deer and elk herds in the area, and is used year-round except when there is deep snow. Single-leaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) are scattered throughout the site and provide some protective cover. There are several springs and a small perennial stream within 0.25 miles of this study. Deer, elk, feral horses, and trespass cattle are found in the area. Deer pellet groups have been sampled in low abundance since 1991. Small pellets, likely from fawn, were noted to be on the site in 2012. Elk pellet groups were sampled in low abundance in 1991, in moderate abundance in 1998 and 2008, but in high abundance in 2003 and 2012. Horse sign was sampled in low abundance in 2008. Cattle pats were sampled in low abundance in 1998 and cattle were in the area in 2012 (Table - Pellet Group Data). The allotment has been closed to livestock grazing since 1978.

Browse: The browse component is comprised of a variety of valuable and palatable species, including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and true mountain mahogany (*Cercocarpus montanus*). Other important but less abundant species include curlleaf mountain mahogany (*C. ledifolius*), bitterbrush (*Purshia tridentata*), and slenderbush eriogonum (*Eriogonum microthecum*). Preferred browse species composed the majority of total browse cover each sample year (Table - Browse Trends). Mountain big sagebrush is a dense, mature population that has decreased in density over the course of the study. The health of the sagebrush population has been vigorous to fair over the same duration of the sample years with decadence ranging from low in 1985 to moderate in 2008, and poor vigor ranging from low in 1985 to moderate in 2012. Recruitment of young sagebrush to the population was high and moderate in 1985 and 1998, respectively. However sagebrush recruitment has been low all other sample years. Utilization of sagebrush has been mostly light to moderate over the course of the study. Utah serviceberry is has maintained a moderately dense, mature population. The health of the serviceberry population has been vigorous most sample years. Serviceberry decadence has been low over the course of the study. Recruitment of young serviceberry plants to the population has been moderate most sample years, but was low in 2003 and 2012. Utilization of serviceberry has been moderate most sample years, but was heavy in 2003. True mountain mahogany is a moderately dense, mature population that has maintained a stable population over the course of the study. The health of the mahogany population has been vigorous over the same duration. Decadence of mahogany has been low over the duration of the study. Recruitment of young mahogany the population has been low each sample year. Utilization of mahogany has been moderate to heavy throughout the course of the study. Curlleaf mountain mahogany is scattered across the site with half of the population highlined into tree form, while the remaining population maintains a shrub growth form. Other browse species sampled on the study include snowberry (*Symphoricarpos oreophilus*), skunkbush sumac (*Rhus trilobata*), gray horsebrush (*Tetradymia canescens*), stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), and grizzlybear pricklypear (*Opuntia erinacea*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory has been abundant and diverse. Mutton bluegrass (*Poa fendleriana*), bluebunch wheatgrass (*Agropyron spicatum*), and Sandberg bluegrass (*Poa secunda*) have provided the majority of the grass cover, and mutton bluegrass was the most abundant grass in all sample years. No annual grasses have been sampled on the study. Most forbs are found growing in close proximity to the shrubs. Perennial forbs on the site are abundant and diverse across the site. Many valuable forage species are present that are very important in providing summer forage. The most common forb species include desert phlox (*Phlox austromontana*), Eaton fleabane (*Erigeron eatonii*), Eaton penstemon (*Penstemon eatonii*), Watson penstemon (*Penstemon watsonii*), silvery lupine (*Lupinus argenteus*), and northwestern paintbrush (*Castilleja angustifolia*) (Table - Herbaceous Trends). The paintbrush was heavily used in 1991 and 1998.

Soil: Natural Resource Conservation Service (NRCS) soil data was not available for this site. The soil is a sandy loam with a neutral soil reaction (pH 7.3) (Table - Soil Analysis Data). Bare ground cover is high with a moderate amount of litter and pavement, and a high amount of vegetation providing protective ground cover (Table - Basic Cover). There is moderate movement of rocks, soil, and litter, which has resulted in pedestalling around shrubs and bunchgrasses. In 2008 and 2012, several gullies were present on the study. The soil erosion condition was determined to be stable in 2003, but moderate in 2008 and 2012.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** The density of mountain big sagebrush increased 2% from 11,332 plants/acre to 11,598 plants/acre. Decadence of sagebrush increased from 3% to 23%, and poor vigor increased from 1% to 11% of the population. Recruitment of young sagebrush to the population decreased from 37% to 9%. The density of Utah serviceberry decreased 63% from 1,066 plants/acre to 398 plants/acre. Decadence of serviceberry increased from 0% to 17%, and poor vigor remained unobserved within the population. Recruitment of young serviceberry to the population increased from 0% to 33%. The density of true mountain mahogany decreased 23% from 1,464 plants/acre to 1,131 plants/acre.
- **1991 to 1998 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. The mountain big sagebrush population was vigorous with decadence decreasing to 13%, and poor vigor decreasing to 3%. Recruitment of young sagebrush to the population increased to 15%. Decadence of serviceerry decreased to 2%, and poor vigor was unobserved within the population. Recruitment of young serviceberry to the population increased slightly to 36%. Decadence of true mountain mahogany remained similar at 8%, and poor vigor deceased to 3%. Recruitment of young mahogany to the population remained similar at 19%.
- **1998 to 2003 - stable (0):** The density of mountain big sagebrush increased 4% from 6,840 plants/acre to 7,100 plants/acre, and cover decreased from 16% to 13%. Decadence of sagebrush increased slightly to 17%, and poor vigor remained at 3%. Recruitment of young sagebrush to the population decreased to 3%. The density of Utah serviceberry increased 2% from 900 plants/acre to 920 plants/acre, and cover decreased from 8% to 6%. The health of the serviceberry population remained vigorous. Recruitment of young serviceberry to the population decreased considerably to 9%. The density of true mountain mahogany increased 41% from 740 plants/acre to 1,940 plants/acre, and cover increased from 5% to 8%. Decadence of true mountain mahogany decreased to 0%, and poor vigor decreased to 3%. Recruitment of young mahogany to the population decreased to 13%.
- **2003 to 2008 - stable (0):** The density of mountain big sagebrush decreased 3% to 6,900 plants/acre, and cover decreased to 12%. Decadence of sagebrush increased to 24%, and poor vigor increased to 6%. Recruitment of young sagebrush to the population increased to 7%. The density of Utah serviceberry increased 4% to 960 plants/acre, and cover increased to 10%. Decadence of serviceberry increased to 13%, and poor vigor remaining unobserved. The density of true mountain mahogany decreased 23% to 800 plants/acre, and cover decreased to 6%. The health of the mahogany population remained vigorous. Recruitment of young mahogany to the population increased slightly to 18%.
- **2008 to 2012 - down (-2):** The density of mountain big sagebrush decreased 32% to 4,720 plants/acre, and cover decreased to 10%. Decadence of sagebrush decreased to 13%, but poor vigor increased to 28%. Recruitment of young sagebrush to the population decreased to 3%. The density of Utah serviceberry decreased 13% to 840 plants/acre, and cover decreased to 8%. Decadence of serviceberry decreased to 7%, and poor vigor increased to 5%. The density of true mountain mahogany decreased 3% to 780 plants/acre, but cover remained similar at 6%. Decadence of mahogany increased to 3%, and poor vigor increased to 10%. Recruitment of young mahogany to the population decreased to 5%.

Grass:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased 11%.

- **1991 to 1998 - stable (0):** The sum of nested frequencies of perennial grasses remained similar.
- **1998 to 2003 - slightly down (-1):** The sum of nested frequencies of perennial grasses decreased 19%, and cover decreased from 13% to 5%. Most of the increase was due to a decrease in mutton blue grass.
- **2003 to 2008 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased 19%, and cover increased to 8%. Mutton bluegrass increased significantly in nested frequency.
- **2008 to 2012 - slightly down (-1):** The sum of nested frequencies of perennial grasses decreased 12%, and cover decreased to 7%. Mutton bluegrass decreased significantly in nested frequency, but bluebunch wheatgrass increased significantly in nested frequency.

Forb:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequencies of perennial forbs increased 19%. Northwestern paintbrush and tapertip hawksbeard (*Crepis acuminata*) increased significantly in nested frequency.
- **1991 to 1998 - slightly down (-1):** The sum of nested frequencies of perennial forbs decreased 18%. The nested frequencies of northwestern paintbrush, tapertip hawksbeard, Eaton fleabane, desert phlox, and longleaf phlox (*Phlox longifolia*) decreased significantly.
- **1998 to 2003 - down (-2):** The sum of nested frequencies of perennial forbs decreased 43%. Cover of perennial forbs decreased from 15% to 7%. Wild onion (*Allium sp.*), northwestern paintbrush, desert parsley (*Lomatium sp.*), and Watson penstemon decreased significantly in nested frequency.
- **2003 to 2008 - up (+2):** The sum of nested frequencies of perennial forbs increased 37%. Cover of perennial forbs increased to 8%. Tapertip hawksbeard and rose pussytoes (*Antennaria rosea*) increased significantly in nested frequency.
- **2008 to 2012 - down (-2):** The sum of nested frequencies of perennial forbs decreased 32%. Cover of perennial forbs remained at 8%.

Trend Summary

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

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	-	-	-	6	-	-	-	.01	-	.00
G	Agropyron smithii	-	-	-	-	1	-	-	-	.00	-
G	Agropyron spicatum	a10	abc38	ab23	c54	bc48	d97	.26	.87	1.07	3.49
G	Koeleria cristata	1	-	6	-	1	1	.06	-	.00	.00
G	Leucopoa kingii	-	-	2	-	-	-	.01	-	-	-
G	Oryzopsis hymenoides	-	-	-	-	-	1	-	-	-	.15
G	Poa fendleriana	c267	c267	c265	a135	b213	a146	11.69	2.57	6.27	2.60
G	Poa secunda	a-	a4	a17	c63	bc44	ab25	.55	1.25	.75	.35
G	Sitanion hystrix	-	-	1	-	-	-	.06	-	-	-
G	Stipa comata	-	-	3	-	-	-	.15	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		278	309	317	258	307	270	12.78	4.70	8.11	6.61
Total for Grasses		278	309	317	258	307	270	12.78	4.70	8.11	6.61
F	Achillea millefolium	1	-	3	-	-	8	.00	-	-	.02
F	Agoseris glauca	a-	a-	b14	ab6	b13	ab6	.04	.04	.05	.02
F	Allium sp.	a-	a-	b18	a3	a3	a3	.09	.00	.03	.00

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
F	Androsace septentrionalis (a)	-	-	5	-	-	-	.01	-	-	-
F	Antennaria rosea	$_{a}$-	$_{a}$2	$_{a}$-	$_{a}$1	$_{b}$16	$_{a}$7	-	.00	.09	.03
F	Arabis drummondi	4	6	2	2	-	3	.01	.00	-	.00
F	Astragalus mollissimus	$_{b}$33	$_{b}$20	$_{b}$18	$_{a}$-	$_{a}$-	$_{a}$-	.14	-	-	-
F	Astragalus utahensis	$_{a}$-	$_{a}$-	$_{ab}$7	$_{a}$-	$_{b}$13	$_{ab}$5	.33	-	.05	.01
F	Balsamorhiza hookeri	$_{a}$-	$_{a}$-	$_{b}$35	$_{a}$-	$_{a}$2	$_{a}$-	.57	-	.03	-
F	Balsamorhiza sagittata	1	3	1	4	-	2	.03	.06	-	.03
F	Calochortus nuttallii	1	-	5	1	-	-	.04	.00	-	-
F	Castilleja angustifolia	$_{b}$62	$_{c}$113	$_{b}$66	$_{a}$25	$_{a}$9	$_{a}$-	1.40	.13	.07	-
F	Collinsia parviflora (a)	-	$_{a}$-	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$1	.05	-	-	.00
F	Crepis acuminata	$_{ab}$32	$_{c}$66	$_{ab}$39	$_{a}$16	$_{bc}$62	$_{a}$16	.29	.03	.44	.03
F	Cryptantha sp.	-	-	-	-	6	-	-	-	.04	-
F	Cymopterus sp.	$_{a}$-	$_{a}$-	$_{b}$25	$_{ab}$11	$_{b}$26	$_{a}$2	.32	.05	.06	.01
F	Delphinium nuttallianum	-	-	2	-	-	3	.00	-	-	.00
F	Erigeron eatonii	$_{c}$162	$_{c}$153	$_{b}$112	$_{b}$106	$_{b}$107	$_{a}$27	2.01	.92	.79	.22
F	Erigeron pumilus	$_{a}$3	$_{a}$5	$_{a}$3	$_{a}$-	$_{a}$2	$_{b}$17	.00	-	.03	.11
F	Eriogonum racemosum	41	35	24	18	23	20	.22	.17	.13	.39
F	Eriogonum umbellatum	27	40	46	28	42	28	.95	.21	.57	.29
F	Fritillaria atropurpurea	-	-	13	-	-	-	.05	-	-	-
F	Galium multiflorum	3	3	6	4	5	8	.18	.03	.04	.10
F	Lappula occidentalis (a)	-	-	3	-	-	-	.00	-	-	-
F	Lomatium sp.	$_{a}$-	$_{a}$-	$_{b}$38	$_{a}$6	$_{a}$-	$_{a}$-	.47	.01	-	-
F	Lupinus argenteus	$_{c}$42	$_{bc}$38	$_{abc}$20	$_{a}$11	$_{ab}$16	$_{abc}$26	.92	.72	1.08	.52
F	Lygodesmia spinosa	-	4	-	-	-	-	-	-	-	-
F	Microsteris gracilis (a)	-	-	3	-	-	-	.00	-	-	-
F	Penstemon eatoni	$_{ab}$7	$_{b}$17	$_{ab}$4	$_{ab}$6	$_{ab}$5	$_{a}$3	.15	.04	.06	.03
F	Penstemon watsonii	$_{ab}$21	$_{b}$22	$_{b}$20	$_{a}$2	$_{ab}$15	$_{ab}$12	1.24	.37	.99	1.54
F	Phlox austromontana	$_{b}$163	$_{b}$197	$_{a}$91	$_{a}$80	$_{a}$81	$_{a}$83	4.61	3.40	2.88	4.13
F	Phlox longifolia	$_{b}$69	$_{b}$86	$_{a}$33	$_{a}$30	$_{ab}$60	$_{a}$36	.15	.10	.19	.18
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{b}$15	$_{b}$13	$_{b}$10	$_{c}$35	.13	.08	.07	.29
F	Streptanthus cordatus	4	2	7	7	3	1	.01	.07	.03	.00
F	Unknown forb-perennial	5	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	23	0	0	1	0.08	0	0	0.00
Total for Perennial Forbs		681	812	667	380	519	351	14.46	6.48	7.76	8.01
Total for Forbs		681	812	690	380	519	352	14.54	6.48	7.76	8.02

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

BROWSE TRENDS--
Management unit 20, Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Amelanchier utahensis	30	30	29	32	8.40	5.89	9.63	7.66
B	Artemisia tridentata vaseyana	87	86	87	85	15.96	13.22	11.47	9.82
B	Cercocarpus ledifolius	4	4	4	8	.39	1.60	1.89	1.84
B	Cercocarpus montanus	30	32	29	36	5.22	7.63	5.76	6.20
B	Chrysothamnus parryi	0	14	1	7	-	.04	-	.15
B	Chrysothamnus viscidiflorus viscidiflorus	22	21	31	27	.91	1.05	1.46	1.09
B	Eriogonum microthecum	30	47	53	43	.79	1.09	1.18	1.57
B	Gutierrezia sarothrae	0	1	0	0	-	-	-	-
B	Opuntia erinacea	19	15	9	2	.22	.09	.21	.03
B	Pinus monophylla	2	0	1	3	-	-	-	.03
B	Purshia tridentata	3	4	3	5	.68	.66	1.16	1.67
B	Symphoricarpos oreophilus	35	40	46	36	1.87	3.34	5.87	3.62
B	Tetradymia canescens	5	10	8	5	.18	-	.04	.16
Total for Browse		45	54	58	49	34.66	34.63	38.70	33.87

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 1

Species	Percent Cover		
	'03	'08	'12
Amelanchier utahensis	11.14	12.44	12.16
Artemisia tridentata vaseyana	11.85	12.38	12.88
Cercocarpus ledifolius	1.25	2.01	2.70
Cercocarpus montanus	7.75	7.63	10.03
Chrysothamnus parryi	.43	.16	.13
Chrysothamnus viscidiflorus viscidiflorus	.50	1.10	1.70
Eriogonum microthecum	.43	1.53	1.48
Opuntia erinacea	.01	.11	-
Purshia tridentata	1.29	1.51	1.39
Symphoricarpos oreophilus	5.03	7.31	5.25
Tetradymia canescens	.10	.05	.21

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 1

Species	Average leader growth (in)		
	'03	'08	'12
Amelanchier utahensis	3.7	1.3	2.1
Cercocarpus ledifolius	3.0	1.8	2.1
Cercocarpus montanus	4.3	1.1	1.3
Purshia tridentata	3.1	1.8	2.0

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

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	12.50	14.50	49.77	42.25	46.03	42.27
Rock	1.00	1.75	4.53	2.73	3.42	2.93
Pavement	36.25	22.00	33.65	22.38	27.08	17.92
Litter	38.75	42.00	34.09	25.88	24.52	26.06
Cryptogams	0	0	.08	0	.03	0
Bare Ground	11.50	19.75	8.10	22.10	13.42	28.92

SOIL ANALYSIS DATA --

Management unit 20, Study no: 1, Upper Indian Peak

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.3	7.3	62.0	21.1	16.9	2.2	9.3	112.0	0.4

PELLET GROUP DATA--
Management unit 20, Study no: 1

Type	Quadrat Frequency			
	'98	'03	'08	'12
Sheep	-	-	-	1
Rabbit	19	-	25	1
Elk	19	24	27	25
Deer	14	3	6	10
Cattle	3	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
-	-	-	-
26 (64)	60 (149)	38 (94)	50 (122)
8 (20)	2 (5)	16 (40)	16 (40)
4 (10)	-	-	-

BROWSE CHARACTERISTICS--
Management unit 20, 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 utahensis									
85	**1066**	0	100	0	133	0	0	0	27/23
91	**398**	33	50	17	399	17	0	0	33/35
98	**900**	36	62	2	60	27	9	0	42/46
03	**920**	9	89	2	20	15	78	0	41/50
08	**960**	17	71	13	100	33	17	0	41/50
12	**840**	17	76	7	100	24	57	5	33/44
Artemisia tridentata vaseyana									
85	**11332**	36	61	3	1199	19	2	1	8/13
91	**11598**	9	68	23	66	50	31	11	8/18
98	**6840**	15	72	13	840	34	13	3	15/23
03	**7100**	3	80	17	-	25	.28	3	9/17
08	**6900**	7	69	24	40	23	10	6	8/20
12	**4720**	3	84	13	60	32	10	28	8/21

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Cercocarpus ledifolius									
85	**66**	100	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**100**	40	60	-	-	40	20	0	76/59
03	**100**	20	80	-	-	20	60	0	73/77
08	**80**	0	100	-	-	25	0	0	50/35
12	**200**	80	20	-	-	0	0	20	33/43
Cercocarpus montanus									
85	**1464**	14	82	5	333	36	0	0	30/12
91	**1131**	18	77	6	333	41	35	6	31/37
98	**740**	19	73	8	20	46	24	3	43/52
03	**1040**	13	87	0	-	12	81	0	39/51
08	**800**	18	83	0	80	33	28	0	37/45
12	**780**	5	92	3	20	33	49	10	37/52
Chrysothamnus parryi									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	-/-
03	**340**	0	94	6	-	6	24	0	7/10
08	**20**	0	100	0	-	0	100	0	14/14
12	**140**	0	71	29	-	0	0	29	7/9
Chrysothamnus viscidiflorus viscidiflorus									
85	**864**	23	69	8	-	0	0	0	8/6
91	**332**	40	40	20	-	20	0	0	9/11
98	**720**	11	72	17	20	11	0	0	10/14
03	**960**	0	94	6	-	19	4	0	10/12
08	**1100**	5	82	13	-	2	0	4	8/12
12	**900**	7	91	2	20	0	0	2	8/14
Eriogonum microthecum									
85	**10532**	16	75	8	666	0	0	3	6/4
91	**7131**	31	59	10	733	10	.93	7	7/7
98	**1000**	6	90	4	120	0	2	0	7/10
03	**2240**	1	97	2	-	4	2	0	7/8
08	**2600**	13	82	5	100	2	0	2	7/10
12	**1780**	3	94	2	-	7	3	6	6/10
Gutierrezia sarothrae									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	0	0	6/9
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

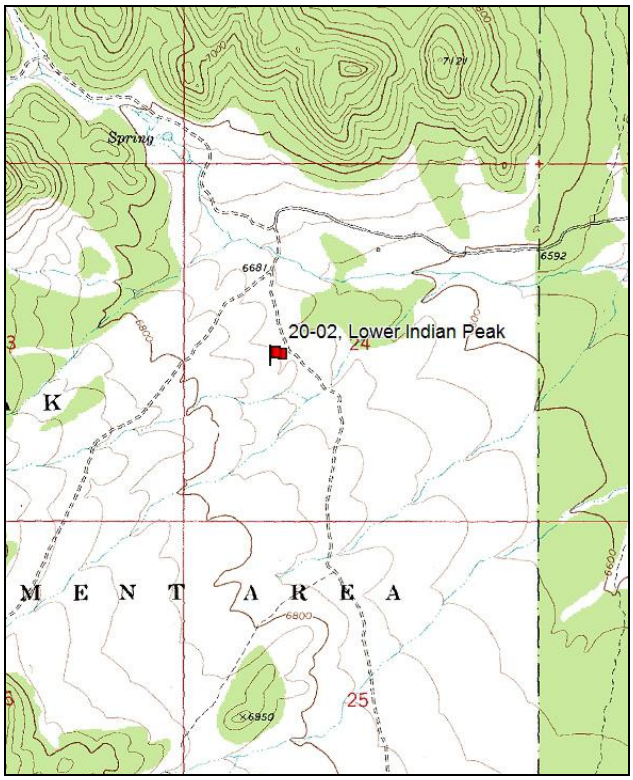
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Opuntia erinacea									
85	**3399**	33	67	0	133	0	0	2	5/8
91	**2599**	28	44	28	199	0	0	26	4/6
98	**440**	36	45	18	-	0	0	18	4/9
03	**420**	14	81	5	-	0	0	10	4/9
08	**200**	0	90	10	80	0	0	30	5/10
12	**60**	0	100	0	-	0	0	67	4/8
Pinus monophylla									
85	**266**	100	0	0	-	0	0	0	-/-
91	**66**	100	0	0	-	0	0	0	-/-
98	**60**	100	0	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**20**	0	0	100	-	0	0	100	-/-
12	**60**	100	0	0	-	0	0	0	-/-
Purshia tridentata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**66**	100	0	-	-	0	0	0	-/-
98	**60**	0	100	-	-	0	33	0	11/53
03	**80**	0	100	-	-	25	75	0	11/55
08	**140**	0	100	-	-	0	86	0	11/29
12	**100**	0	100	-	-	0	100	0	11/51
Rhus trilobata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	20	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Symphoricarpos oreophilus									
85	**1265**	53	47	0	133	0	0	0	10/9
91	**866**	62	38	0	-	15	0	0	12/22
98	**1420**	28	72	0	60	3	0	0	12/22
03	**1900**	12	85	3	-	8	0	2	11/22
08	**1900**	36	63	1	440	2	2	0	12/23
12	**1460**	15	85	0	60	23	0	3	9/20
Tetradymia canescens									
85	**532**	0	63	37	133	0	0	13	10/6
91	**399**	33	0	67	66	0	0	50	-/-
98	**100**	0	80	20	-	0	0	0	12/13
03	**320**	13	75	13	-	19	0	0	12/16
08	**340**	12	41	47	-	6	0	41	6/8
12	**100**	20	80	0	-	20	40	20	9/15

LOWER INDIAN PEAK - TREND STUDY NO. 20-2-12

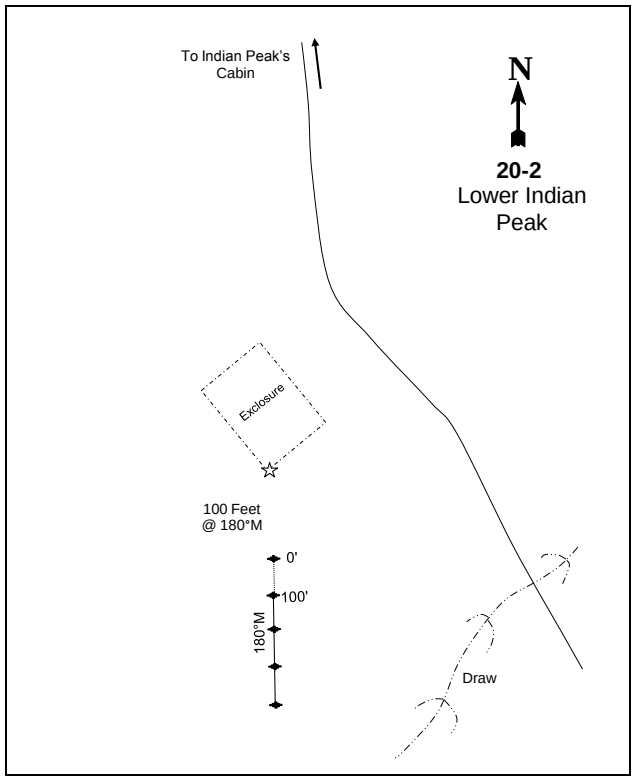
Vegetation Type: Black Sagebrush
Range Type: Substantial Deer Winter, Substantial Elk Year-long
NRCS Ecological Site Description: Upland Shallow Loam (Utah Juniper-Singleleaf Pinyon), R028AY324UT
Land Ownership: UDWR
Elevation: 6,740 ft. (2,054 m)
Aspect: East
Slope: 8-10%
Transect bearing: 180° magnetic
Belt placement: line 1 (11ft & 95ft), line 2 (71ft), line 3 (59ft), line 4 (59ft)
Note: Rebar is on the 6ft mark on belt 1, 8ft mark on belt 3, 1ft mark on belt 5.

Directions: From the Indian Peaks state cabin, travel 0.4 miles west to a fork. Turn left and cross the stream. Continue 0.1 miles and turn left at the fork. Go 0.3 miles to an exclosure which is about 180 ft off the right side of the road. The 0-foot stake is 100 feet south and in line with the fence of the southwest corner of the exclosure. The 0-foot stake is a rebar with browse tag 7076.

Map Name: Buckhorn Spring



Diagrammatic Sketch:



Township: 29S Range: 18W Section: 24

GPS: NAD 83, UTM 12S 253679 E 4239629 N

LOWER INDIAN PEAK - TREND STUDY NO. 20-2

Site Information

Site Description: This study is located on a chained and seeded section of land that is administered by the Utah Division of Wildlife Resources (DWR). In 1959, one hundred acres were chained and drill seeded with a mixture of grass, forb, and browse species. The study samples an area that is dominated by perennial grasses, black sagebrush (*Artemisia nova*), singleleaf pinyon pine *(Pinus monophylla*), and Utah juniper (*Juniperus osteosperma*). Although not included in the original treatment polygon, juniper and pinyon trees were likely included in the Indian Peak's WMA Lop and Scatter project (WRI Project #1784) in 2011. The project was designed to reduce encroaching pinyon and juniper trees in order to preserve habitat for deer, elk, and other wildlife species dependant on sagebrush steppe (WRI Database 2013). Pinyon and juniper trees dominate the surrounding area, which makes the treated areas very valuable to wintering big game. There is an ephemeral stream approximately 0.25 miles from the study. Deer pellet groups were sampled in low abundance since 1998. Elk pellet groups were sampled in low abundance in 1998, 2008 and 2012, but in high abundance in 2003. Cattle pats were sampled in low abundance in 2008 and 2012. Rabbit pellet group quadrat frequency was high in 2003 and 2008 (Table - Pellet Group Data).

Browse: The dominant preferred browse species on the study include black sagebrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and provide the majority of the preferred browse cover on the site (Table - Browse Trends). Antelope bitterbrush (*Purshia tridentata*), green ephedra (*Ephedra viridis*), and skunk bush sumac (*Rhus trilobata*) are also present in low abundance. Black sagebrush is a moderately dense, mature population. The health of the black sagebrush population has been vigorous most sample years. Decadence of black sagebrush was low at the outset of the study, but has been moderate to high since 2003. Recruitment of young black sagebrush to the population has steadily decreased over the duration of the study and was nominal in 2012. Utilization of black sagebrush has been moderate. Mountain big sagebrush is a sparse, mature population that has gradually increased in density over the course of the study. Decadence of mountain big sagebrush has been moderate since 1998, and poor vigor has been low since 1998, but was high in 2012. Recruitment of young mountain big sagebrush was low in 1998 and 2012, but was good in 2003 and 2008. Utilization of mountain big sagebrush has ranged from light in 1998 to heavy in 2012. Mountain big sagebrush plant size and cover has steadily decreased since 1998. Although antelope bitterbrush is not abundant on the site, bitterbrush utilization has been heavy since 1998, which indicates its high value for wildlife in the area (Table - Browse Characteristics). Singleleaf pinyon pine and Utah juniper are scattered throughout the study. The density of juniper trees increased from 1998 to 2008, but decreased in 2012 following the lop and scatter treatment (Table - Point-Quarter Tree Data). The woodland succession stage was considered to be between Phase I and II in 2008, but was considered to be in Phase I in 2012 (Tausch et al. 2009).

Herbaceous Understory: The herbaceous understory is diverse and dominated by perennial grasses. Crested wheatgrass (*Agropyron cristatum*) is the most abundant perennial grass and provides the majority of grass cover. Intermediate wheatgrass (*A. intermedium*), smooth brome (*Bromus inermis*), Russian wildrye (*Elymus junceus*), purple threeawn (*Aristida purpurea*), Sandberg bluegrass (*Poa secunda*), and the weedy species bulbous bluegrass (*P. bulbosa*) have been sampled consistently since 1998, but provided little cover. Crested wheatgrass and smooth brome showed heavy use in 2008. The invasive annual species cheatgrass (*Bromus tectorum*) is common on the site, but provides little cover. Fifteen forb species have been sampled since 1985, four of which are annuals. Desert phlox (*Phlox austromontana*), gilia (*Gilia sp.*), and scarlet globemallow (*Sphaeralcea coccinea*) are the most commonly sampled forb species (Table - Herbaceous Trends).

Soil: Natural Resource Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover is high, with a moderate amount of rock, vegetation, and litter providing protective ground cover (Table - Basic

Cover). Large out crops of rock are found throughout the site that indicate a shallow soil surface. The erosion condition was determined to be stable in 2003 and 2008, but slight in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - slightly up (+1):** The density of black sagebrush increased 15% from 1,332 plants/acre to 1,532 plants/acre. The health of the black sagebrush population is vigorous with decadence and poor vigor being absent from the population. Recruitment of young black sagebrush decreased slightly from 45% to 39%.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. The health of the black sagebrush population remained vigorous with decadence increasing slightly from 0% to 5%, and poor vigor remaining at 0%. Recruitment of young black sagebrush to the population decreased to 21%. Dying black sagebrush plants was not observed within the population.
- **1998 to 2003 - slightly down (-1):** The density of black sagebrush increased 8% from 1,320 plants/acre to 1,420 plants/acre. Decadence of black sagebrush increased to 42%, and poor vigor increased slightly to 7%. Recruitment of young black sagebrush to the population decreased to 7%. Cover of black sagebrush increased from 2% to 5%. The density of mountain big sagebrush decreased 52% from 500 plants/acre to 240 plants/acre. Decadence of big sagebrush decreased from 24% to 17%, but poor vigor increased from 4% to 8% of the population. Recruitment of young mountain big sagebrush to the population increased from 4% to 25%. Cover of mountain big sagebrush decreased from 4% to 2%.
- **2003 to 2008 - slightly up (+1):** The density of black sagebrush did not change at 1,420 plants/acre. However, decadence of black sagebrush decreased to 17%, and poor vigor remained similar at 8%. Recruitment of young black sagebrush to the population increased to 11%. Cover of black sagebrush remained at 5%. The density of mountain big sagebrush increased 83% to 440 plants/acre. Decadence of big sagebrush increased to 23%, and poor vigor increased to 14%. Recruitment of young mountain big sagebrush to the population remained similar at 23%. Cover of mountain big sagebrush decreased to 1%.
- **2008 to 2012 - slightly down (-1):** The density of black sagebrush decreased 24% to 1,080 plants/acre. Decadence of black sagebrush increased to 22%, but poor vigor remained similar at 9%. Recruitment of young black sagebrush to the population decreased to 4%. Cover of black sagebrush remained at 5%. The density of mountain big sagebrush increased 23% to 540 plants/acre. Decadence of big sagebrush decreased to 19%, but poor vigor increased to 30%. Recruitment of young mountain big sagebrush to the population decreased to 11%. Cover of mountain big sagebrush remained at 1%. Pinyon pine and Utah juniper cover was reduced following the lop and scatter treatment.

Grass:

- **1985 to 1991 - stable (0):** The sum of nested frequencies of perennial grasses decreased 6%.
- **1991 to 1998 - slightly down (-1):** The sum of nested frequencies of perennial grasses, excluding bulbous bluegrass, decreased 15%. Intermediate wheatgrass, purple threeawn, and blue grama (*Bouteloua gracilis*) decreased significantly in nested frequency. The invasive annual species cheatgrass was the second most common grass on the site.
- **1998 to 2003 - down (-2):** The sum of nested frequencies of perennial grasses, excluding bulbous bluegrass, decreased 42%. Crested wheatgrass and smooth brome decreased significantly in nested frequency. However, the nested frequency of cheatgrass also decreased significantly, and decreased in cover from 3% to less than 1%.
- **2003 to 2008 - up (+2):** The sum of nested frequencies of perennial grasses, excluding bulbous bluegrass, increased 32%. The invasive annual species cheatgrass increased significantly in nested frequency, and increased in cover to 1%.

- **2008 to 2012 - stable (0):** The sum of nested frequencies of perennial grasses, excluding bulbous bluegrass, increased 10%, and cover increased from 12% to 16%. Intermediate wheatgrass and Sandberg bluegrass increased significantly in nested frequency.

Forb:

- **1985 to 1991 - stable (0):** Perennial forbs are rare on the site.
- **1991 to 1998 - stable (0):** Perennial forbs remain rare on the site.
- **1998 to 2003 - stable (0):** Perennial forbs remain rare on the site.
- **2003 to 2008 - stable (0):** Perennial forbs remain rare on the site.
- **2008 to 2012 - stable (0):** Perennial forbs remain rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 20, 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
98	8.3	9.0	4.9	30.0	-2.1	0.8	0.0	**50.9**	Poor-Fair
03	10.7	0.7	4.9	9.2	-0.3	0.4	0.0	**25.6**	Very Poor
08	8.7	8.2	5.8	22.9	-1.0	0.4	0.0	**45.1**	Poor
12	8.5	8.4	2.3	29.8	-1.9	0.2	0.0	**47.3**	Poor

Trend Summary

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

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	$_{c}$256	$_{bc}$241	$_{bc}$230	$_{a}$156	$_{ab}$192	$_{a}$157	12.79	3.93	9.47	9.61
G	Agropyron dasystachyum	$_{b}$16	$_{ab}$2	$_{ab}$1	$_{ab}$1	$_{a}$-	$_{a}$-	.00	.00	-	-
G	Agropyron intermedium	$_{a}$32	$_{c}$86	$_{ab}$28	$_{a}$18	$_{a}$17	$_{b}$60	1.25	.26	.41	3.44
G	Aristida purpurea	$_{ab}$18	$_{b}$37	$_{a}$7	$_{a}$14	$_{a}$9	$_{a}$-	.06	.10	.33	-
G	Bouteloua gracilis	$_{a}$-	$_{b}$19	$_{a}$1	$_{a}$-	$_{a}$-	$_{a}$6	.00	-	-	.18
G	Bromus inermis	$_{ab}$25	$_{ab}$19	$_{b}$46	$_{a}$6	$_{ab}$14	$_{a}$13	1.26	.04	.18	.17
G	Bromus tectorum (a)	-	-	$_{b}$184	$_{a}$34	$_{b}$168	$_{b}$195	2.86	.34	1.29	2.56
G	Elymus junceus	$_{b}$87	$_{a}$18	$_{a}$9	$_{a}$5	$_{a}$11	$_{a}$3	.05	.03	.81	.00
G	Oryzopsis hymenoides	-	-	-	1	1	-	-	.00	.00	-
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{b}$23	$_{b}$36	$_{b}$12	$_{b}$15	.29	.99	.19	1.10
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{ab}$7	$_{a}$-	$_{b}$16	$_{a}$3	.21	-	.09	.06
G	Poa secunda	$_{a}$-	$_{a}$-	$_{b}$20	$_{ab}$4	$_{b}$8	$_{c}$65	.25	.01	.05	1.40
G	Sitanion hystrix	$_{b}$19	$_{ab}$6	$_{b}$11	$_{a}$-	$_{b}$10	$_{ab}$1	.72	-	.05	.03
G	Sporobolus cryptandrus	-	-	-	-	1	-	-	-	.03	-
G	Stipa comata	-	-	3	6	-	-	.04	.21	-	-
Total for Annual Grasses		0	0	184	34	168	195	2.86	0.34	1.29	2.56
Total for Perennial Grasses		453	428	386	247	291	323	16.96	5.60	11.65	16.01
Total for Grasses		453	428	570	281	459	518	19.83	5.94	12.95	18.57
F	Astragalus cibarius	2	3	-	2	-	-	-	.15	-	-
F	Astragalus sp.	-	-	-	-	3	4	-	-	.01	.01

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
F	Cymopterus sp.	-	-	2	-	-	4	.00	-	-	.01
F	Draba sp. (a)	-	-	$_{b}$36	$_{a}$-	$_{a}$1	$_{a}$-	.13	-	.00	-
F	Erigeron pumilus	$_{b}$8	$_{a}$-	$_{a}$3	$_{a}$-	$_{a}$-	$_{a}$-	.03	-	-	-
F	Gilia sp. (a)	-	-	$_{a}$19	$_{b}$48	$_{a}$3	$_{a}$-	$_{a}$.05	.19	.01	-
F	Lappula occidentalis (a)	-	-	1	-	7	9	.00	-	.01	.01
F	Leucelene ericoides	$_{a}$-	$_{b}$15	$_{a}$2	$_{a}$-	$_{a}$-	$_{a}$-	.00	-	-	-
F	Navarretia intertexta (a)	-	-	-	2	-	-	-	.00	-	-
F	Penstemon palmeri	-	3	-	-	-	-	-	-	-	-
F	Phlox austromontana	4	7	10	4	5	5	.37	.04	.18	.06
F	Senecio multilobatus	-	-	1	-	-	-	.00	-	-	-
F	Sphaeralcea coccinea	3	-	2	1	2	2	.01	.00	.01	.03
F	Streptanthus cordatus	-	-	-	3	-	-	-	.00	-	-
F	Unknown forb-perennial	2	1	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	56	50	11	9	0.18	0.19	0.03	0.01
Total for Perennial Forbs		19	29	20	10	10	15	0.42	0.19	0.20	0.11
Total for Forbs		19	29	76	60	21	24	0.60	0.39	0.23	0.13

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

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

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia nova	30	33	34	27	1.95	4.79	4.99	5.36
B	Artemisia tridentata vaseyana	21	12	19	23	3.90	1.91	1.11	.83
B	Chrysothamnus nauseosus hololeucus	4	1	4	3	.15	.00	.03	-
B	Chrysothamnus parryi	0	1	0	1	-	.00	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	2	3	6	1	.38	.03	.03	-
B	Echinocereus sp.	1	3	0	1	-	-	-	-
B	Ephedra viridis	2	1	2	1	.15	.66	.41	.15
B	Gutierrezia sarothrae	7	12	19	28	.03	.15	.37	.43
B	Juniperus osteosperma	4	4	2	1	3.90	4.23	4.50	2.32
B	Opuntia whipplei	1	0	0	0	.00	-	-	-
B	Pediocactus simpsonii	0	3	1	0	-	.03	.03	-
B	Pinus monophylla	0	0	1	0	.00	.56	2.44	-
B	Purshia tridentata	2	2	2	1	.53	1.00	.38	.38
B	Sclerocactus sp.	1	0	3	0	.03	-	.03	-
Total for Browse		75	75	93	87	11.03	13.39	14.34	9.50

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 2

Species	Percent Cover			
	'98	'03	'08	'12
Artemisia nova	-	3.46	4.18	4.58
Artemisia tridentata vaseyana	-	1.01	1.50	1.11
Chrysothamnus nauseosus hololeucus	-	-	.36	.06
Chrysothamnus viscidiflorus viscidiflorus	-	.16	-	-
Ephedra viridis	-	.40	.41	.18
Gutierrezia sarothrae	-	.18	.46	.25
Juniperus osteosperma	3.00	5.88	6.86	2.56
Pinus monophylla	-	.36	3.46	-
Purshia tridentata	-	.46	.33	.11
Sclerocactus sp.	-	-	.03	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 2

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.9	1.2	1.1
Purshia tridentata	2.8	0.7	1.1

POINT-QUARTER TREE DATA--
Management unit 20, Study no: 2

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	22	29	34	28
Pinus monophylla	78	78	50	30

Average diameter (in)			
'98	'03	'08	'12
4.8	7.1	6.3	4.7
4.2	5.5	6.5	4.4

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

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	8.75	4.00	34.35	19.46	28.01	26.97
Rock	14.25	22.00	13.17	13.34	13.81	11.96
Pavement	23.25	16.25	10.75	14.92	14.71	3.83
Litter	36.00	32.50	37.12	34.44	38.41	38.97
Cryptogams	0	.25	1.24	.58	.22	.07
Bare Ground	17.75	25.00	21.53	27.68	15.89	25.78

SOIL ANALYSIS DATA --

Management unit 20, Study no: 2, Lower Indian Peak

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.9	6.4	64.0	17.4	18.6	2.1	12.7	99.2	0.6

PELLET GROUP DATA--
Management unit 20, Study no: 2

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	25	57	87	31
Elk	8	36	16	14
Deer	3	4	8	8
Cattle	-	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
16 (40)	44 (109)	17 (66)	9 (23)
7 (17)	11 (26)	11 (26)	10 (25)
6 (15)	-	-	2 (4)

BROWSE CHARACTERISTICS--
Management unit 20, 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)
Artemisia frigida									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	5/11
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Artemisia nova									
85	**1332**	45	55	0	133	15	0	0	11/13
91	**1532**	39	61	0	-	43	13	0	9/16
98	**1320**	21	74	5	220	20	2	0	9/22
03	**1420**	7	51	42	-	32	1	7	10/20
08	**1420**	11	72	17	20	28	17	8	13/26
12	**1080**	4	74	22	20	33	13	9	9/25
Artemisia tridentata vaseyana									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**500**	4	72	24	40	16	4	4	21/34
03	**240**	25	58	17	-	50	0	8	20/35
08	**440**	23	55	23	80	14	23	14	14/20
12	**540**	11	70	19	120	11	37	30	13/25
Ceratoides lanata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	3/11

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	17/38
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus nauseosus hololeucus									
85	**265**	0	25	75	-	0	0	0	8/9
91	**265**	0	25	75	-	25	0	75	20/22
98	**100**	0	60	40	-	40	0	40	19/23
03	**20**	0	0	100	-	0	0	0	21/31
08	**120**	0	83	17	-	0	50	17	14/19
12	**60**	0	67	33	-	0	33	33	11/16
Chrysothamnus parryi									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	100	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	5/13
12	**20**	0	100	-	20	0	0	0	6/11
Chrysothamnus viscidiflorus viscidiflorus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**132**	50	50	0	-	50	50	0	7/22
98	**40**	0	100	0	-	0	0	0	13/23
03	**60**	0	67	33	-	0	0	33	13/24
08	**120**	17	50	33	-	33	17	33	6/9
12	**20**	0	0	100	-	0	0	100	-/-
Echinocereus sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	4/12
03	**60**	0	100	-	-	0	0	0	3/7
08	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	3/8
Ephedra viridis									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**40**	50	50	0	-	50	0	50	27/39
03	**20**	0	0	100	-	100	0	100	25/38
08	**40**	0	50	50	-	100	0	50	23/31
12	**20**	0	0	100	-	0	0	0	17/35

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Eriogonum sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	2/4
12	**0**	0	0	-	-	0	0	0	-/-
Gutierrezia sarothrae									
85	**3731**	34	55	11	2266	5	0	0	6/7
91	**1731**	81	15	4	3066	0	0	0	5/6
98	**180**	0	56	44	40	0	0	44	5/7
03	**420**	0	71	29	-	0	0	0	8/9
08	**980**	4	84	12	40	2	2	8	7/8
12	**1260**	24	68	8	60	0	0	19	6/9
Juniperus osteosperma									
85	**66**	0	100	-	-	0	0	0	69/83
91	**66**	0	100	-	-	0	0	0	138/91
98	**80**	0	100	-	-	0	0	0	-/-
03	**80**	25	75	-	-	0	0	0	-/-
08	**40**	0	100	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	-/-
Opuntia sp.									
85	**66**	0	100	0	-	0	0	0	2/4
91	**66**	0	0	100	-	0	0	0	-/-
98	**20**	0	100	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	5/7
12	**0**	0	0	0	-	0	0	0	-/-
Opuntia whipplei									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	4/11
03	**0**	0	0	-	-	0	0	0	4/11
08	**0**	0	0	-	-	0	0	0	3/5
12	**0**	0	0	-	-	0	0	0	-/-
Pediocactus simpsonii									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**60**	0	100	-	-	0	0	0	2/2
08	**20**	0	100	-	-	0	0	0	2/3
12	**0**	0	0	-	-	0	0	0	-/-

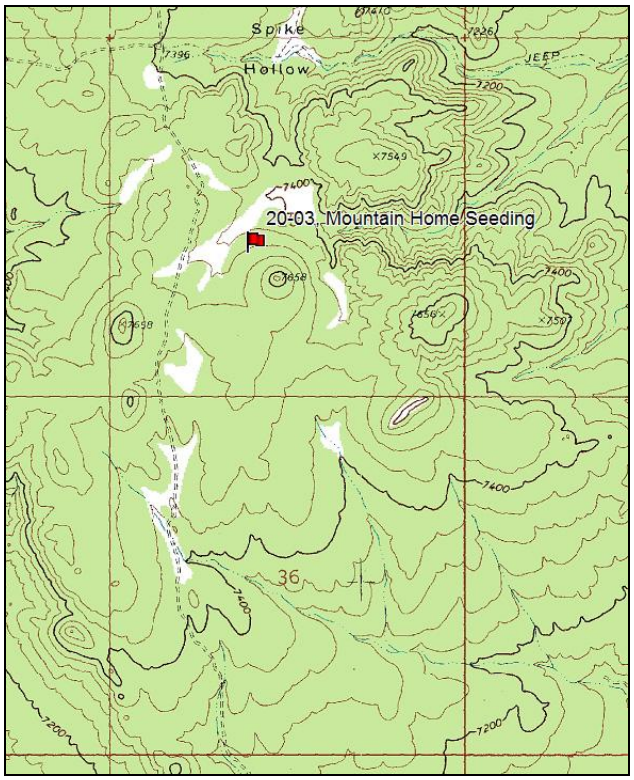
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Pinus monophylla									
85	**66**	100	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**20**	100	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Purshia tridentata									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**40**	0	50	50	-	0	100	50	21/60
03	**60**	0	0	100	-	0	100	0	21/68
08	**60**	0	33	67	-	100	0	0	18/49
12	**20**	0	100	0	-	100	0	0	19/48
Rhus trilobata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	25/70
08	**0**	0	0	-	-	0	0	0	25/78
12	**0**	0	0	-	-	0	0	0	35/38
Sclerocactus sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	2/3
03	**0**	0	0	-	-	0	0	0	-/-
08	**60**	0	100	-	-	0	0	0	5/11
12	**0**	0	0	-	-	0	0	0	-/-

MOUNTAIN HOME SEEDING - TREND STUDY NO. 20-3-12

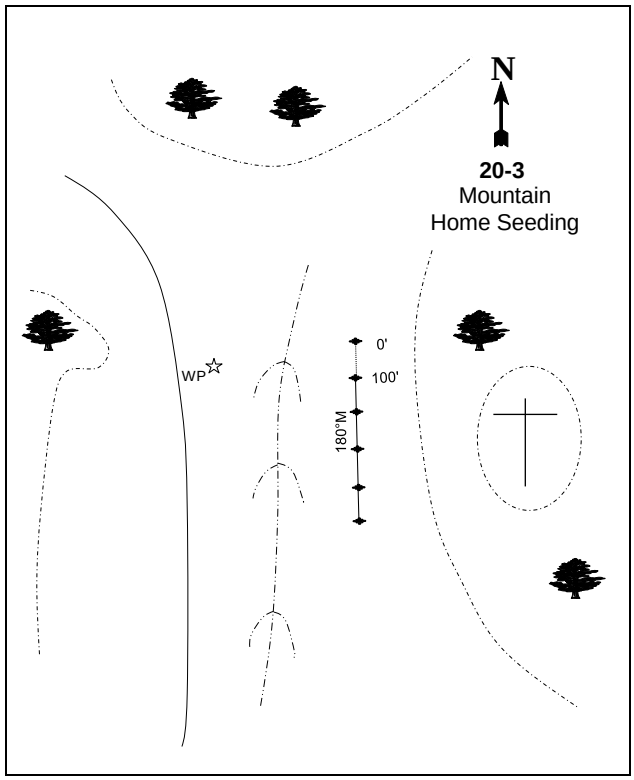
Vegetation Type: Perennial Grass
Range Type: Substantial Deer Winter, Substantial Elk Year-long
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: BLM
Elevation: 7,480 ft. (2,280 m)
Aspect: Northwest
Slope: 5%
Transect bearing: 180° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)

Directions: From the Indian Peaks cabin, drive to the main Pine Valley Road. Turn left (north) and drive about 2.0 miles to a fork which is labeled with a sign saying "Hamblin Valley Road 15 miles". Drive west on this road avoiding side roads about 12.0 miles to a four-way intersection. The sign reads "Lopers Spring 6.0 miles" to the north. Turn right (north) and drive 6.2 miles to a witness post on the right side of the road. (You will pass another 4 way intersection at about 3.7 miles.) The 0-foot stake is 170 paces from the witness post at 113 degrees magnetic. The 0-foot stake is marked with browse tag 143.

Map Name: Lopers Spring



Diagrammatic Sketch:



Township: 27S Range: 19W Section: 25

GPS: NAD 83, UTM 12S 244818 E 4257570 N

MOUNTAIN HOME SEEDING - TREND STUDY NO. 20-3

Site Information

Site Description: This study was established in 1998 on a singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) treatment area on land administered by the Bureau of Land Management (BLM). In 1989, 1,200 acres of pinyon-juniper woodland were chained, hand-cut, burned, and aerially seeded to benefit big game and wild horses. Although the project improved the habitat, heavy wildlife use and drought conditions diminished grass and forage production. Singleleaf pinyon pine, Utah juniper, and several species of rabbitbrush (*Chrysothamnus spp*.) had encroached on the treatment area. Therefore, in fall 2005 pinyon and juniper trees, and rabbitbrush were manually and mechanically removed, and the treatment area was reseeded (Table - Seed Mix) as part of the Mountain Home Habitat Improvement project (WRI Project #226) (WRI Database 2013). The area is occupied by deer, elk and wild horses throughout most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site. Deer pellet groups have been sampled in low abundance since 1998. Elk pellet groups were sample in moderate abundance in 1998, but in high abundance in 2003, 2008, and 2012. Horse piles were sampled in moderate abundance in 2003, but in high abundance in 1998, 2008, and 2012. Cattle pats were sampled in low abundance in 2003 (Table - Pellet Group Data).

SEED MIX--
Management unit 20, Study no: 3

Project Name: Mountain Home Habitat Improvement WRI Database #: 226			
Application: 3-Point Seed Broadcaster		Acres:	1200
Seed type		lbs in mix	lbs/acre
G	Crested Wheatgrass 'Douglas'	600	0.50
G	Crested Wheatgrass 'Hycrest'	600	0.50
G	Pubescent Wheatgrass	1221	1.02
G	Snake River Wheatgrass 'Secar'	1200	1.00
G	Indian Ricegrass	1200	1.00
G	Sandberg Bluegrass 'SID OR'	600	0.50
G	Hard Fescue 'Durar'	600	0.50
G	Canby Bluegrass 'Canbar'	600	0.50
F	Blue Flax 'Appar'	60	0.05
F	Yellow Sweetclover	400	0.33
F	Alfalfa 'Ladak+'	400	0.33
F	Alfalfa 'Nomad'	400	0.33
F	Alfalfa 'Spredor 4'	400	0.33
F	Small Burnet 'Delar'	1200	1.00
F	Cicer Milkvetch 'Lutana'	1188	0.99
F	Sainfoin 'Eski'	1800	1.50
Total Pounds:		12469	10.39
PLS Pounds:			9.43

Browse: The browse component consists of mostly graystem rabbitbrush (*Chrysothamnus nauseosus* ssp. *hololeucus*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and the preferred browse species mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Sagebrush is a dense, young population that has increased considerably in density since 2003. Decadence within the sagebrush population has been low in all sample

years. Poor vigor within the sagebrush population has not been observed most sample years, but was high in 2012. Utilization has been light most sample years, but the one plant that was sampled in 2003 was heavily browsed. Graystem rabbitbrush is a dense, mature population that has decreased in density since 2008. The health of graystem rabbitbrush has been vigorous to fair. Recruitment of graystem rabbitbrush has been high since 2008. Rubber rabbitbrush was first sampled in 2003, and is a dense, mature population that has increased considerably in density since 2003. The health of the rubber rabbitbrush population is vigorous, but poor vigor was moderate in 2012. Recruitment of young rubber rabbit brush to the population is high and has increased since 2008 (Table - Browse Characteristics).

Herbaceous Understory: The treatment area was seeded with seven grass species (Table - Seed Mix), however, crested wheatgrass (*Agropyron cristatum*) and Indian ricegrass (*Oryzopsis hymenoides*) were the only seeded species sampled, but crested wheatgrass has been the dominant grass on the site since 1998. Other perennial grasses sampled included intermediate wheatgrass (*Agropyron intermedium*), smooth brome (*Bromus inermis*), purple three-awn (*Aristida purpurea*), and bottlebrush squirreltail (*Sitanion hystrix*). The invasive annual species cheatgrass (*Bromus tectorum*) was sampled each year, but provided little cover over the course of the study. Forbs were sparse and provided minimal cover in all sample years. The majority of the forb cover was provided by perennials. Six forb species were seeded (Table - Seed Mix), and four of these were sampled, including blue flax (*Linum perenne*), alfalfa (*Medicago sativa*), small burnet (*Sanguisorba minor*), and milkvetch (*Astragalus sp*.). Other forbs sampled each year included thorn skeleton plant (*Lygodesmia spinosa*), longleaf phlox (*Phlox longifolia*), spring parsley (*Cymopterus sp*.), and scarlet globemallow (*Sphaeralcea coccinea*) (Table - Herbaceous Trends).

Soil: Natural Resource Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a slightly acidic soil reaction (pH 6.3) (Table - Soil Analysis Data). Bare ground cover is high, with a moderate amount of vegetation and a low amount of litter and rock providing protective ground cover (Table - Basic Cover). The soil erosion condition has been determined to be stable since 2003.

Trend Assessments

Browse:

- **1998 to 2003 - stable (0):** Browse species were very rare on the site. The density of mountain big sagebrush increased from 0 plants/acre to 20 plants/acre.
- **2003 to 2008 - slightly up (+1):** The density of mountain big sagebrush increased substantially to 1,340 plants/acre. The health of the sagebrush was vigorous with no decadence or poor vigor being observed. Recruitment of young sagebrush to the population increased from 0% to 70% and comprised the majority of the population. Cover of sagebrush increased from 0% to less than 1%. However, the two rabbitbrush species have increased substantially on the site, and cover has increased from 1% to 3%.
- **2008 to 2012 - up (+2):** The density of mountain big sagebrush increased nearly four-fold to 4,900 plants/acre. Decadence of sagebrush remained low at 2%, but poor vigor increased from 0% to 78%. Sagebrush plants were chlorotic and desiccated. Cover of sagebrush increased to 2%. Recruitment of young sagebrush to the population increased to 74%, and comprised the majority of the population. The combined rabbitbrush density remained similar, but cover increased to 6%.

Grass:

- **1998 to 2003 - slightly down (-1):** The sum of nested frequencies of perennial grasses decreased 18%. Perennial grasses decreased in cover from 30% to 9%. Most of the decrease in cover came from a decrease in crested wheatgrass cover.
- **2003 to 2008 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased 19%. Perennial grasses increased in cover to 13%.
- **2008 to 2012 - stable (0):** The sum of nested frequencies of perennial grasses decreased 9%. Perennial grasses decreased in cover to 12%.

Forb:

- **1998 to 2003 - stable (0):** Perennial forbs are rare on the site.
- **2003 to 2008 - stable (0):** Perennial forbs remain rare on the site.
- **2008 to 2012 - stable (0):** Perennial forbs remain rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 20, study no: 3

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
98	0.0	0.0	0.0	30.0	-0.5	0.8	0.0	**30.3**	Very Poor
03	0.0	0.0	0.0	18.6	-0.1	0.4	0.0	**19.0**	Very Poor
08	0.3	0.0	0.0	26.3	0.0	0.7	0.0	**27.3**	Very Poor
12	2.4	0.0	0.0	24.6	0.0	0.5	0.0	**27.4**	Very Poor

Trend Summary

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

Type	Species	Nested Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	$_{b}$352	$_{a}$318	$_{ab}$337	$_{ab}$312	25.30	8.56	10.92	9.50
G	Agropyron intermedium	$_{a}$34	$_{a}$18	$_{b}$57	$_{a}$16	.90	.08	.39	.54
G	Aristida purpurea	5	-	4	3	.15	-	.01	.01
G	Bromus inermis	$_{b}$115	$_{a}$82	$_{ab}$92	$_{ab}$105	3.25	.67	1.80	2.09
G	Bromus tectorum (a)	$_{b}$84	$_{a}$29	$_{a}$6	$_{a}$15	.65	.12	.01	.03
G	Oryzopsis hymenoides	-	-	-	8	-	-	-	.09
G	Sitanion hystrix	3	-	7	8	.03	-	.01	.04
Total for Annual Grasses		84	29	6	15	0.64	0.12	0.01	0.03
Total for Perennial Grasses		509	418	497	452	29.64	9.32	13.14	12.29
Total for Grasses		593	447	503	467	30.29	9.44	13.15	12.32
F	Astragalus sp.	1	-	3	6	.00	-	.00	.06
F	Collinsia parviflora (a)	$_{b}$11	$_{a}$-	$_{a}$1	$_{ab}$6	.03	-	.00	.01
F	Cryptantha sp.	-	-	-	5	-	-	-	.02
F	Cymopterus sp.	$_{b}$34	$_{a}$2	$_{a}$6	$_{a}$1	.11	.00	.04	.03
F	Dalea sp.	-	-	3	-	-	-	.00	-
F	Descurainia pinnata (a)	2	-	-	-	.03	-	-	-
F	Gayophytum ramosissimum(a)	-	-	3	-	-	-	.00	-
F	Gilia sp. (a)	$_{b}$25	$_{a}$-	$_{a}$-	$_{a}$-	.08	-	-	-
F	Grindelia squarrosa	-	-	1	-	-	-	.01	-
F	Halogeton glomeratus (a)	-	2	-	-	-	.00	-	-
F	Lappula occidentalis (a)	5	-	-	1	.01	-	-	.00
F	Linum lewisii	-	-	1	-	-	-	.00	-
F	Lupinus argenteus	$_{a}$3	$_{a}$-	$_{ab}$4	$_{b}$9	.00	-	.03	.05
F	Lygodesmia spinosa	1	5	3	2	.03	.15	.15	.00
F	Medicago sativa	$_{b}$7	$_{a}$1	$_{a}$-	$_{a}$-	.22	.03	-	-
F	Microsteris gracilis (a)	$_{b}$24	$_{a}$-	$_{a}$1	$_{a}$5	.05	-	.00	.02

Type	Species	Nested Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
F	Phlox longifolia	$_{a}$1	$_{a}$7	$_{ab}$12	$_{b}$22	.00	.02	.04	.07
F	Sanguisorba minor	-	-	3	-	-	-	.01	-
F	Senecio multilobatus	-	-	2	-	-	-	.00	-
F	Sphaeralcea coccinea	2	-	3	1	.03	.00	.06	.00
Total for Annual Forbs		67	2	5	12	0.21	0.00	0.01	0.03
Total for Perennial Forbs		49	15	41	46	0.41	0.21	0.36	0.25
Total for Forbs		116	17	46	58	0.62	0.21	0.38	0.29

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

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

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	0	1	28	59	-	.00	.27	1.91
B	Chrysothamnus nauseosus	0	0	41	62	-	.03	1.00	1.69
B	Chrysothamnus nauseosus hololeucus	0	2	62	61	.38	1.00	2.39	4.19
	Chrysothamnus parryi	0	1	0	0	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	1	2	-	-	-	.00
B	Gutierrezia sarothrae	0	1	0	0	-	.00	-	-
Total for Browse		0	5	132	184	0.37	1.03	3.66	7.80

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 3

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	.28	.95	3.95
Chrysothamnus nauseosus	.53	1.38	2.56
Chrysothamnus nauseosus hololeucus	-	2.40	4.46

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 3

Species	Average leader growth (in)
	'12
Artemisia tridentata vaseyana	1.6

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

Cover Type	Average Cover %			
	'98	'03	'08	'12
Vegetation	35.65	10.62	17.22	23.29
Rock	13.67	11.80	16.79	16.34
Pavement	23.51	24.60	36.04	8.66
Litter	42.54	18.95	25.23	18.10
Cryptogams	.04	0	.15	0
Bare Ground	15.58	41.51	13.88	36.92

SOIL ANALYSIS DATA --

Management unit 20, Study no: 3, Mountain Home Reseed

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.2	6.3	70.0	15.1	14.9	2.1	21.5	163.2	0.6

PELLET GROUP DATA--
Management unit 20, Study no: 3

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	5	-	53	6
Horse	30	27	20	5
Elk	27	16	31	38
Deer	14	7	9	3
Cattle	-	1	-	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
44 (109)	38 (95)	44 (107)	12 (29)
16 (40)	39 (98)	52 (127)	44 (109)
7 (17)	3 (7)	5 (12)	3 (8)
-	1 (2)	-	-

BROWSE CHARACTERISTICS--
Management unit 20, 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 utahensis									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	9/21
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Artemisia tridentata vaseyana									
98	**0**	0	0	0	-	0	0	0	30/40
03	**20**	0	100	0	-	0	100	0	30/48
08	**1340**	70	30	0	80	3	3	0	11/13
12	**4900**	74	24	2	440	2	8	78	15/21

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus									
98	**0**	0	0	0	-	0	0	0	-/-
03	**0**	0	0	0	40	0	0	0	42/61
08	**1760**	9	82	9	20	22	0	3	14/17
12	**2680**	32	59	9	1360	1	0	37	19/21
Chrysothamnus nauseosus hololeucus									
98	**0**	0	0	0	-	0	0	0	35/48
03	**40**	0	100	0	-	50	0	0	33/49
08	**3500**	15	75	9	20	21	2	7	12/17
12	**2360**	22	64	14	460	7	0	34	18/21
Chrysothamnus parryi									
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	0	0	11/10
08	**0**	0	0	-	-	0	0	0	9/19
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus viscidiflorus viscidiflorus									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	12/21
08	**40**	0	100	-	-	0	0	0	8/10
12	**60**	67	33	-	20	0	0	33	9/16
Gutierrezia sarothrae									
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	100	0	-	-	0	0	0	6/5
08	**0**	0	0	-	-	0	0	0	12/27
12	**0**	0	0	-	-	0	0	0	-/-
Juniperus osteosperma									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Leptodactylon pungens									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	9/35
Pinus monophylla									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

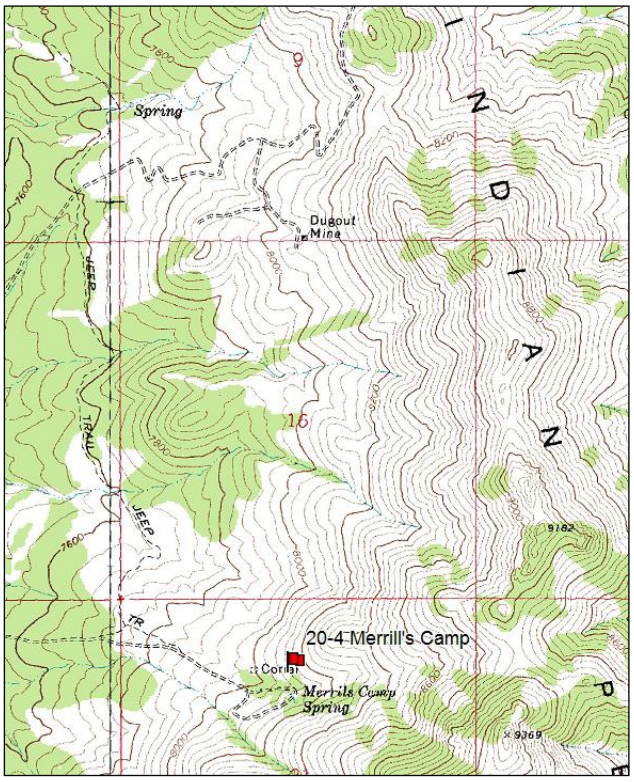
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Ribes sp.									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	28/22
08	**0**	0	0	-	-	0	0	0	33/36
12	**0**	0	0	-	-	0	0	0	-/-

MERRILLS CAMP - TREND STUDY NO. 20-4-12

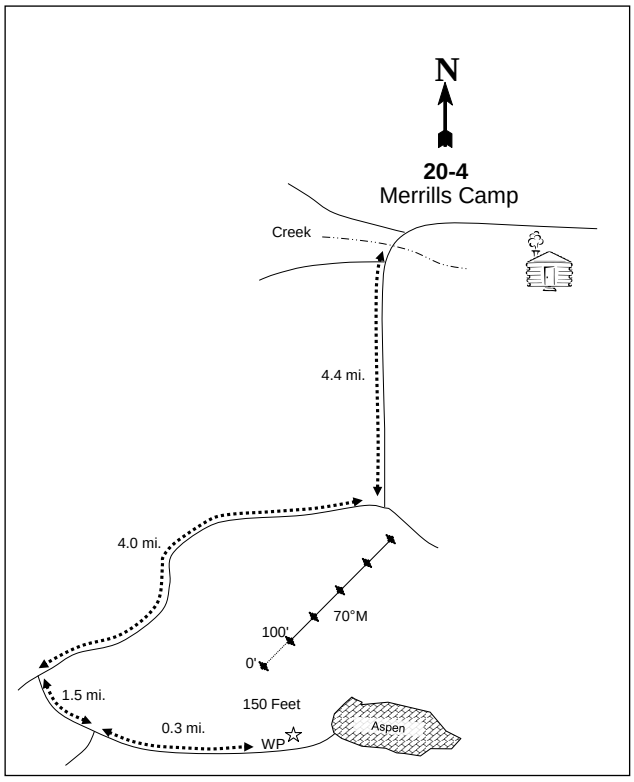
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Summer, Substantial Elk Year-long
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: Private
Elevation: 8,150 ft. (2,484 m)
Aspect: Southwest
Slope: 30%
Transect bearing: 70° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)

Directions: From the Indian Peaks Cabin, go 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive 4.4 miles to a "T" intersection and turn right. Drive 4.0 miles and turn left. Proceed for another 1.5 miles and turn left. Drive for 0.3 miles to the witness post on the left side of the road. The 0-foot stake is 50 paces up the hill at approximately 0°M. The 0-foot stake is marked with browse tag 112.

Map Name: Pinto Springs



Diagrammatic Sketch:



Township: 30S Range: 18W Section: 21

GPS: NAD 83, UTM 12S 248942 E 4230696 N

MERRILS CAMP - TREND STUDY NO. 20-4

Site Information

Site Description: The study is located on the southwest side of the Indian Peak Range near Merrils Camp Spring at the headwaters of Atchison Creek. The study is located on private land, but appears to be managed as part of the Bureau of Land Management Atchison Creek allotment. Merrils Camp Spring is the nearest source of water available to wildlife, and is located in an old groove of aspen trees and shrubs that may provide escape and thermal cover for wildlife approximately 500 feet from the site. The study samples a mountain brush community that is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and has a scattered population of singleleaf pinyon pine (*Pinus monophylla*) throughout the site. Deer pellet groups were sampled in low abundance in 2012. Elk pellet groups were sampled in low abundance in 2012. Sheep pellet groups were sampled in low abundance in 2012. Horse piles were sampled in low abundance in 2012 (Table - Pellet Group Data). Common Poorwills (*Phalaenoptilus nuttallii*) were found brooding under Utah serviceberry plants in 2012.

Browse: The preferred browse species found on the site are mountain big sagebrush, Utah serviceberry (*Amelachier utahensis*), and black sagebrush (*Artemisia nova*). However, black sagebrush is not common on the site. Other browse species that are common on the site are stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), mountain snowberry (*Symphoricarpos oreophilus*), and Oregon grape (*Mahonia repens*). Mountain big sagebrush is a dense, mature population. Decadence of mountain big sagebrush is low, but poor vigor is high in the population. Recruitment of young sagebrush to the population is minimal. Utilization of sagebrush was moderate to heavy. Utah serviceberry is a moderately dense, mature population. Decadence and poor vigor of serviceberry is low. Recruitment of young serviceberry to the population was not observed in 2012. Utilization of serviceberry was mostly heavy. Although mountain snowberry is not considered a preferred browse species, utilization of snowberry has had some moderate use. The snowberry population is a dense, mature population (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous community is sparse and lacks diversity. Perennial grasses are fairly rare on the site and provide little cover. The dominant perennial grass species are bluebunch wheatgrass and bottlebrush squirreltail (*Sitanion hystrix*), which provide the majority of perennial grass cover. The invasive annual species cheatgrass is the dominant grass on the study, and provides the majority of grass cover. Perennial forbs are fairly rare on the site and provide little cover. The dominant perennial forb on the site is silvery lupine (*Lupinus argenteus*), and provides the majority of forb cover. Other frequently occurring perennial forb species are longleaf phlox (*Phlox longifolia*) and pale agoseris (*Agoseris glauca*), though these species provide limited cover. The annual forb species blue-eyed Mary (*Collinsia parviflora*), and slender phlox (*Microsteris gracilis*) also occur frequently (Table - Herbaceous Trends).

Soil: Natural Resource Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a strongly acidic soil reaction (5.5 pH) (Table - Soil Analysis Data). Bare ground cover is moderate, with a moderate amount of litter and rock, and a high amount of vegetation providing protective ground cover (Table - Basic Cover). The soil erosion condition was determined to be stable in 2012.

Trend Summary

HERBACEOUS TRENDS--
Management unit 20, Study no: 4

Type	Species	Nested Frequency '12	Average Cover % '12
G	Agropyron spicatum	63	.85
G	Bromus tectorum (a)	390	8.33
G	Poa fendleriana	4	.15
G	Poa secunda	11	.19
G	Sitanion hystrix	62	.41
Total for Annual Grasses		390	8.33
Total for Perennial Grasses		140	1.60
Total for Grasses		530	9.94
F	Agoseris glauca	15	.03
F	Alyssum alyssoides (a)	3	.01
F	Artemisia ludoviciana	4	.03
F	Astragalus argophyllus	1	.00
F	Astragalus sp.	1	.00
F	Calochortus nuttallii	1	.00
F	Chaenactis douglasii	6	.39
F	Collinsia parviflora (a)	67	.63
F	Comandra pallida	1	.00
F	Crepis acuminata	1	.00
F	Cryptantha sp.	1	.00
F	Cymopterus sp.	3	.01
F	Erigeron eatonii	3	.00
F	Gilia sp. (a)	3	.01
F	Leucelene ericoides	3	.01
F	Lupinus argenteus	59	1.57
F	Microsteris gracilis (a)	48	.14
F	Oenothera sp.	4	.01
F	Penstemon eatoni	1	.00
F	Penstemon watsonii	5	.07
F	Phlox longifolia	67	.27
Total for Annual Forbs		121	0.79
Total for Perennial Forbs		176	2.44
Total for Forbs		297	3.24

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

BROWSE TRENDS--
Management unit 20, Study no: 4

Type	Species	Strip Frequency '12	Average Cover % '12
B	Amelanchier utahensis	27	7.90
B	Artemisia nova	8	1.18
B	Artemisia tridentata vaseyana	95	19.73
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus parryi	37	1.06
B	Chrysothamnus viscidiflorus viscidiflorus	4	.33
B	Gutierrezia sarothrae	3	.03
B	Mahonia repens	14	.19
B	Opuntia sp.	1	-
B	Pinus monophylla	2	.71
B	Symphoricarpos oreophilus	63	5.88
Total for Browse		255	37.03

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 4

Species	Percent Cover '12
Amelanchier utahensis	8.21
Artemisia nova	2.63
Artemisia tridentata vaseyana	22.83
Chrysothamnus parryi	1.38
Chrysothamnus viscidiflorus viscidiflorus	.18
Gutierrezia sarothrae	.08
Mahonia repens	.08
Pinus monophylla	.03
Symphoricarpos oreophilus	7.69

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 4

Species	Average leader growth (in) '12
Amelanchier utahensis	1.6
Artemisia tridentata vaseyana	1.8

BASIC COVER--
Management unit 20, Study no: 4

Cover Type	Average Cover % '12
Vegetation	47.88
Rock	11.37
Pavement	3.33
Litter	32.70
Bare Ground	20.12

SOIL ANALYSIS DATA --

Management unit 20, Study no: 4, Merrills Camp

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
-	5.5	67.4	17.4	15.1	2.2	6.7	232.0	0.5

PELLET GROUP DATA--
Management unit 20, Study no: 4

Type	Quadrat Frequency '12	Days use per acre (ha) '12
Rabbit	1	-
Horse	5	6 (14)
Elk	3	14 (35)
Deer	4	11 (26)
Cattle	1	-
Sheep	-	2 (5)

BROWSE CHARACTERISTICS--
Management unit 20, 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 utahensis									
12	**660**	0	97	3	-	36	64	9	42/48
Artemisia nova									
12	**180**	0	100	-	20	0	100	22	9/33
Artemisia tridentata vaseyana									
12	**4940**	4	83	13	140	37	30	44	14/28
Cercocarpus ledifolius									
12	**0**	0	0	-	-	0	0	0	68/75
Chrysothamnus nauseosus albicaulis									
12	**20**	0	100	-	-	0	0	0	29/33

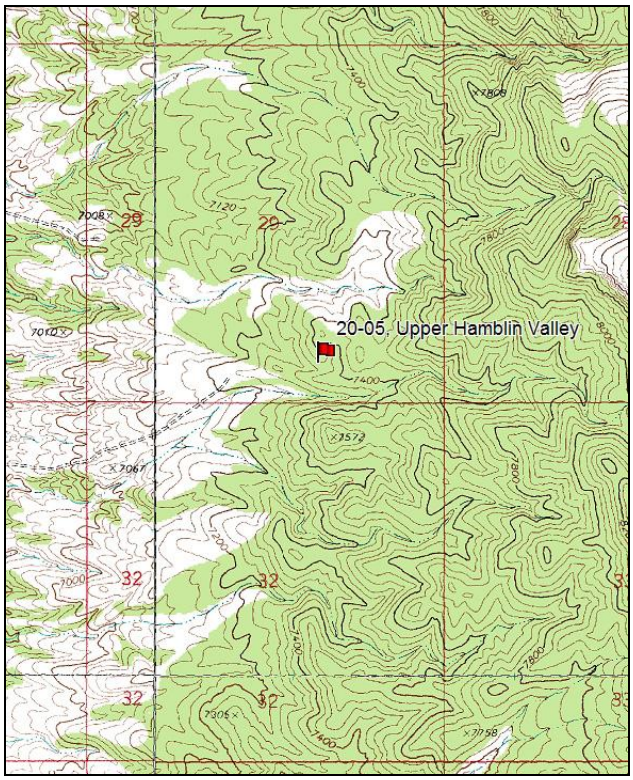
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi									
12	**1260**	3	97	-	-	2	0	5	7/12
Chrysothamnus viscidiflorus viscidiflorus									
12	**100**	0	100	-	-	0	0	0	9/13
Gutierrezia sarothrae									
12	**100**	0	100	-	-	0	0	0	6/9
Mahonia repens									
12	**1180**	8	92	-	-	0	0	10	3/4
Opuntia sp.									
12	**20**	0	100	-	-	0	0	100	4/10
Pinus monophylla									
12	**40**	100	0	-	40	0	0	0	-/-
Symphoricarpos oreophilus									
12	**4200**	17	83	-	340	18	7	4	9/15

UPPER HAMBLIN VALLEY - TREND STUDY NO. 20-5-12

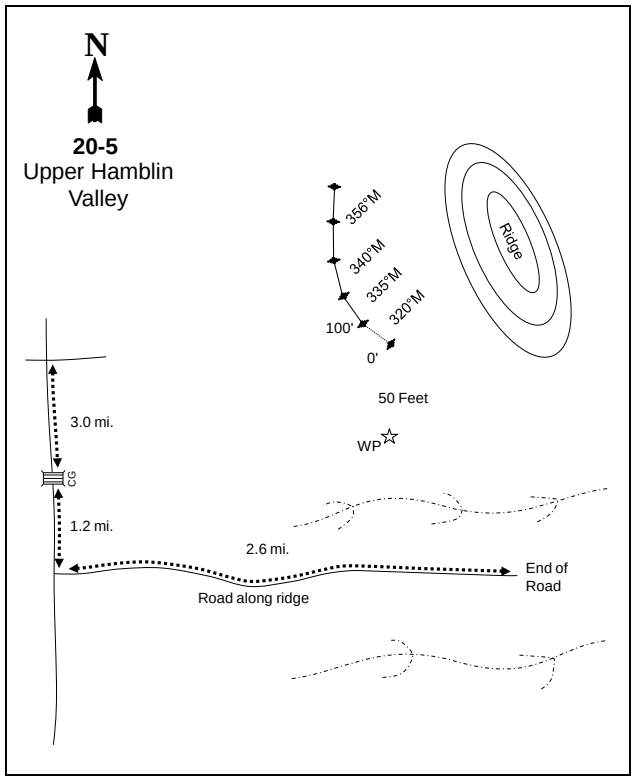
Vegetation Type: Curlleaf Mountain Mahogany
Range Type: Substantial Deer Winter, Substantial Elk Year-long
NRCS Ecological Site Description: Upland Shallow Loam (Utah Juniper-Singleleaf Pinyon), R028AY324UT
Land Ownership: BLM
Elevation: 7,350 ft. (2,240 m)
Aspect: Southwest
Slope: 22%
Transect bearing: 320° magnetic (Line 1), 335° magnetic (Line 2), 340° magnetic (Line 3), 356° magnetic (Line 4-5),
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: Rebar is on the 5ft mark on belt 2 and on the 18ft mark on belt 4

Directions: From the Indian Peaks cabin, go north and west over the Pine Valley Pass Road to Hamblin Valley Road. This intersection has a cattle corral. From this intersection, drive north 17.8 miles to another intersection. Turn right and drive 3.0 miles to a cattle guard. At the cattle guard, stay right and travel south 1.2 miles to a intersection. Turn left and travel east 2.6 miles until the road ends and park here. The site is on the ridge across the gully to the northwest. The 0-foot stake is 50 feet west of the witness post and can be seen on the ridge from the end of the road. The 0-foot stake is marked with browse tag 205.

Map Name: Mountain Home Pass



Diagrammatic Sketch:



Township: 26S Range: 19W Section: 29

GPS: NAD 83, UTM 12S 239099 E 4266940 N

UPPER HAMBLIN VALLEY - TREND STUDY NO. 20-5

Site Information

Site Description: This study was established in 1998 to sample important winter range in upper Hamblin Valley on land administered by the Bureau of Land Management (BLM) as part of the Hamlin allotment. The vegetation community consists of a scattered overstory of singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*), with an understory of curlleaf mountain mahogany (*Cercocarpus ledifolius*). Elk, deer, and wild horses frequent the area. Deer pellet groups have been sampled in low abundance each sample year. Elk pellet groups were sampled in moderate abundance in 1998, 2008, and 2012, but high abundance in 2003. Horse piles were sampled in low abundance in 1998 and 2003 (Table - Pellet Group Data). Several horses were observed while driving to the study in 2008.

Browse: Preferred browse on the study consists of curlleaf mountain mahogany, black sagebrush (*Artemisia nova*), and green ephedra (*Ephedra viridis*). However, green ephedra is not common on the site, and provides little cover (Table - Browse Trends). Curl-leaf mountain mahogany exhibits some characteristics of littleleaf mountain mahogany (*Cercocarpus intricatus*), including narrow leaf forms. They are most likely hybrid forms between curlleaf and littleleaf mahogany, which occurs often in this area. Mahogany is a moderately sparse, mature population that has maintained a stable population size over the course of the study. The health of the mahogany population has been vigorous most sample years, but was poor in 2012. In 2012, mahogany decadence was moderate, and poor vigor was high. Recruitment of young mahogany to the population has been minimal over the course of the study. Utilization of mahogany has been mostly heavy over the sample years. Black sagebrush is a sparse, mature population that has maintained a fairly stable population size since 2003. Sagebrush decadence was high in 2008 and 2012, and poor vigor was high in 2012. Recruitment of young sagebrush to the population has been low over the course of the study. Utilization of sagebrush has been light for each sample year. Although mountain snowberry is not considered a preferred browse species, utilization of snowberry has displayed some moderate use since 1998. Snowberry has maintained a stable population size over the course of the study (Table - Browse Characteristics). Singleleaf pinyon pine and Utah juniper occur in a moderately dense stand of mostly mature trees scattered over the site (Table - Point-Quarter Tree Data). The pinyon and juniper woodland appears to be approaching co-dominance with the shrub understory; therefore, the woodland succession stage is considered to be between Phase I and II (Tausch et al. 2009).

Herbaceous Understory: The herbaceous understory fairly infrequent, and has provided little cover since 1998 Moreover, the herbaceous community is composed mostly of low forage value species. Perennial grasses are rare and provide little cover. Perennial grass species include bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Sitanion hystrix*), and pine needlegrass (*Stipa pinetorum*). The invasive annual species cheatgrass (*Bromus tectorum*) was sampled only in 1998 and 2012, but provided little cover. Forbs are relatively diverse, but most species are infrequent. Rock goldenrod (*Petradoria pumila*) was the most abundant forb in all sample years and provided the majority of forb cover. Heath aster (*Leucelene ericoides*) was also abundant in all sample years, and draba (*Draba* sp.) was abundant in 1998 (Table - Herbaceous Trends).

Soil: Natural Resource Conservation Service (NRCS) soil data was not available for this site. The soil texture is a loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Phosphorus may have limited availability for plant growth and development at 4.5 ppm (Tiedemann and Lopez 2004). The soil is very rocky on the surface and throughout the profile. Bare ground cover is low with a high amount of pavement, and a moderate amount of vegetation, litter, and rock providing protective ground cover (Table - Basic Cover). The soil erosion condition was determined to be stable in 2003 and 2012, but slight in 2008.

Trend Assessments

Browse:

- **1998 to 2003 - slightly up (+1):** The density of curl-leaf mountain mahogany increased 24% from 420 plants/acre to 520 plants/acre. Decadence of mahogany decreased from 14% to 0%, and poor vigor decreased from 5% to 0%. Recruitment of young mahogany to the population decreased from 10% to 4%, and is considered to be minimal. Cover of mahogany increased from 7% to 9%. The density of black sagebrush increased 43% from 700 plants/acre to 1,000 plants/acre. Decadence of black sagebrush decreased from 14% to 4%, and poor vigor decreased from 3% to 0%. Recruitment of young sagebrush to the population decreased from 14% to 2%. Cover of sagebrush remained near 1%.
- **2003 to 2008 - slightly down (-1):** The density of curl-leaf mountain mahogany decreased 19% to 420 plants/acre. Decadence of mahogany increased to 29%, and poor vigor remained at 0%. Recruitment of young mahogany to the population decreased to 0%. Cover of mahogany decreased to 7%. The density of black sagebrush increased 26% to 1,260 plants/acre. Decadence of black sagebrush increased to 57%, and poor vigor increased to11%. Recruitment of young sagebrush to the population slightly increased to 5%. Cover of sagebrush remained near 1%.
- **2008 to 2012 - slightly down (-1):** The density of curl-leaf mountain mahogany increased 24% to 520 plants/acre, but cover decreased to 5%. The Decadence of mahogany decreased to 23%, and poor vigor increased to 42%. Recruitment of young mahogany to the population increased to 4%, but is still considered to be minimal. The density of black sagebrush decreased 16% to 1,060 plants/acre. Decadence of black sagebrush decreased to 38%, and poor vigor increased to 47%. Recruitment of young sagebrush to the population remained similar at 5%. Cover of sagebrush remained near 1%.

Grass:

- **1998 to 2003 - down (-2):** The sum of nested frequencies of perennial grasses decreased 39%. Perennial grass cover decreased from 2% to 1%. Bluebunch wheatgrass and Sandberg bluegrass decreased significantly in nested frequency.
- **2003 to 2008 - up (+2):** The sum of nested frequencies of perennial grasses increased 31%. Perennial grass cover increased to 2%. Sandberg bluegrass increased significantly in nested frequency.
- **2008 to 2012 - stable (0):** The sum of nested frequencies of perennial grasses remained similar. Perennial grass cover remained near 2%.

Forb:

- **1998 to 2003 - down (-2):** The sum of nested frequencies of perennial forbs decreased 26%. Cover of perennial forbs remained at 7%.
- **2003 to 2008 - up (+2):** The sum of nested frequencies of perennial forbs increased 20%. Cover of perennial forbs increased to 8%.
- **2008 to 2012 - stable (0):** The sum of nested frequencies of perennial forbs remained similar. Cover of perennial forbs decreased to 7%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 20, 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
98	13.0	9.9	5.3	4.4	0.0	10.0	0.0	**42.7**	Poor
03	18.0	14.3	1.6	2.3	0.0	10.0	0.0	**46.1**	Poor
08	13.3	5.1	0.3	4.5	0.0	10.0	0.0	**33.2**	Very Poor-Poor
12	8.9	6.4	1.8	3.8	0.0	10.0	0.0	**30.9**	Very Poor

Trend Summary

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

Type	Species	Nested Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	$_{b}$87	$_{a}$49	$_{ab}$54	$_{a}$47	1.29	.58	1.52	.79
G	Bromus tectorum (a)	$_{b}$17	$_{a}$-	$_{a}$-	$_{b}$22	.06	-	-	.05
G	Oryzopsis hymenoides	10	14	17	10	.06	.22	.20	.27
G	Poa secunda	$_{b}$58	$_{a}$21	$_{b}$51	$_{b}$57	.78	.27	.31	.66
G	Sitanion hystrix	4	-	4	8	.06	-	.15	.16
G	Stipa comata	-	2	-	-	-	.01	-	-
G	Stipa pinetorum	$_{a}$-	$_{b}$11	$_{a}$1	$_{a}$1	-	.05	.03	.01
Total for Annual Grasses		17	0	0	22	0.06	0	0	0.05
Total for Perennial Grasses		159	97	127	123	2.20	1.14	2.23	1.90
Total for Grasses		176	97	127	145	2.25	1.14	2.23	1.95
F	Alyssum alyssoides (a)	-	-	3	1	-	-	.00	.00
F	Arabis sp.	2	-	3	-	.01	-	.01	-
F	Arenaria sp.	$_{b}$31	$_{a}$7	$_{ab}$15	$_{ab}$21	.19	.02	.07	.06
F	Balsamorhiza hookeri	-	-	5	-	-	-	.03	-
F	Castilleja linariaefolia	-	-	3	3	-	-	.03	.00
F	Collinsia parviflora (a)	-	-	-	6	-	-	-	.01
F	Cryptantha sp.	$_{b}$30	$_{a}$-	$_{b}$20	$_{b}$19	.45	-	.12	.30
F	Cymopterus sp.	$_{a}$10	$_{ab}$10	$_{b}$26	$_{b}$22	.07	.04	.28	.15
F	Delphinium nuttallianum	1	1	-	-	.00	.00	-	-
F	Descurainia pinnata (a)	3	-	-	-	.00	-	-	-
F	Draba sp. (a)	$_{b}$193	$_{a}$2	$_{a}$-	$_{a}$3	1.47	.00	-	.01
F	Epilobium brachycarpum (a)	3	-	-	2	.01	-	-	.15
F	Erigeron eatonii	$_{b}$12	$_{a}$-	$_{a}$1	$_{b}$19	.08	-	.00	.16
F	Gilia sp. (a)	$_{b}$10	$_{ab}$5	$_{a}$-	$_{a}$-	.03	.01	-	-
F	Leucelene ericoides	$_{ab}$69	$_{b}$79	$_{ab}$69	$_{a}$43	.68	.90	1.08	.45
F	Lomatium sp.	$_{c}$31	$_{b}$10	$_{a}$-	$_{a}$-	.22	.05	.00	-
F	Oenothera sp.	5	-	-	-	.16	-	-	-
F	Pedicularis centranthera	-	-	-	2	-	-	-	.01
F	Petradoria pumila	150	156	174	184	4.73	5.77	6.38	5.48
F	Phlox hoodii	-	-	-	1	-	-	-	.00
F	Physaria chambersii	$_{b}$11	$_{ab}$1	$_{a}$-	$_{ab}$6	.07	.00	-	.07
F	Ranunculus testiculatus (a)	-	-	-	1	-	-	-	.00
F	Senecio multilobatus	3	-	-	-	.00	-	-	-
Total for Annual Forbs		209	7	3	13	1.51	0.01	0.00	0.18
Total for Perennial Forbs		355	264	316	320	6.67	6.80	8.01	6.69
Total for Forbs		564	271	319	333	8.19	6.82	8.02	6.87

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

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

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia nova	17	17	19	18	.76	1.37	1.29	.76
B	Cercocarpus ledifolius	18	19	18	21	7.16	9.25	6.98	4.56
B	Chrysothamnus parryi	0	0	1	0	-	-	.00	-
B	Chrysothamnus viscidiflorus	0	0	0	1	-	-	-	-
B	Ephedra viridis	7	7	6	6	1.08	1.94	.98	.91
B	Gutierrezia sarothrae	3	11	9	6	.03	.24	.19	.19
B	Pediocactus simpsonii	0	0	2	0	-	-	.00	-
B	Pinus monophylla	6	6	6	6	5.34	3.16	5.59	6.50
B	Sclerocactus sp.	2	3	0	0	.00	.03	-	-
B	Symphoricarpos oreophilus	10	9	8	8	1.62	1.46	1.75	.97
Total for Browse		63	72	69	66	16.01	17.48	16.81	13.90

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 5

Species	Percent Cover		
	'03	'08	'12
Artemisia nova	1.71	2.06	1.29
Cercocarpus ledifolius	8.11	8.63	7.16
Ephedra viridis	1.50	.25	.73
Pediocactus simpsonii	-	.03	-
Pinus monophylla	8.61	9.26	8.94
Symphoricarpos oreophilus	1.45	1.31	1.68

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 5

Species	Average leader growth (in)		
	'03	'08	'12
Cercocarpus ledifolius	1.0	1.0	1.1

POINT-QUARTER TREE DATA--
Management unit 20, Study no: 5

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	<18	36	38	41
Pinus monophylla	82	126	117	96

Average diameter (in)			
'98	'03	'08	'12
9.9	5.5	9.3	12.3
7.1	7.4	7.9	9.7

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

Cover Type	Average Cover %			
	'98	'03	'08	'12
Vegetation	24.20	24.50	26.43	23.32
Rock	27.03	23.28	28.42	22.93
Pavement	28.82	31.09	29.83	35.43
Litter	30.17	24.95	28.57	22.42
Cryptogams	1.11	.81	.22	.34
Bare Ground	14.01	8.71	5.63	6.96

SOIL ANALYSIS DATA --

Management unit 20, Study no: 5, Upper Hamblin Valley

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.0	7.0	44.0	35.4	20.6	3.5	4.5	64.0	0.8

PELLET GROUP DATA--
Management unit 20, Study no: 5

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	2	2	19	6
Horse	3	2	-	-
Elk	8	8	7	13
Deer	2	1	3	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
4 (10)	3 (9)	-	-
21 (51)	44 (109)	29 (71)	25 (61)
6 (15)	11 (26)	21 (51)	3 (7)

BROWSE CHARACTERISTICS--
Management unit 20, 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)
Artemisia nova									
98	**700**	14	71	14	20	3	0	3	9/19
03	**1000**	2	94	4	-	2	0	0	6/13
08	**1260**	5	38	57	-	2	0	11	8/20
12	**1060**	6	57	38	80	13	0	47	8/18
Cercocarpus ledifolius									
98	**420**	10	76	14	20	5	90	5	41/58
03	**520**	4	96	0	-	23	65	0	47/63
08	**420**	0	71	29	20	29	33	0	40/53
12	**520**	4	73	23	-	19	77	42	36/53
Chrysothamnus parryi									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**20**	0	100	-	-	0	0	0	6/3
12	**0**	0	0	-	-	0	0	0	-/-

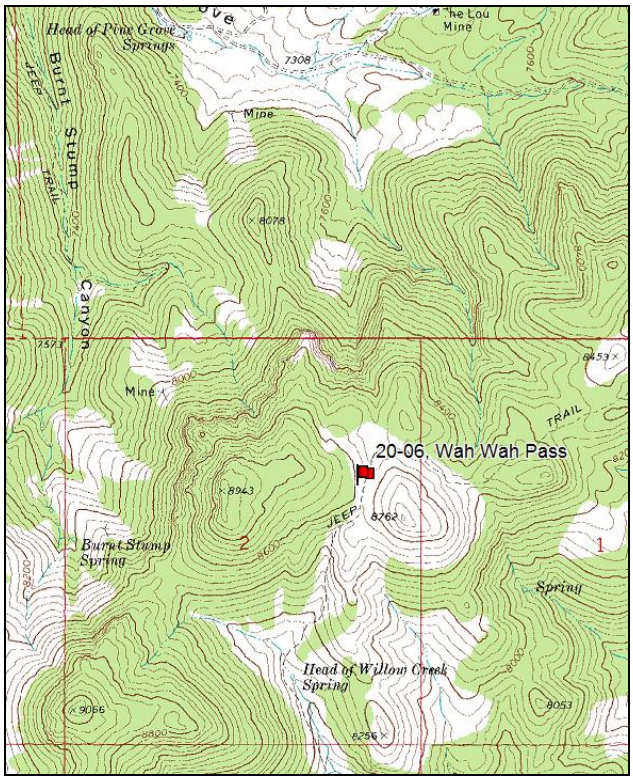
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	100	0	100	33/39
Ephedra viridis									
98	**160**	13	50	38	-	25	25	0	28/43
03	**160**	0	88	13	-	25	13	0	24/32
08	**140**	0	71	29	-	71	14	14	24/30
12	**120**	0	50	50	-	17	17	50	24/41
Gutierrezia sarothrae									
98	**100**	0	100	0	-	0	0	0	4/6
03	**240**	8	92	0	-	0	0	0	5/5
08	**280**	0	64	36	-	0	0	29	4/7
12	**120**	0	83	17	20	0	0	17	4/8
Juniperus osteosperma									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	20	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Pediocactus simpsonii									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	1/4
08	**40**	0	100	-	-	0	0	0	2/2
12	**0**	0	0	-	-	0	0	0	2/3
Pinus monophylla									
98	**120**	33	67	-	100	0	0	0	-/-
03	**200**	30	70	-	60	0	0	0	-/-
08	**120**	33	67	-	20	0	0	0	-/-
12	**120**	33	67	-	20	0	0	0	-/-
Sclerocactus sp.									
98	**40**	0	100	-	20	0	0	0	2/3
03	**60**	0	100	-	-	0	0	0	2/6
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	3/6
Symphoricarpos oreophilus									
98	**260**	23	77	0	-	31	8	0	23/34
03	**240**	8	67	25	-	33	0	0	24/29
08	**240**	17	58	25	20	25	17	0	27/33
12	**200**	10	60	30	-	70	10	30	24/32

WAH WAH PASS - TREND STUDY NO. 20-6-12

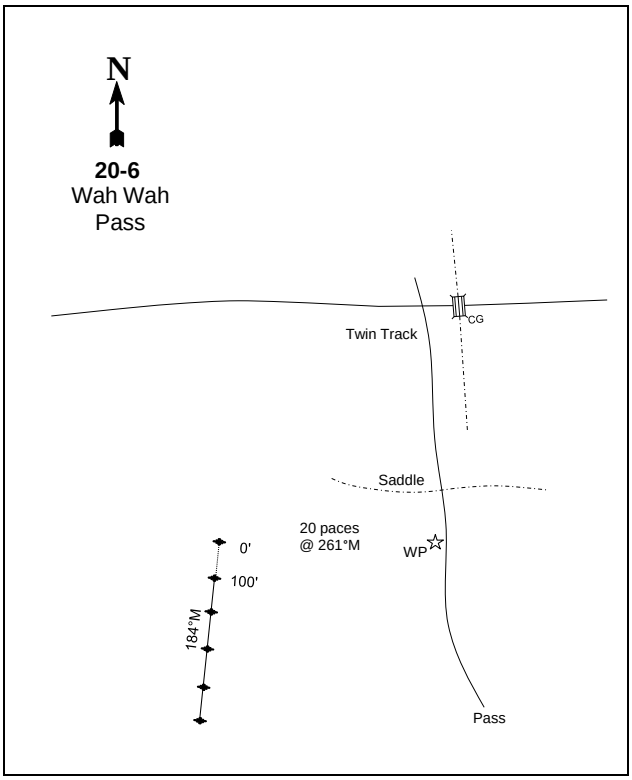
Vegetation Type: Curlleaf Mountain Mahogany
Range Type: Crucial Deer Summer, Substantial Elk Year-long
NRCS Ecological Site Description: Mountain Shallow Loam (Curlleaf Mountain Mahogany), R028AY460UT
Land Ownership: SITLA
Elevation: 8,620 ft. (2,627 m)
Aspect: East
Slope: 5-20%
Transect bearing: 184° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)
Note: Rebar is on the 1ft mark on belt 4

Directions: From the Indian Peaks cabin turnoff from the Pine Valley Road, go north 3.5 miles through an "S" turn in the road, crossing a gully to a fork. Turn right and travel east 1.45 miles to a cattle guard. Continue about 7.1 miles up the canyon to the pass. Turn right before a fence and another cattle guard on a twin track. Travel south about 1.9 miles to a saddle and a witness post on the right side of the road. From the post, the 0-foot stake is 20 paces at a bearing of 261°M.

Map Name: Lamerdorf Peak



Diagrammatic Sketch:



Township: 29S Range: 19W Section: 2

GPS: NAD 83, UTM 12S 272424 E 4244446 N

WAH WAH PASS - TREND STUDY NO. 20-6

Site Information

Site Description: This study was established in 1998 to monitor wildlife presence in the Wah Wah Mountains on land that is administered by the Utah School and Institutional Trust Lands Administration (SITLA) as part of the Bucket Ranch allotment. The Willow Creek wildfire burned 285 acres of the slope directly east of the study in July of 1997. The area is considered high-elevation winter range for deer. The study is also frequented by elk, cattle, and wild horses. Deer pellet groups were sampled in low abundance in 1998 and 2012, moderate abundance in 2003, and high abundance in 2008. Deer pellet groups were more prevalent at the southern end of the baseline, which is surrounded by dense curlleaf mountain mahogany (*Cercocarpus ledifolius*). Elk pellet groups were sampled in low abundance in 2003 and 2012, and moderate abundance in 2008. Cattle pats were sampled in low abundance in all sample years. In 1998, cattle were observed on the study using the shade provided by the taller mountain mahogany. A cattle carcass and skeleton were found on the site in 2008, and another carcass was found in 2012. Wild horses were also seen near the study in 1998 and 2003. Horse piles were sampled in low abundance each year sampled (Table - Pellet Group Data). Most of the cattle and horse use was concentrated near the northern end of the baseline near an open meadow.

Browse: The vegetation community consists primarily of an old growth stand of curlleaf mountain mahogany with a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) understory. Mountain mahogany is a moderately dense, mature population that has steadily decreased in density since 2003. The health of the mahogany population has been vigorous over the course of the study. Recruitment of young mahogany to the population has been good over the course of the study years. Utilization of mahogany has been mostly moderate to heavy. Many of the plants have a high-lined tree like growth form that makes them unavailable for animal use. Mountain big sagebrush is a moderately dense, mature population that has steadily decreased in density since 2003. Decadence of sagebrush was moderate at the outset of the study, but has steadily decreased over the course of the study. Poor vigor within the sagebrush population has been low for each sampled year. Recruitment of young sagebrush to the population has been good over the course of the study. Utilization of sagebrush has been light most sample years, but was moderate in 2008. Although mountain snowberry is not considered a preferred browse species, snowberry plants have displayed some utilization over the course of the study. Snowberry is a dense, mature population that has increased in density since 2003. There are also small populations of wax currant (*Ribes cereum* ssp. *cereum*) and slenderbush eriogonum (*Eriogonum microthecum*) on the study. Singleleaf pinyon pine (*Pinus monophylla*) and white fir (*Abies concolor*) trees are scattered throughout the site (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is diverse but provides little cover. Mutton bluegrass (*Poa fendleriana*) has provided the majority of the grass cover in all sample years. Other perennial grass species present include bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), sedge (*Carex sp.*), and bottlebrush squirreltail (*Sitanion hystrix*). The invasive annual species cheatgrass (*Bromus tectorum*) has been sampled on the site since 2003, but is not common on the site. Forbs are diverse, but no species are particularly abundant. Some of the more common species include pale agoseris (*Agoseris glauca*), thistle (*Cirsium* sp.), Eaton fleabane (*Erigeron eatonii*), and lousewort (*Pedicularis centranthera*) (Table - Herbaceous Trends).

Soil: Natural Resource Conservation Service (NRCS) soil data was not available for this site. The soil texture is a clay loam with a neutral soil reaction (pH 6.8). Phosphorus may have limited availability for plant growth and development at 2.6 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is low with high amounts of litter and vegetation providing protective ground cover. The soil surface is fairly rocky, with pavement and rock concentrated in the open interspaces (Table - Basic Cover). The soil erosion condition was determined to be stable in each sample year since 2003.

Trend Assessments

Browse:

- **1998 to 2003 - up (+2):** The density of curlleaf mountain mahogany increased 4% from 1,440 plants/acre to 1,500 plants/acre. Cover of mahogany decreased considerably from 27% to 13%. Decadence of mahogany increased from 3% to 17%, and poor vigor increased from 1% to 16%. Recruitment of young mahogany to the population decreased from 36% to 19%. The density of mountain big sagebrush increased 88% from 2,180 plants/acre to 4,100 plants/acre. Cover of sagebrush decreased from 6% to 4%. Decadence of sagebrush decreased from 26% to 13%, and poor vigor decreased from 10% to 2%. Recruitment of young sagebrush to the population increased considerably from 17% to 51%.
- **2003 to 2008 - slightly down (-1):** The density of curlleaf mountain mahogany decreased 33% to 1,000 plants/acre. Cover of mahogany decreased considerably to 6%. Decadence decreased to 10%, and poor vigor decreased to 4% of the population. Recruitment of young mahogany to the population decreased to 16%. The density of mountain big sagebrush decreased 13% to 3,580 plants/acre. Cover of sagebrush was maintained at 4%. Decadence of sagebrush decreased to 4%, and poor vigor remained low at 2%. Recruitment of young sagebrush to the population decreased to 27%.
- **2008 to 2012 - down (-2):** The density of curlleaf mountain mahogany decreased 28% to 720 plants/acre. Cover of mahogany increased to 11%. Decadence of mahogany decreased to 8%, but poor vigor increased to 17%. Recruitment of young mahogany to the population increased to 19%. The density of mountain big sagebrush decreased 40% to 2,140 plants/acre. Cover of sagebrush increased slightly to 5%.Decadence decreased to 2%, and poor vigor decreased to 2%. Recruitment of young sagebrush to the population was maintained at 27%.

Grass:

- **1998 to 2003 - stable (0):** Perennial grasses are rare on the site, and lack diversity within the community.
- **2003 to 2008 - stable (0):** Perennial grasses remain rare on the site, and lack diversity within the community.
- **2008 to 2012 - stable (0):** Perennial grasses remain rare on the site, and lack diversity within the community.

Forb:

- **1998 to 2003 - down (-2):** The sum of nested frequencies of perennial forbs decreased 50%. Perennial forbs decreased in cover from 7% to 3%.
- **2003 to 2008 - up (+2):** The sum of nested frequencies of perennial forbs increased 46%. Perennial forb cover increased to 5%.
- **2008 to 2012 - stable (0):** The sum of nested frequencies of perennial forbs remained similar. Perennial forb cover decreased to 4%.

Trend Summary

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

Type	Species	Nested Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	a7	ab12	b25	ab12	.03	.04	.70	.07
G	Bromus tectorum (a)	-	3	1	1	-	.01	.00	.00
G	Carex sp.	-	3	7	12	-	.15	.04	.09
G	Oryzopsis hymenoides	3	3	5	7	.01	.01	.21	.09

Type	Species	Nested Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
G	Poa fendleriana	65	50	56	79	2.16	.40	.88	2.27
G	Poa pratensis	-	-	1	3	-	-	.03	.00
G	Sitanion hystrix	-	2	1	2	-	.01	.00	.15
G	Stipa columbiana	-	-	3	-	-	-	.04	-
Total for Annual Grasses		0	3	1	1	0	0.00	0.00	0.00
Total for Perennial Grasses		75	70	98	115	2.21	0.61	1.90	2.70
Total for Grasses		75	73	99	116	2.21	0.62	1.91	2.70
F	Agoseris glauca	$_{b}$37	$_{a}$14	$_{ab}$28	$_{a}$10	.73	.03	.58	.01
F	Balsamorhiza hookeri	$_{b}$7	$_{a}$1	$_{a}$-	$_{a}$-	.60	.03	-	-
F	Balsamorhiza sagittata	2	-	2	-	.15	-	.03	-
F	Calochortus nuttallii	$_{ab}$11	$_{a}$2	$_{b}$18	$_{a}$2	.05	.00	.07	.00
F	Chaenactis douglasii	9	5	-	5	.21	.01	-	.18
F	Chenopodium fremontii (a)	$_{a}$-	$_{b}$14	$_{ab}$3	$_{b}$14	-	.08	.01	.05
F	Cirsium sp.	$_{b}$43	$_{a}$15	$_{ab}$24	$_{ab}$24	.70	.26	.45	.33
F	Cryptantha sp.	5	5	4	7	.03	.03	.04	.39
F	Cymopterus sp.	1	-	4	-	.00	-	.00	-
F	Erigeron eatonii	33	27	35	39	.40	.22	.72	.57
F	Eriogonum spathulatum	3	6	-	6	.15	.16	-	.04
F	Gayophytum ramosissimum(a)	-	1	-	-	-	.00	-	-
F	Ipomopsis aggregata	6	3	3	1	.04	.00	.00	.03
F	Lappula occidentalis (a)	14	3	6	6	.08	.01	.01	.01
F	Linum lewisii	9	-	6	9	.23	-	.18	.04
F	Lithospermum ruderale	-	-	3	-	-	-	.03	-
F	Lupinus argenteus	18	6	13	7	.43	.23	.39	.18
F	Machaeranthera canescens	2	1	-	1	.03	.00	-	.00
F	Medicago sativa	4	-	-	-	.38	-	-	-
F	Mertensia arizonica leonardi	3	-	-	-	.15	-	-	-
F	Pedicularis centranthera	21	16	24	17	.70	.62	.97	.54
F	Penstemon pachyphyllus	$_{b}$13	$_{b}$23	$_{b}$10	$_{a}$-	.10	.58	.22	-
F	Penstemon sp.	-	-	-	2	-	-	-	.15
F	Penstemon watsonii	$_{b}$13	$_{a}$-	$_{ab}$1	$_{b}$15	.28	.01	.15	.20
F	Petradoria pumila	$_{a}$14	$_{a}$11	$_{ab}$22	$_{b}$33	.37	.24	.80	1.25
F	Physaria chambersii	$_{b}$19	$_{a}$2	$_{a}$5	$_{a}$8	.58	.00	.01	.04
F	Polygonum douglasii (a)	$_{a}$-	$_{a}$7	$_{b}$25	$_{b}$31	-	.01	.31	.10
F	Senecio multilobatus	6	3	-	4	.06	.00	-	.06
F	Taraxacum officinale	3	-	2	-	.03	-	.15	-
F	Veronica biloba (a)	-	-	1	-	-	-	.00	-
Total for Annual Forbs		14	25	35	51	0.07	0.12	0.34	0.16
Total for Perennial Forbs		282	140	204	190	6.47	2.47	4.83	4.06
Total for Forbs		296	165	239	241	6.55	2.59	5.18	4.23

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

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

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Abies concolor	0	3	1	3	.15	.03	.15	.06
B	Artemisia tridentata vaseyana	40	37	37	37	6.40	4.03	4.38	5.27
B	Cercocarpus ledifolius	39	41	32	27	27.11	13.33	5.84	10.97
B	Chrysothamnus parryi	0	7	10	14	-	.59	.69	.90
B	Chrysothamnus viscidiflorus viscidiflorus	22	4	6	10	1.19	.30	.04	.63
B	Eriogonum microthecum	0	0	3	4	-	-	.06	.15
B	Gutierrezia sarothrae	0	28	31	22	-	1.13	1.95	1.57
B	Juniperus osteosperma	0	0	0	1	.38	.63	-	.38
B	Leptodactylon pungens	0	1	0	1	-	-	-	.15
B	Mahonia repens	18	16	19	21	2.09	1.36	1.95	2.45
B	Pinus monophylla	2	2	2	3	.00	.03	.18	1.28
B	Ribes cereum cereum	1	1	1	1	.63	.15	.38	.63
B	Symphoricarpos oreophilus	54	56	59	57	14.33	13.00	15.11	19.39
B	Tetradymia canescens	0	0	2	1	-	-	.00	-
Total for Browse		176	196	203	202	52.30	34.60	30.76	43.86

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 6

Species	Percent Cover			
	'98	'03	'08	'12
Abies concolor	2.00	.98	1.79	.51
Artemisia tridentata vaseyana	-	4.80	4.90	5.36
Cercocarpus ledifolius	50.79	56.43	46.08	41.86
Chrysothamnus parryi	-	.23	.10	.80
Chrysothamnus viscidiflorus viscidiflorus	-	-	.30	.31
Eriogonum microthecum	-	-	.10	-
Gutierrezia sarothrae	-	1.95	2.38	1.51
Juniperus osteosperma	-	.80	-	.78
Mahonia repens	-	1.28	1.79	2.34
Pinus monophylla	3.40	.60	.66	1.85
Ribes cereum cereum	-	.11	.01	.03
Symphoricarpos oreophilus	-	16.14	23.10	23.43
Tetradymia canescens	-	-	.03	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 6

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	0.9	1.4	1.2
Cercocarpus ledifolius	3.3	1.3	1.8

POINT-QUARTER TREE DATA--
Management unit 20, Study no: 6

Species	Trees per Acre			
	'98	'03	'08	'12
Cercocarpus ledifolius	240	312	268	232

Average diameter (in)			
'98	'03	'08	'12
8.0	8.9	13.5	9.1

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

Cover Type	Average Cover %			
	'98	'03	'08	'12
Vegetation	49.24	36.05	35.69	45.40
Rock	7.25	7.03	7.14	8.32
Pavement	8.96	4.26	5.28	4.43
Litter	74.97	65.70	57.98	48.18
Cryptogams	.00	0	.03	0
Bare Ground	7.97	6.56	12.87	12.30

SOIL ANALYSIS DATA --

Management unit 20, Study no: 6, Wah Wah Pass

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.2	6.8	29.6	34.8	35.6	4.9	2.6	195.2	0.7

PELLET GROUP DATA--
Management unit 20, Study no: 6

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	9	6	32	-
Horse	2	9	5	7
Elk	-	1	7	11
Deer	9	7	17	10
Cattle	8	5	18	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
3 (9)	10 (24)	2 (6)	1 (1)
-	14(35)	22 (55)	13 (31)
11 (26)	21 (53)	55 (137)	16 (40)
3 (9)	19 (47)	9 (23)	8 (20)

BROWSE CHARACTERISTICS--
Management unit 20, 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)
Abies concolor									
98	**0**	0	0	-	-	0	0	0	-/-
03	**60**	100	0	-	-	0	0	0	-/-
08	**20**	100	0	-	40	0	0	0	-/-
12	**60**	100	0	-	-	0	0	0	-/-
Artemisia tridentata vaseyana									
98	**2180**	17	57	26	220	0	0	10	11/20
03	**4100**	51	36	13	240	5	.48	2	10/18
08	**3580**	27	69	4	560	56	0	2	11/22
12	**2140**	27	71	2	220	15	0	0	11/21
Cercocarpus ledifolius									
98	**1440**	36	61	3	3960	32	4	1	68/102
03	**1500**	19	64	17	400	45	24	16	59/60
08	**1000**	16	74	10	80	6	22	4	-/-
12	**720**	19	72	8	480	6	31	17	88/98
Chrysothamnus parryi									
98	**0**	0	0	0	-	0	0	0	-/-
03	**460**	30	61	9	-	61	13	0	8/11
08	**420**	24	76	0	40	0	0	0	8/13
12	**460**	4	96	0	-	0	0	4	9/12
Chrysothamnus viscidiflorus viscidiflorus									
98	**860**	12	81	7	20	0	0	5	6/10
03	**200**	30	60	10	-	0	0	0	11/14
08	**260**	0	100	0	-	0	0	0	7/12
12	**600**	13	87	0	-	0	0	0	9/14
Eriogonum microthecum									
98	**0**	0	0	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**80**	0	75	25	20	0	0	25	5/7
12	**80**	0	100	0	100	25	0	0	4/6
Gutierrezia sarothrae									
98	**0**	0	0	0	-	0	0	0	9/14
03	**2780**	4	96	1	-	0	0	0	8/9
08	**3760**	27	65	8	320	0	0	7	6/9
12	**1280**	6	94	0	-	0	0	0	8/11
Juniperus osteosperma									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	100	-/-

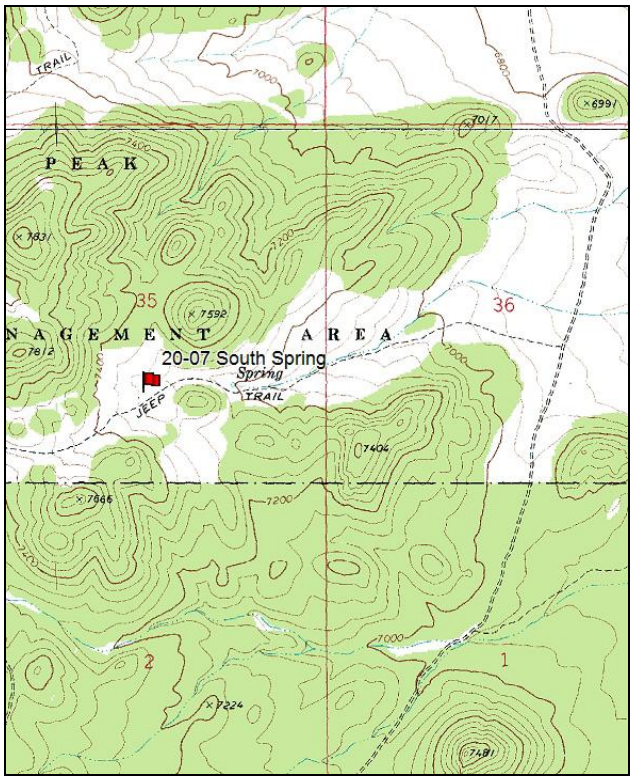
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Leptodactylon pungens									
98	**0**	0	0	-	-	0	0	0	-/-
03	**380**	0	100	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**60**	0	100	-	40	0	0	0	3/10
Mahonia repens									
98	**4800**	24	76	0	60	0	0	0	4/7
03	**9500**	0	100	0	-	0	0	.42	3/5
08	**16060**	14	84	2	980	0	0	.37	3/5
12	**9400**	4	96	0	-	0	0	0	4/4
Opuntia sp.									
98	**0**	0	0	-	-	0	0	0	3/9
03	**0**	0	0	-	-	0	0	0	3/7
08	**0**	0	0	-	-	0	0	0	4/11
12	**0**	0	0	-	-	0	0	0	-/-
Pinus monophylla									
98	**40**	50	50	-	80	0	0	0	-/-
03	**80**	75	25	-	60	0	0	0	-/-
08	**40**	50	50	-	80	0	0	0	-/-
12	**60**	100	0	-	20	0	0	33	-/-
Ribes cereum cereum									
98	**20**	0	0	100	-	100	0	0	25/27
03	**20**	0	100	0	-	0	0	0	30/40
08	**20**	0	100	0	-	0	0	0	31/45
12	**20**	0	100	0	-	100	0	0	24/23
Symphoricarpos oreophilus									
98	**5000**	16	78	6	20	5	0	.40	13/27
03	**4600**	3	92	5	-	6	2	3	11/26
08	**5840**	23	76	1	60	3	2	0	13/29
12	**6200**	5	95	0	280	2	2	0	10/30
Tetradymia canescens									
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	10/26
08	**40**	0	100	-	-	0	0	0	9/13
12	**20**	100	0	-	-	0	0	0	-/-

SOUTH SPRING - TREND STUDY NO. 20-7-12

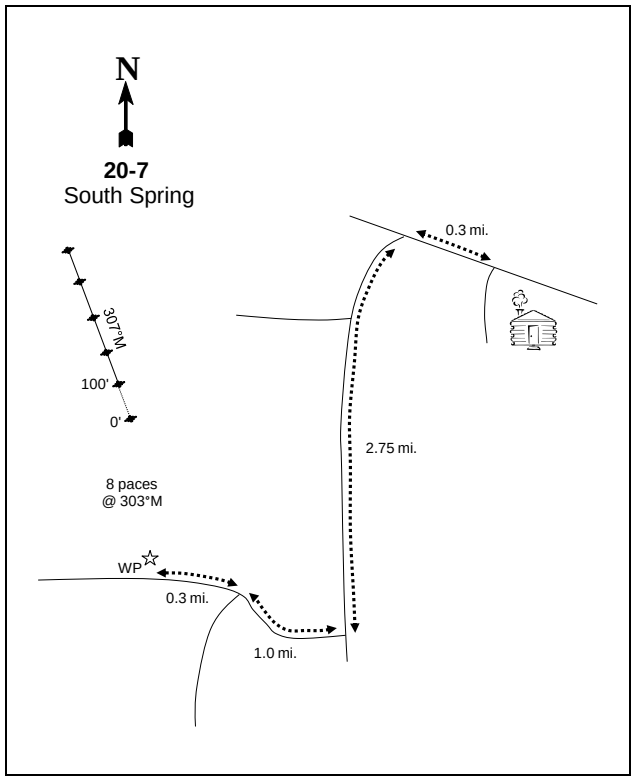
Vegetation Type: Rubber Rabbitbrush
Range Type: Substantial Deer Winter, Substantial Elk Year-long
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: UDWR
Elevation: 7,310 ft. (2,228 m)
Aspect: East
Slope: 10%
Transect bearing: 307° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)

Directions: From the Indian Peaks Cabin, go 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive 2.75 miles to another right (closed road). Follow this for 1.0 miles to a fork near a spring with a trough. Take a right and drive 0.3 miles into a sagebrush/grass flat and to the witness post on the right (north) side of the road. The 0-foot stake is 8 paces at 303°M from the witness post.

Map Name: Pinto Spring



Diagrammatic Sketch:



Township: 29S Range: 18W Section: 35

GPS: NAD 83, UTM 12S 252367 E 4236143 N

SOUTH SPRING - TREND STUDY NO. 20-7

Site Information

Site Description: This study was established in 1999 to monitor the effects of a controlled burn on a sagebrush community and subsequent wildlife use in the area on land administered by the Utah Division of Wildlife Resources (DWR). It samples a small valley that originally supported a population of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a good understory of grass. The area was supposed to be burned in fall 1999, but may have been burned the following year. Additionally, the area was chained in the early 1960s. Deer pellet groups were sampled in low abundance 1999, 2003, and 2012; but were sampled in moderate abundance in 2008. Elk pellet groups were sampled in moderate abundance in 2008 and 2012, but were sampled in high abundance in 1999 and 2003. Cattle pats were sampled in low abundance in 1999, 2003, and 2012. Several wild horses were observed near the study in 2008, and horse piles were sampled in low abundance in 2008 and 2012 (Table - Pellet Group Data).

Browse: The browse community has experienced a community shift from mountain big sagebrush being the dominate browse species in 1999 to rabbitbrush species (*Chrysothamnus spp.*) becoming the dominant populations on the site. Mountain big sagebrush is a moderately dense, young population that dramatically decreased in density following the fire in 1999, but has increased in density each sample year since 2003. The health of the sagebrush population has been vigorous most sample years, but poor vigor was high in 2012. Decadence within the sagebrush population has been absent most sample years, but was high in 1999. Recruitment of young sagebrush to the population has been low most sample years, but was excellent in 2012. Utilization was moderate in 1999 and 2003, but has been light all other sample years. A small population of heavily-browsed antelope bitterbrush (*Purshia tridentata*) was present in 1999. However, bitterbrush decreased in density considerably following the fire, and has not been sampled within the density strips since 2003. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is a dense, young population that has varied in density over the course of the study, but has gradually increased in cover over the same duration. Stickyleaf low rabbitbrush is the most commonly occurring browse species on the site. Graystem rabbitbrush *(Chrysothamnus nauseosus* ssp. *hololeucus*) is a dense, mature population that has varied in density over the course of the study, but has increased in cover the same duration (Table - Browse Characteristics). Although graystem rabbitbrush is not the most commonly occurring browse species on the site, it is the most abundant with cover being the highest of any of the browse species (Table - Browse Trends).

Herbaceous Understory: Prior to the burn, the grass component was dominated by introduced perennial species such as crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*A. intermedium*), and smooth brome (*Bromus inermis*), which together provided the majority of the total grass cover. After the burn, crested wheatgrass and smooth brome cover decreased substantially, while intermediate wheatgrass increased on the site to become the dominate perennial grass, and provides the majority of cover on the site. Additionally, the invasive annual species cheatgrass (*Bromus tectorum*) has become the dominant grass on the study since 2003. Other perennials that have been observed on the study other sample years included blue grama (*Bouteloua gracilis*), Indian ricegrass (*Oryzopsis hymenoides*), and needle-and-thread (*Stipa comata*). The forb community is sparse and lacks structural diversity. Silvery lupine (*Lupinus argenteus*) has provided the majority of forb cover in all sample years. Longleaf phlox (*Phlox longifolia*) was also relatively abundant in 2003 and 2008 (Table - Herbaceous Trends).

Soil: Resource Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover is moderate, with high amounts of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil surface is fairly loose with few rocks. The soil erosion condition was determined to be stable since 2003.

Trend Assessments

Browse:

- **1999 to 2003 - down (-2):** The density of mountain big sagebrush decreased from 4,100 plants/acre to 40 plants/acre. Cover of sagebrush decreased from 14% to near 0%.
- **2003 to 2008 - slightly up (+1):** The density of mountain big sagebrush increased five-fold to 620 plants/acre, and cover increased to 1%. The health of the sagebrush population was vigorous with decadence and poor vigor absent within the population. Recruitment of young sagebrush to the population was 10% of the population. The density of stickyleaf low rabbitbrush increased nearly seven-fold from 1,200 plants/acre to 8,000 plants/acre, and increased in cover from 3% to 5%. The density of graystem rabbitbrush increased considerably from 120 plants/acre to 5,780 plants/acre, and increased in cover from 0% to 10%.
- **2008 to 2012 - up (+2):** The density of mountain big sagebrush increased five-fold to 3,200 plants/acre, and cover increased to 5%. No decadence was observed within the sagebrush population, but poor vigor increased from 0% to 37%. Recruitment of young sagebrush to the population increased to 70%. The density of stickyleaf low rabbitbrush decreased 50% to 4,020 plants/acre, but remained at 5% cover. The density of graystem rabbitbrush decreased 54% 2,660 plants/acre, but increased in cover to 11%.

Grass:

- **1999 to 2003 - down (-2):** The sum of nested frequencies of perennial grasses decreased 66%, and cover decreased from 17% to 7%. Crested wheatgrass decreased significantly in nested frequency. The annual species cheatgrass decreased significantly in nested frequency, but increased in cover from 1% to 2%.
- **2003 to 2008 - slightly up (+1):** The sum of nested frequencies of perennial grasses increased two-fold, and cover increased to 9%. Crested wheatgrass and intermediate wheatgrass increased significantly in nested frequency. The annual species cheatgrass increased significantly in nested frequency, and increased in cover to 9%.
- **2008 to 2012 - slightly down (-1):** The sum of nested frequencies and cover of perennial grasses remained similar. Intermediate wheatgrass decreased significantly in nested frequency. The annual species cheatgrass increased significantly in nested frequency, and increased in cover to 21%.

Forb:

- **1999 to 2003 - slightly up (+1):** The sum of nested frequencies of perennial forbs increased 69%, and cover increased from 3% to 12%. Silvery lupine is the only common perennial forb species and is responsible for most of the changes in the perennial forb component.
- **2003 to 2008 - stable (0):** The sum of nested frequencies of perennial forbs increased 20%, but cover decreased to 5%. Silvery lupine is the only common perennial forb species and is responsible for most of the changes in the perennial forb component.
- **2008 to 2012 - down (-2):** The sum of nested frequencies of perennial forbs decreased 62%, and cover decreased to 2%. Silvery lupine is the only common perennial forb species and is responsible for most of the changes in the perennial forb component.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 20, 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
99	17.2	6.3	0.5	30.0	-0.9	5.1	0.0	**58.3**	Fair
03	0.2	0.0	0.0	13.0	-1.4	10.0	0.0	**21.9**	Very Poor
08	1.0	0.0	0.0	18.2	-5.1	10.0	0.0	**24.1**	Very Poor
12	6.0	0.0	0.0	18.5	-15.6	3.5	0.0	**12.3**	Very Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 20, Study no: 7

Type	Species	Nested Frequency				Average Cover %			
		'99	'03	'08	'12	'99	'03	'08	'12
G	Agropyron cristatum	c297	a9	b40	b48	11.23	.22	.57	.79
G	Agropyron dasystachyum	a-	c61	c69	b37	-	1.56	.97	.45
G	Agropyron intermedium	a52	a70	b124	a138	2.17	4.23	5.55	6.60
G	Bouteloua gracilis	2	2	4	-	.03	.03	.00	-
G	Bromus inermis	c118	a10	b42	b73	2.78	.07	.89	1.09
G	Bromus tectorum (a)	b117	a59	c359	d422	1.16	1.80	6.81	20.79
G	Elymus cinereus	-	-	2	-	-	.03	.15	-
G	Elymus junceus	-	-	-	-	-	-	.00	-
G	Oryzopsis hymenoides	15	5	23	8	.55	.19	.27	.08
G	Sitanion hystrix	6	-	7	4	.01	-	.09	.06
G	Stipa columbiana	-	-	3	-	-	-	.15	-
G	Stipa comata	a2	a9	b36	a16	.00	.17	.43	.15
Total for Annual Grasses		117	59	359	422	1.16	1.80	6.81	20.79
Total for Perennial Grasses		492	166	350	324	16.78	6.52	9.09	9.23
Total for Grasses		609	225	709	746	17.95	8.33	15.90	30.03
F	Amaranthus sp.	-	-	-	-	-	.00	-	-
F	Astragalus sp.	2	1	6	3	.03	.00	.03	.03
F	Collinsia parviflora (a)	-	-	5	4	-	-	.01	.01
F	Cymopterus sp.	-	-	2	2	-	-	.00	.03
F	Descurainia pinnata (a)	a-	a-	b21	a-	-	-	.23	-
F	Eriogonum racemosum	-	-	-	-	.03	-	-	-
F	Gilia sp. (a)	a-	a-	b18	a-	-	-	.04	-
F	Lappula occidentalis (a)	-	-	-	5	-	-	-	.01
F	Lithospermum ruderale	-	-	-	-	-	.00	-	-
F	Lupinus argenteus	a83	b118	b131	a51	2.51	12.23	4.94	1.57
F	Lygodesmia spinosa	a-	a-	ab2	b6	-	.01	.00	.06
F	Navarretia intertexta (a)	-	-	-	-	-	.30	-	-
F	Phlox longifolia	a-	b23	b32	a2	-	.05	.17	.00
F	Sisymbrium altissimum (a)	a-	a-	ab2	b10	-	-	.03	.02
F	Sphaeralcea coccinea	-	2	-	1	-	.03	-	.03

Type	Species	Nested Frequency				Average Cover %			
		'99	'03	'08	'12	'99	'03	'08	'12
Total for Annual Forbs		0	0	46	19	0	0.30	0.32	0.04
Total for Perennial Forbs		85	144	173	65	2.57	12.33	5.16	1.73
Total for Forbs		85	144	219	84	2.57	12.64	5.49	1.78

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

BROWSE TRENDS--
Management unit 20, Study no: 7

Type	Species	Strip Frequency				Average Cover %			
		'99	'03	'08	'12	'99	'03	'08	'12
B	Artemisia tridentata vaseyana	81	2	19	48	13.75	.15	.81	4.76
B	Chrysothamnus nauseosus hololeucus	0	5	53	49	-	.00	10.32	10.87
B	Chrysothamnus viscidiflorus viscidiflorus	21	35	50	49	.45	2.51	5.19	5.34
B	Juniperus osteosperma	1	0	0	0	.00	-	-	-
	Pinus monophylla	2	0	0	0				
B	Purshia tridentata	6	0	0	0	.03	-	-	-
B	Tetradymia canescens	7	11	10	10	.53	.30	.74	1.28
Total for Browse		118	53	132	156	14.77	2.97	17.07	22.28

CANOPY COVER, LINE INTERCEPT--
Management unit 20, Study no: 7

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	-	.55	2.46
Chrysothamnus nauseosus hololeucus	.26	10.98	9.39
Chrysothamnus viscidiflorus viscidiflorus	3.36	6.81	5.03
Tetradymia canescens	.71	.40	.33

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 20, Study no: 7

Species	Average leader growth (in)
	'12
Artemisia tridentata vaseyana	1.5

POINT-QUARTER TREE DATA--
Management unit 20, Study no: 7

Species	Trees per Acre			
	'99	'03*	'08*	'12*
Juniperus osteosperma	48	-	-	-
Pinus monophylla	76	-	-	-

Average diameter (in)			
'99	'03*	'08*	'12*
1.4	-	-	-
3.2	-	-	-

*Point-Quarter Tree Data not sampled.

BASIC COVER--
Management unit 20, Study no: 7

Cover Type	Average Cover %			
	'99	'03	'08	'12
Vegetation	36.65	22.70	41.91	57.98
Rock	.08	.10	.32	.04
Pavement	8.43	53.25	16.69	.71
Litter	58.56	17.32	36.11	41.01
Cryptogams	.18	0	0	0
Bare Ground	8.90	15.23	16.56	18.27

SOIL ANALYSIS DATA --

Management unit 20, Study no: 7, South Spring

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.7	6.4	72.0	15.4	12.6	2.5	12.3	256.0	0.5

PELLET GROUP DATA--
Management unit 20, Study no: 7

Type	Quadrat Frequency			
	'99	'03	'08	'12
Rabbit	8	46	85	7
Horse	-	-	12	1
Elk	28	83	59	4
Deer	8	9	8	7
Cattle	2	-	1	-

Days use per acre (ha)			
'99	'03	'08	'12
-	-	-	-
		15 (37)	4 (10)
74 (183)	89 (220)	18 (69)	19 (48)
15 (36)	13 (31)	20 (50)	1 (3)
4 (9)	2 (5)	-	2 (4)

BROWSE CHARACTERISTICS--
Management unit 20, 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)
Artemisia tridentata vaseyana									
99	**4100**	1	70	29	-	38	1	15	28/33
03	**40**	50	50	0	-	50	0	0	11/12
08	**620**	10	90	0	-	3	0	0	13/17
12	**3200**	76	24	0	220	0	0	37	16/24
Chrysothamnus nauseosus									
99	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	20/31
08	**0**	0	0	-	-	0	0	0	22/31
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus nauseosus hololeucus									
99	**0**	0	0	0	-	0	0	0	-/-
03	**120**	50	50	0	-	0	0	0	17/23
08	**5780**	6	92	2	-	2	1	6	15/21
12	**2660**	2	94	4	20	2	0	34	21/30
Chrysothamnus viscidiflorus viscidiflorus									
99	**580**	17	76	7	-	0	3	0	17/17
03	**1200**	3	97	0	20	5	0	0	14/20
08	**8000**	56	38	7	820	0	0	.50	14/21
12	**4020**	13	87	0	-	0	0	2	12/20
Juniperus osteosperma									
99	**20**	100	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Pinus monophylla									
99	**40**	100	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Purshia tridentata									
99	**140**	14	57	29	-	14	71	29	15/28
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	7/13
12	**0**	0	0	0	-	0	0	0	6/13
Tetradymia canescens									
99	**280**	0	100	0	-	0	0	0	15/17
03	**340**	0	100	0	100	0	6	0	10/16
08	**360**	0	39	61	-	33	50	11	8/18
12	**340**	18	82	0	-	6	0	6	7/15

SUMMARY
WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which inlude **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. Seven interagency range trend studies were sampled in Unit 20 during the summer of 2012.

Three studies [Upper Indian Peak (20-1), Merrils Camp (20-4), and Wah Wah Pass (20-6)] are categorized as deer summer range sites, and sample mountain brush communities. All of these studies are also considered to be elk year-long range. The four other studies [Lower Indian Peak (20-2), Mountain Home Seeding (20-3), Upper Hamblin Valley (20-5), and South Spring (20-7)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush or black sagebrush communities. All of these studies 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 the Western division (Division 1). The Western division had a historic annual mean precipitation of 8.66 inches from 1895 to 2012. The mean annual PDSI of the Western division displays a series of prolonged, severe drought years over the course of study years in the unit (Figure 1 and Figure 2) (Time Series Data 2012).

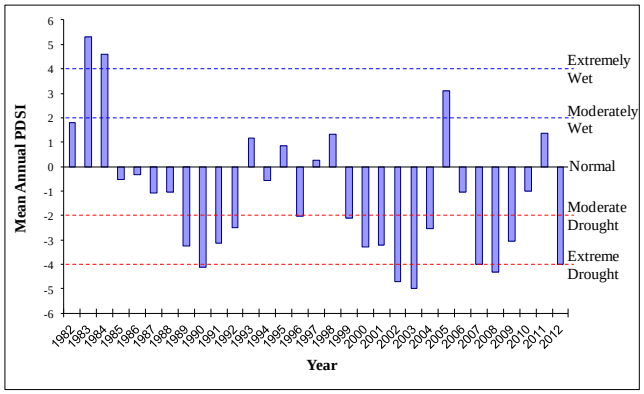


Figure 1. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the Western division (Division 1). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

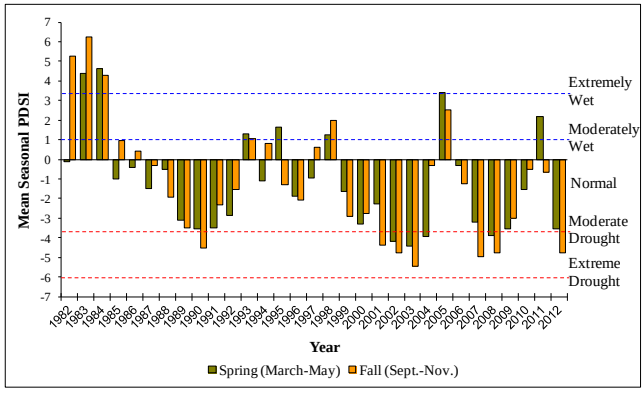


Figure 2. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the Western division (Division 1). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

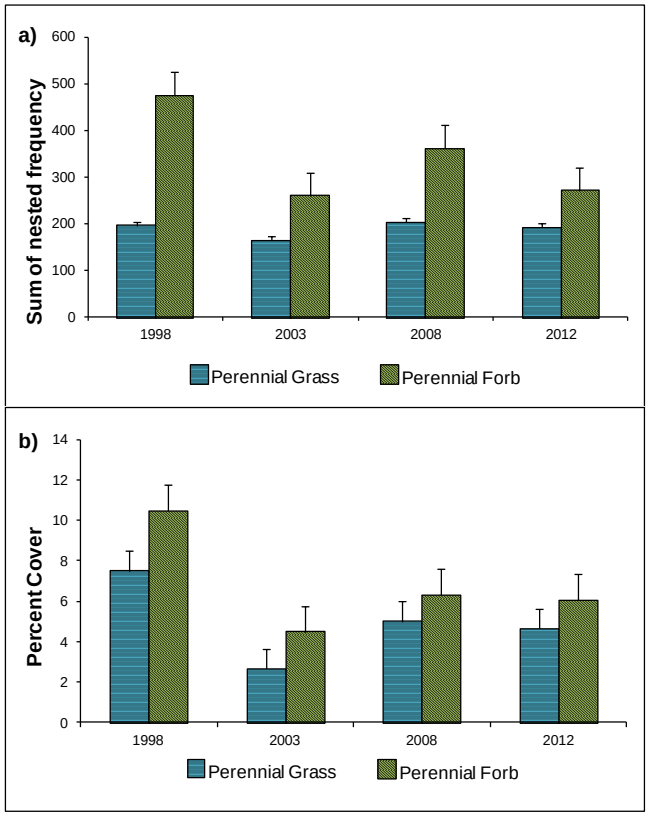


Figure 3. a) Deer summer range sites mean perennial grass and perennial forb sum of nested frequency by year for WMU 20, Southwest Desert. **b)** Deer summer range sites mean perennial grass and perennial forb cover by year for WMU 20.

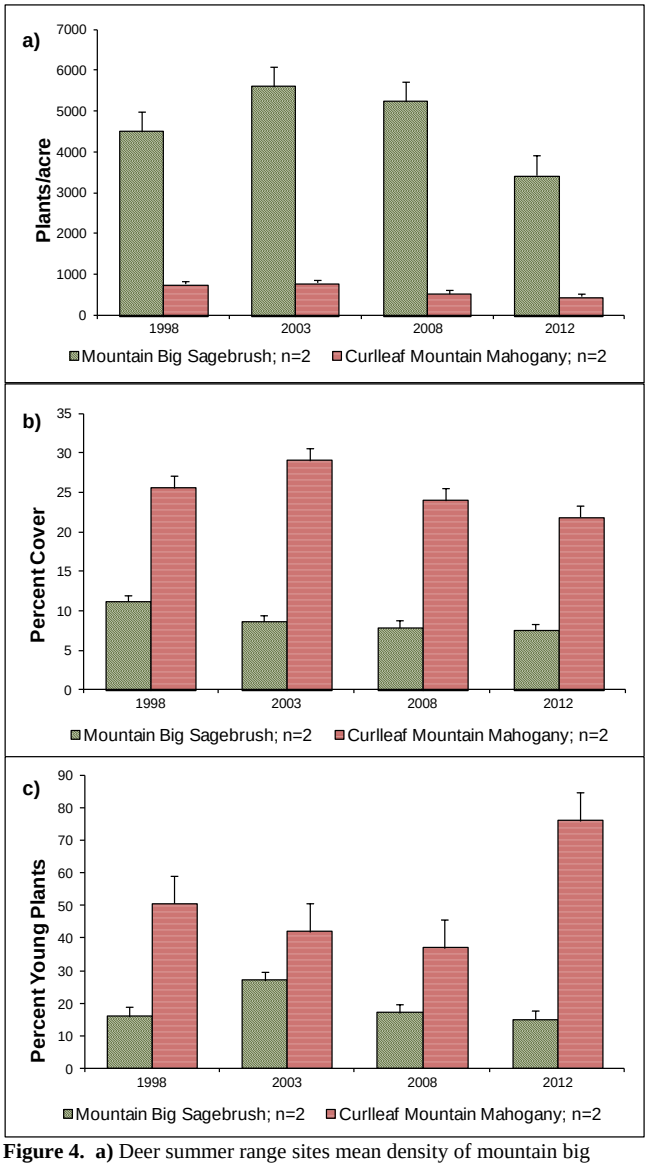


Figure 4. a) Deer summer range sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and curlleaf mountain mahogany (*Cercocarpus ledifolius*) by year for WMU 20, Southwest Desert. **b)** Deer summer range sites mean cover of mountain big sagebrush and curlleaf mountain mahogany by year for WMU 20. **c)** Deer summer range sites mean recruitment of young mountain big sagebrush and curlleaf mountain mahogany plants by year for WMU 20.

The 1961-1990 mean annual precipitation was 16-18 in. on the Lower Indian Peak study; 18-20 in. on the South Spring study; and 20-24 in. on the Upper Indian Peak, Mountain Home Seeding, Merrill's Camp, Upper Hamblin Valley, and Wah Wah Pass studies (PRISM Climate Group 2011).

Deer Summer Range

Browse: The summer range sites cumulative median browse trend for the unit has fluctuated, but has generally decreased since 2003 (Figure 8a). The three summer range studies in the unit have distinct vegetation types associated with them. The Upper Indian Peak study samples a mixed mountain brush community of mountain big sagebrush, Utah serviceberry (*Amelanchier utahensis*), true mountain mahogany (*Cercocarpus montanus*) and other preferred browse species. The Wah Wah Pass study samples a curlleaf mountain mahogany (*Cercocarpus ledifolius*) community of large, tree-like plants, with an understory of mixed shrub species including mountain big sagebrush and mountain snowberry (*Symphoricarpos oreophilus*). The Merrils Camp study was established in 2012 and samples a mountain big sagebrush community with some Utah serviceberry and mountain snowberry dispersed throughout the site. The Merrils Camp study was not included in this summary because it only had one year of data. For more information on this study, refer to the associated studies discussion section.

Mountain big sagebrush is present on both the Indian Peak and Wah Wah pass studies, but is more dominant on the Indian Peak study. Trends of mountain big sagebrush are primarily influenced by the Indian Peak

study. The mean density and of mountain big sagebrush increased significantly in 2003, but decreased significantly in 2012. The mean density of mountain big sagebrush was significantly lower in 2012 than in 1998 (Figure 4a). Mean cover of mountain big sagebrush decreased significantly in 2003, and has remained at reduced levels in the subsequent sample years (Figure 4b). The mean recruitment of young mountain big sagebrush plants increased significantly in 2003, but decreased significantly in 2008 (Figure 4c).

Curlleaf mountain mahogany is present on both the Indian Peak and Wah Wah pass studies, but is more dominant on the Wah Wah Pass study. Trends of curlleaf mountain mahogany are primarily influenced by the Wah Wah Pass study. Mean density of curlleaf mountain mahogany decreased significantly in 2008, and remained at reduced levels in 2012 (Figure 4a). Mean line-intercept cover has been high throughout the study years, but decreased significantly in 2008 (Figure 4b). Mean recruitment of young curlleaf mountain mahogany plants has been high over the course of the study, but increased significantly in 2012 (Figure 4c).

Herbaceous Understory: The summer range median cumulative grass trend for the unit has remained relatively stable with a slight increase in 1991 (Figure 8a). Perennial grass species are not particularly abundant for summer range sites. The mean sum of nested frequency of perennial grasses has remained relatively stable since 1998 (Figure 3a). The mean cover of perennial grasses decreased significantly in 2003, but increased significantly in 2008 and remained similar in 2012. Despite the increase in 2008, mean cover of perennial grasses remained below 1998 levels (Figure 3b).

The summer range median cumulative forb trend for the unit has fluctuated over the course of the study. The cumulative trend had an increase in 1991, decreased in 1998 and 2003, but increased again in 2008 (Figure 8a). Perennial forbs have been moderately diverse and abundant within the sampled communities. The mean sum of nested frequency and cover of perennial forbs decreased significantly in 2003, and have remained at reduced levels in subsequent sample years (Figure 3a and Figure 3b).

Occupancy: Pellet group transect data indicates that elk predominately occupy these summer range studies. The mean abundance of elk pellet groups increased substantially in 2003, and has remained higher in subsequent sample years. These trends are primarily driven by elk pellet groups on the Indian Peak study study. Mean abundance of deer pellet groups has been primarily low, but was much higher in 2008 due to an increase on the Wah Wah Pass study. Livestock use has been light on the studies since 1998 (Figure 9a).

Discussion: Despite decreases in the mountain big sagebrush and curlleaf mountain mahogany populations on these summer range studies, the browse component of the summer range 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.

Mid-Level Potential Deer Range

Browse: The mid-level potential site cumulative median browse trend has increased over the duration of the study years (Figure 8b). Mountain big sagebrush is the dominant browse species on Mountain Home Seeding and South Spring studies, and is a less prevalent on the Lower Indian Peak study. The mean density of mountain big sagebrush decreased significantly in 2003, but increased significantly in 2012 to above 1998 levels (Figure 6a). Mean cover of mountain big sagebrush also decreased significantly in 2008. Mean cover increased in 2012, but remained below 1998/99 levels (Figure 6b). Most of the decrease in mountain big sagebrush is due to a prescribed fire on the South Spring study that removed nearly all of the sagebrush. Increases in mountain big sagebrush have been seen on both the South Spring and Mountain Home Seeding since 2003.

Black sagebrush is prevalent on the Lower Indian Peak and Upper Hamblin Valley studies. The mean density and cover of black sagebrush has been relatively stable over the sample years, though mean cover increased significantly in 2003 (Figure 6a and Figure 6b).

Herbaceous Understory: The mid-level potential median cumulative grass trend decreased substantially from 1991 to 2003, but increased somewhat in 2003 (Figure 8b). Perennial grasses comprise the majority of the herbaceous understory on most of these studies. Grasses within these communities are fairly diverse, but introduced seeded species generally dominate the composition. The annual grass species cheatgrass (*Bromus tectorum*) is prevalent on the Lower Indian Peak and South Spring studies. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) was sampled on the Lower Indian Peak study, but is rare and was not included in this summary. The mean sum of nested frequency and cover of perennial grasses decreased significantly in 2003, but increased in 2008. Despite the increase, perennial grass sum of nested frequency and cover were significantly lower in 2012 than in 1998/99 (Figure 5a and Figure 5b). Mean sum of nested frequency and cover of annual grasses decreased significantly in 2003, but increased significantly again in 2008 (Figure 5a and Figure 5b). Most of the increase was due to increases on the South Spring study.

The mid-level potential median cumulative forb trend has remained stable since the outset of the study (Figure 8b). Perennial forb species are rare on most of the studies except for the Upper Hamblin Valley study. Those perennial forb species sampled on the Upper Hamblin Valley study are generally of low forage value to wildlife. The mean sum of nested frequency and cover of perennial forb species has remained low since 1998/99 (Figure 5a and Figure 5b).

Occupancy: Pellet group transect data indicates that elk predominantly occupy these study areas. The mean abundance of elk pellet groups has been moderate to high, with the highest abundance in 2003. The mean abundance of deer has been generally low since 1998/99. The mean abundance of livestock sign has been minimal on the studies since 1998/99. Horse pellet groups were sampled on many of the sites, but were most prevalent on the Mountain Home Seeding study (Figure 9b).

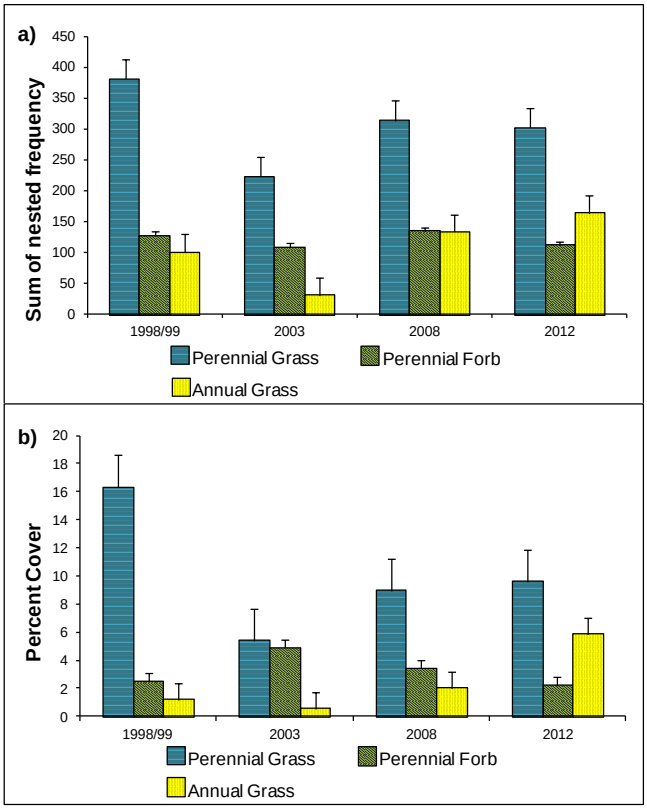


Figure 5. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, and annual grass sum of nested frequency by year for WMU 20, Southwest Desert. **b)** Mid-level potential sites mean perennial grass (-POBU), perennial forb, and annual grass cover by year for WMU 20.

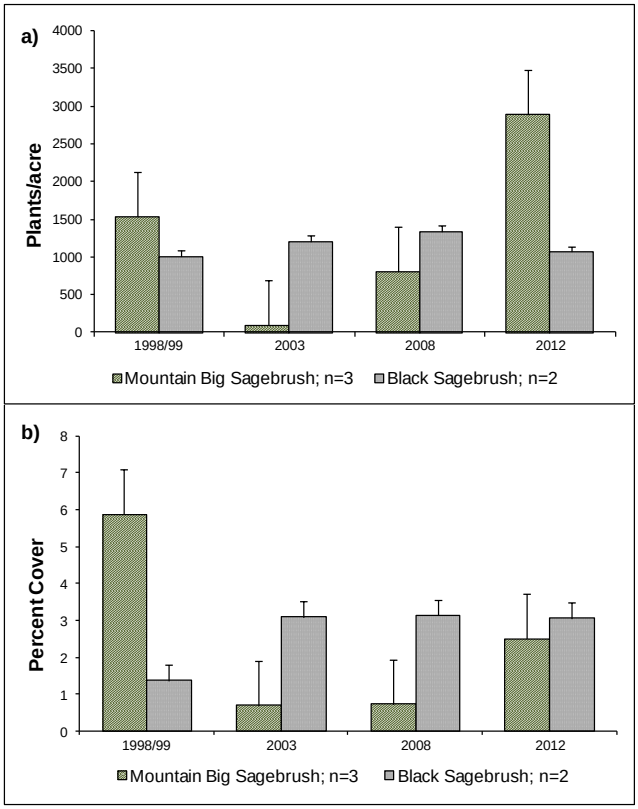


Figure 6. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and black sagebrush (*A. nova*) by year for WMU 20, Southwest Desert. **b)** Mid-level potential sites mean cover of mountain big sagebrush and black sagebrush by year for WMU 20.

Deer Desirable Components Index (DCI): The mid-level potential deer DCI decreased from poor to very poor in 2003, and has remained very poor in subsequent sample years. Most of the decrease in score is due to decreases in perennial grass cover and increases in annual grass cover. Increased decadence of preferred browse species also contributes to the lower scores (Table 1 and Figure 7).

Discussion: Mountain big sagebrush appears to be reestablishing on the Mountain Home Seeding and South Spring studies. Some factors that may limit reestablishment of mountain big sagebrush include competition from other browse species, namely rabbitbrush (*Chrysothamnus spp.*), as well as competition from cheatgrass. Heavy utilization by wildlife and wild horses, particularly on the Mountain Home Seeding study, may have detrimental impacts on the herbaceous components of the sites.

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
98/99	9.6	6.3	2.7	23.6	-0.9	4.2	0.0	**45.6**	Poor
03	7.2	3.7	1.6	10.8	-0.4	5.2	0.0	**28.1**	Very Poor
08	5.8	3.3	1.5	18.0	-1.5	5.3	0.0	**32.4**	Very Poor
12	6.4	3.7	1.0	19.2	-4.4	3.5	0.0	**29.5**	Very Poor

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=4) by year for WMU 20, Southwest Desert. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

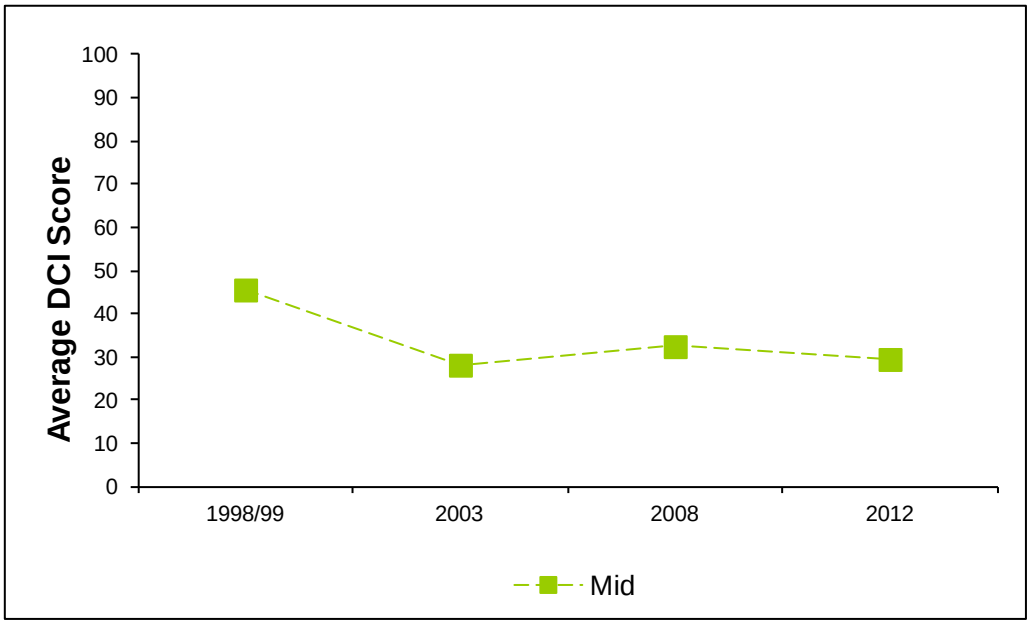


Figure 7. Mean mid-level (n=4) potential scale deer DCI scores by year for WMU 20, Southwest Desert. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

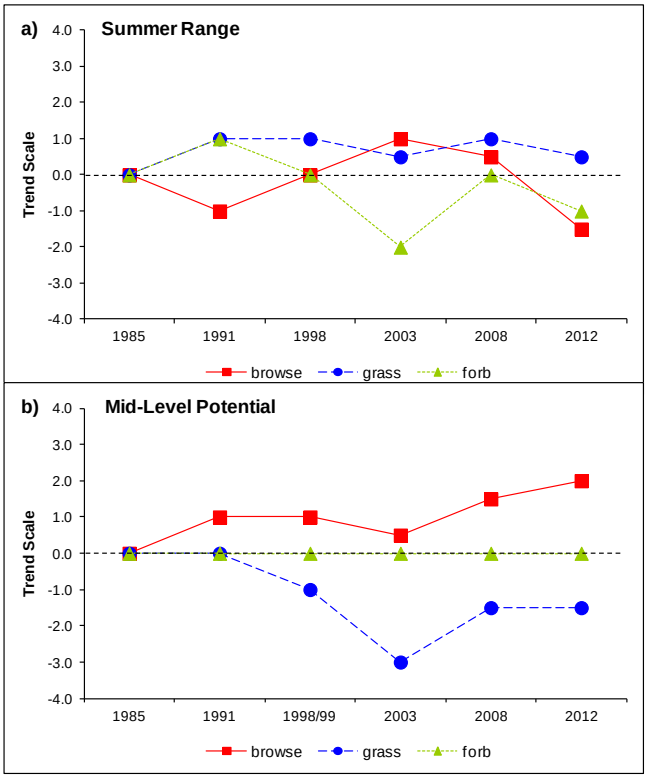


Figure 8. **a)** Deer summer range sites cumulative median browse, grass and forb trends by year for WMU 20, Southwest Desert. **b)** Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 20.

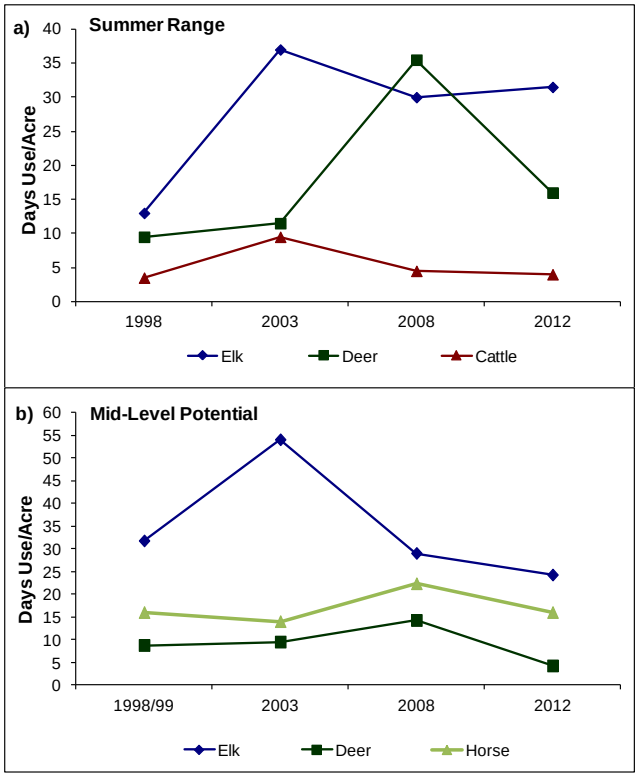
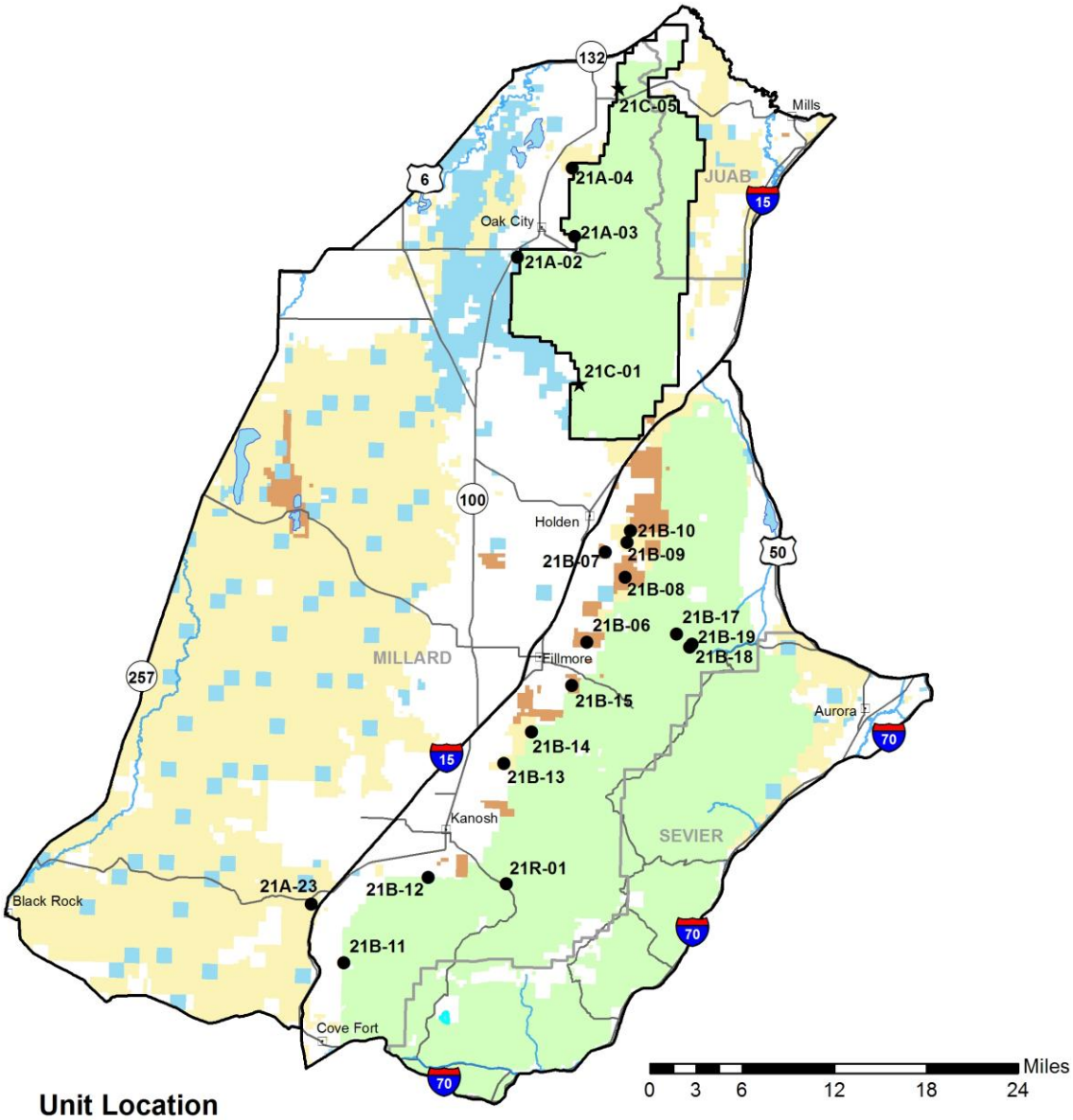
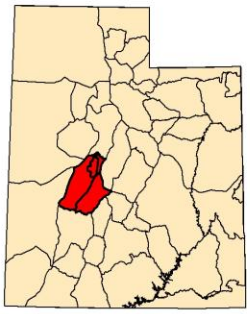


Figure 9. **a)** Deer summer range sites mean animals days use/acre (n=2) by year for WMU 20, Southwest Desert. **b)** Mid-level potential sites mean animal days use/acre (n=4) by year for WMU 20.

Management Unit 21



Unit Location



Transect Location	Waterbody
Suspended Study	BLM
City	USFS
Road	SITLA
County Boundary	UDWR
River	Private

WILDLIFE MANAGEMENT UNIT 21 - FILLMORE

Boundary Description

Millard, Sevier, Sanpete, and Juab counties - Boundary begins at I-70 and I-15; north on I-15 to Black Rock Road; west on Black Rock Road to SR-257; north on SR-257 to US-50 (US-6); east on US-50 (US-6) to US-6, north on US-6 to SR-132; east on SR-132 to SR-28; south on SR-28 to US-89; south on US-89 to I-70; west on I-70 to I-15 and beginning point.

Management Unit Description

The Fillmore unit includes the area encompassed by the Oak Creek (21A) and Pahvant (21B) subunits. Total usable mule deer range is estimated at about 1,126,800 acres. Year-long deer range only makes up 1% of the area. Summer deer ranges are usually confined to elevations above 7,000 feet and are limiting, as they only make up 30% of the range. The majority (69%) of mule deer range within the Fillmore unit is classified as winter range. Total useable elk range is estimated at 505,047 acres. Year-long, summer, and winter elk ranges represent 22%, 38%, and 40% of the total elk range, respectively. The majority of deer and elk ranges lie on public lands administered by the BLM and US Forest Service. The Fillmore unit includes the Canyon Mountains northeast of Scipio, the Valley Mountains east of Scipio, and the Pahvant Range east of Fillmore. Elevation is highly variable from approximately 5,000 feet near Fillmore, 10,129 feet on Pioneer Peak, 9,711 feet at Fool Creek Peak in the Canyon Mountains, and 8,240 feet in the Valley Mountains. The Valley Mountains are relatively dry and have no continuous flowing drainages. The Canyon Mountains drain mostly to the west by way of Oak Creek and Fools Creek, and to the east down Little Oak Creek. The major Pahvant drainages are Chalk Creek, Pioneer Creek, Maple Hollow, and Wild Goose Creek on the west side, and Maple Creek on the east side.

The major vegetation types that make up the summer range are mountain brush, conifer, aspen, and dry meadow. A history of severe overgrazing of these steep mountain ranges has resulted in poor ground cover and related soil disturbances. These issues caused problems of periodic flash flooding and soil erosion, which necessitated a great deal of costly watershed and soil stabilization work by the US Forest Service. Contour trenching, seeding, grazing reductions, and other management practices have largely eliminated the flash flooding problems. However, the land is still in the recovery process. Meanwhile, production rates of desirable forage remains relatively low.

A number of events have resulted in changes in the character of the winter range, especially for the Valley Mountains. In 1981, two large wildfires burned approximately 60,000 acres of mostly pinyon and juniper areas of the winter range, resulting in a significant reduction of important escape and thermal cover. Portions of these burns have been seeded, resulting in increased production of forbs and grasses in some areas. However, browse species in some of the burned areas remain limited. In addition to these burns, approximately 6% of the winter range was chained and seeded. In 2012, the Clay Springs fire burned the majority of the Canyon Mountain range. Also, a deer-proof fence built along I-15 has severely limited the movement of deer between the Oak Creek and Pahvant subunits, which was common before the construction. The three underpasses built near Scipio Pass are receiving little use and apparently deer have yet to learn to use these structures. The unit is also receiving an increase in recreational use, especially in the Oak Creek area. Poor quality of both summer and winter ranges and depredation on private lands are the major problems within the Oak Creek subunit.

MANAGEMENT SUBUNIT 21A,C - OAK CREEK

Management Unit Description

Utah, Juab, and Millard Counties - Boundary begins at the junction of I-15 and Mills Rd, south on I-15 to US-50, northwest on US-50 to US-6, northeast on US-6 to SR 132; east on SR 132 to the Sevier River south following the Sevier River to Mills Rd; east on Mills Rd to I-15 to beginning point.

Unit Description

The Clay Springs wildfire burned the majority of Subunit 21C and portion of Subunit 21A in the summer of 2012.

Range Trend Studies

One interagency range trend study was sampled in Subunit 21A during the summer of 2012. A total of six studies have been established within Subunit 21A since 1985. Six studies were established in 1985: Long Canyon (21C-1), Lovell Hollow (21A-2), Cascade Spring (21A-3), Horse Hollow (21A-4), Wood Canyon (21C-5), and Barker Canyon (21A-23).

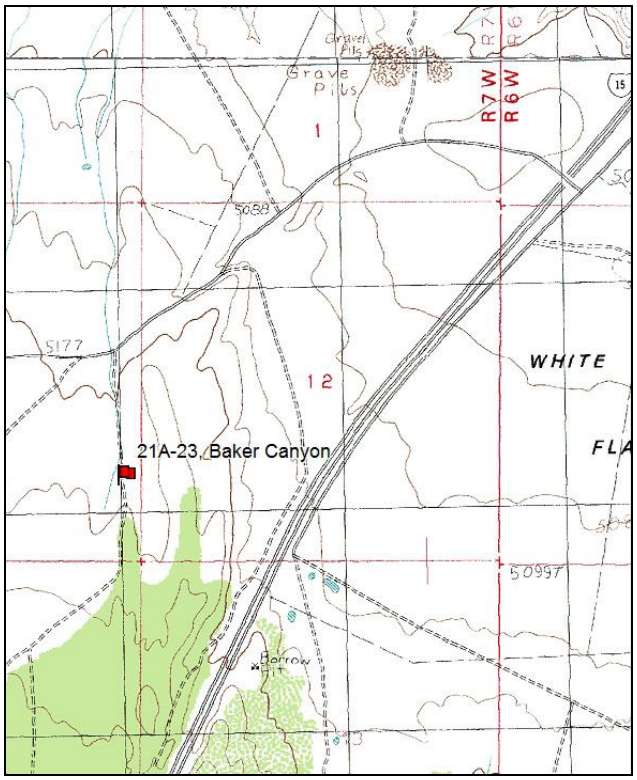
In 2012, three studies (Lovell Hollow, Cascade Spring, and Horse Hollow) were not sampled due to being burned in the Clay Springs fire, but will be reread in the future. In 2003, one study (Wood Canyon) was suspended. In 2008, one study (Long Canyon) was suspended. These studies were suspended for various 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.

BAKER CANYON - TREND STUDY NO. 21A-23-12

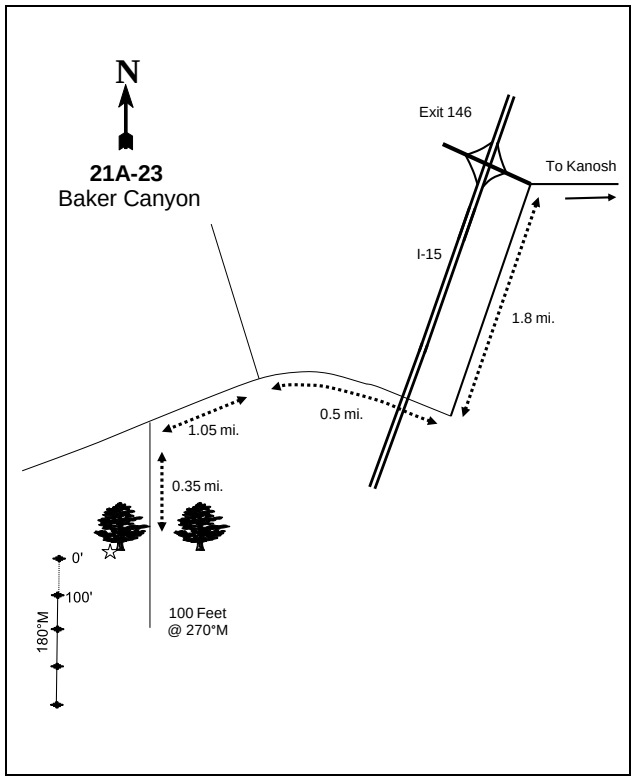
Vegetation Type: Perennial Grass
Range Type:
NRCS Ecological Site Description: Upland Loam (Wyoming Big Sagebrush), R028AY309UT
Land Ownership: BLM
Elevation: 5,220 ft (1,591 m)
Aspect: Northwest
Slope: 3%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
Proceed south from Kanosh on the main road. Turn left just before the I-15 interchange. Travel on the frontage road for 1.8 miles (paralleling the freeway on the east side) to an overpass. Go over the interstate and continue 0.5 miles west to a fork. Take the left fork and go about 1.05 miles. Just beyond the point of a small hill turn left on a 2-tire track road. Go 0.35 miles to the first point where the road squeezes between two junipers. From the south side of the large juniper to the right, go 100 feet due west to the start of the frequency baseline. The 0-foot baseline stake is a rebar, tagged #7071.

Map Name: Cove Fort



Diagrammatic Sketch:



Township: 24S Range: 7W Section: 11

GPS: NAD 83, UTM 12S 360922 E 4288321 N

BAKER CANYON - TREND STUDY NO. 21A-23

Site Information

Site Description: The study samples deer winter range just west of Interstate 15 and the White Sage Flat area on land administered by the Bureau of Land Management (BLM) as part of the Twin Peaks allotment. Some of the surrounding area was plowed and drill seeded with Russian wildrye (*Elymus junceus*) in 1967, but the study itself was not treated. The BLM did a controlled burn of the area to reduce sagebrush cover prior to 1991. The original baseline remained unburned, but the density plots were burned. The baseline was extended in 1998, which included the original baseline and the burned density plots. Traditionally, deer have concentrated in the White Sage Flat area in the winter and spring, but past presence was reported as being low. Deer pellet groups have been sampled in low abundance since 1998. The minimal deer presence sampled is concentrated in the areas of unburned sagebrush. Presence of deer is also low due to the deer-proof fence built along I-15, which essentially eliminates historical winter deer migrations to the area. Cattle sign has been sampled in low abundance since 1998. Quadrat frequency of rabbit pellets has been moderate to high since 2003 (Table - Pellet Group Data).

Browse: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the most abundant preferred browse species. The majority of the sagebrush on the study is located in areas that did not burn. The sagebrush stand is comprised of a small density population of mature and decadent plants. Recruitment of young sagebrush plants was good in the early sample years, but has been poor since 1998. Vigor was generally good in the sagebrush population in the early years of the study, but plants displaying poor vigor have increased throughout the study years and poor vigor was very high in 2012. Utilization has been mostly moderate to heavy throughout the study years. In the past, the shorter sagebrush plants had a clubbed appearance, which may be the result of past heavy hedging and poor annual growth. Nevada ephedra (*Ephedra nevadensis*) also occurs on the site in low numbers. Recruitment of young ephedra plants was good from 1998 to 2008, but was poor in the other sample years. Decadence and poor vigor of ephedra have generally been low, but poor vigor was high in 2012. Utilization of ephedra has been mostly light to moderate, though with some heavy use in several sample years (Table - Browse Characteristics). Utah juniper (*Juniperus osteosperma*) trees are scattered throughout the study. Juniper density has increased slightly since 2003 (Table - Point-Quarter Tree Data).

Herbaceous Understory: Herbaceous species are most common in the burned areas of the study. Perennial grass species are fairly abundant. Bluebunch wheatgrass (*Agropyron spicatum*) is the dominant grass, with other sampled perennial species such as Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail *(Sitanion hystrix*), and Indian ricegrass (*Oryzopsis hymenoides*) also being relatively common. Cheatgrass *(Bromus tectorum*) is common on the site, and provides a substantial amount of cover at times. Perennial forbs are fairly diverse and abundant, but annual forbs comprise a large portion of the forb component. Common perennial forbs include Hood's phlox (*Phlox hoodii*), scarlet globemallow (*Sphaeralcea coccinea*), and Torrey milkvetch (*Astragalus calycosus*). Abundant annual forbs include pale alyssum (*Alyssum alyssoides*), storksbill (*Erodium cicutarium*), and bur buttercup (*Ranunculus testiculatus*) (Table - Herbaceous Trends).

Soil: The soil is classified as a Mosida loam, which occurs on valleys and alluvial fans. These soils are formed from alluvium derived from igneous and sedimentary rock, and are characterized as deep and well drained (Soil Survey Staff 2011). The soil is a sandy clay loam with a neutral soil reaction (pH 7.1). Bare ground cover has fluctuated, but has generally been moderately high. Vegetation, litter, and pavement provide the majority of the protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - down (-2):** The controlled burn reduced sagebrush density from 3,998 plants/acre to 199 plants/acre. Recruitment of young plants increased from 15% to 67% of the population. Decadence decreased from 42% to 0%, and poor vigor decreased from 13% to 0%.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998, including areas that did not burn; therefore, the trend was determined using other parameters. Recruitment of young sagebrush plants decreased to 5%. Sagebrush decadence increased to 15% of the population.
- **1998 to 2003 - slightly down (-1):** Sagebrush density decreased 28% from 780 plants/acre to 560 plants/acre, but cover increased from 3% to 5%. Decadence of sagebrush increased to 29%, and poor vigor increased from 0% to 21% of the population. Ephedra density increased three-fold from 100 plants/acre to 320 plants/acre, and cover increased slightly from 1% to 2%. Recruitment of young ephedra plants remained very high at 69% of the population.
- **2003 to 2008 - stable (0):** Sagebrush density remained similar at 580 plants/acre, but cover decreased slightly to 4%. Decadence of sagebrush increased to 41%, and plants displaying poor vigor increased to 28% of the population. Ephedra density increased 50% to 480 plants/acre, but cover decreased slightly to 1%. Recruitment of young ephedra plants remained high to 50% of the population.
- **2008 to 2012 - slightly down (-1):** Sagebrush density decreased 14% to 500 plants/acre, but cover remained similar at 4%. Decadence of sagebrush decreased slightly to 32%, but poor vigor increased to 76% of the population. Density of ephedra decreased 54% to 220 plants/acre, but cover increased slightly to 2%. Recruitment of young ephedra plants decreased to 0%. Decadence of ephedra decreased to 0%, but poor vigor increased to 45% of the population.

Grass:

- **1985 to 1991 - up (+2):** The sum of nested frequency of perennial grasses increased 51%.
- **1991 to 1998 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 11%.
- **1998 to 2003 - up (+2):** The sum of nested frequency of perennial grasses increased 23%, and cover increased from 10% to 13%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 7% to 1%.
- **2003 to 2008 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 9%, and cover decreased to 12%. Cheatgrass increased significantly in nested frequency, and cover increased to 3%.
- **2008 to 2012 - up (+2):** The sum of nested frequency of perennial grasses increased 31%, but cover remained similar at 12%.

Forb:

- **1985 to 1991 - up (+2):** The sum of nested frequency of perennial forbs increased two-fold.
- **1991 to 1998 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased 10%. Annual forb sum of nested frequency increased substantially.
- **1998 to 2003 - down (-2):** The sum of nested frequency of perennial forbs decreased 57%, and cover decreased from 5% to 3%. Annual forb sum of nested frequency also decreased substantially.
- **2003 to 2008 - stable (0):** The sum of nested frequency of perennial forbs increased slightly, but cover remained similar at 2%. Annual forb sum of nested frequency increased substantially.
- **2008 to 2012 - stable (0):** The perennial forb sum of nested frequency increased slightly, but cover remained similar at 2%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 21A, 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
98	5.2	0.0	0.0	20.5	-4.9	10.0	0.0	**30.8**	Fair
03	6.9	7.2	4.4	26.5	-1.0	5.4	0.0	**49.3**	Good
08	4.6	0.0	0.0	23.4	-1.9	4.4	0.0	**30.5**	Fair
12	5.8	0.0	0.0	24.4	-4.1	4.4	0.0	**30.4**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 21A, Study no: 23

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	ab77	a69	bc132	c134	d180	cd143	7.48	9.98	10.78	7.50
G	Bromus tectorum (a)	-	-	c238	a100	b208	bc218	6.51	1.39	2.50	5.53
G	Elymus junceus	-	-	1	-	-	-	.00	-	-	-
G	Oryzopsis hymenoides	a4	b23	a8	ab14	a6	3	.39	.38	.04	.03
G	Poa fendleriana	8	-	1	-	2	-	.15	-	.03	-
G	Poa secunda	a53	ab96	a62	b110	a67	c186	1.73	2.16	.79	4.44
G	Sitanion hystrix	c28	d68	bc24	bc22	a1	ab4	.52	.68	.03	.21
Total for Annual Grasses		0	0	238	100	208	218	6.51	1.39	2.50	5.53
Total for Perennial Grasses		170	256	228	280	256	336	10.27	13.23	11.68	12.18
Total for Grasses		170	256	466	380	464	554	16.79	14.62	14.18	17.72
F	Alyssum alyssoides (a)	-	-	d304	a19	b210	c249	3.30	.05	.85	1.35
F	Antennaria rosea	-	3	-	-	6	1	-	-	.01	.00
F	Astragalus calycosus	a-	cd48	d62	b12	bc23	cd44	.93	.08	.28	.53
F	Astragalus marianus	b17	b26	ab3	a-	a-	a-	.04	-	-	-
F	Calochortus nuttallii	-	3	-	-	-	-	-	-	-	-
F	Chaenactis douglasii	ab3	b12	a-	a-	a-	a-	-	-	-	-
F	Comandra pallida	-	-	5	6	4	9	.03	.18	.15	.07
F	Crepis acuminata	-	2	-	-	-	-	-	-	-	-
F	Draba sp. (a)	-	-	4	-	3	-	.01	-	.00	-
F	Erodium cicutarium (a)	-	-	a59	ab71	b100	ab74	1.17	2.45	2.14	.48
F	Gilia sp. (a)	-	-	-	2	-	-	-	.00	-	-
F	Lactuca serriola (a)	-	4	1	-	-	-	.00	-	-	-
F	Machaeranthera canescens	c33	ab8	bc15	a-	a-	a2	.23	-	-	.00
F	Phlox hoodii	ab25	bc56	c64	ab29	a22	abc47	2.58	1.12	.38	1.02
F	Phlox longifolia	a-	b18	a-	a3	b18	a1	-	.00	.43	.00
F	Ranunculus testiculatus (a)	-	-	b138	a-	b122	b127	1.04	-	.69	.44
F	Salsola iberica (a)	-	b58	a-	a-	a-	a-	-	-	-	-
F	Sphaeralcea coccinea	14	25	33	28	27	31	1.40	1.28	.95	.58
F	Thlaspi alpestre	b11	a-	a-	a-	a-	a-	-	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
Total for Annual Forbs		0	62	506	92	435	450	5.53	2.50	3.69	2.27
Total for Perennial Forbs		103	201	182	78	100	135	5.23	2.68	2.20	2.21
Total for Forbs		103	263	688	170	535	585	10.77	5.18	5.90	4.49

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

BROWSE TRENDS--
Management unit 21A, Study no: 23

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata wyomingensis	23	19	22	19	3.15	4.82	3.67	3.84
B	Chrysothamnus nauseosus hololeucus	1	2	1	3	1.00	.71	.03	.79
B	Chrysothamnus viscidiflorus stenophyllus	10	12	11	14	.99	1.22	1.22	1.56
B	Ephedra nevadensis	4	6	5	5	1.23	1.91	1.16	1.66
B	Juniperus osteosperma	2	2	3	2	2.90	3.12	.06	2.94
B	Tetradymia canescens	0	0	2	0	-	-	.03	-
Total for Browse		40	41	44	43	9.29	11.78	6.18	10.79

CANOPY COVER, LINE INTERCEPT--
Management unit 21A, Study no: 23

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata wyomingensis	3.20	2.68	4.31
Chrysothamnus nauseosus hololeucus	.85	.35	1.28
Chrysothamnus viscidiflorus stenophyllus	.46	.05	.73
Ephedra nevadensis	.95	.95	1.26
Juniperus osteosperma	6.40	6.86	8.31
Tetradymia canescens	-	.75	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21A, Study no: 23

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata wyomingensis	1.3	1.7	0.8

POINT-QUARTER TREE DATA--
Management unit 21A, Study no: 23

Species	Trees per Acre		
	'03	'08	'12
Juniperus osteosperma	34	45	49

Average diameter (in)		
'03	'08	'12
2.8	4.1	2.5

BASIC COVER--
Management unit 21A, Study no: 23

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	2.50	4.50	33.32	29.96	28.10	36.52
Rock	2.00	2.75	4.11	2.98	2.16	1.42
Pavement	26.00	22.75	23.60	34.47	31.07	18.14
Litter	40.25	42.75	28.61	23.34	34.54	40.01
Cryptogams	4.50	3.75	1.54	1.45	3.01	3.86
Bare Ground	24.75	23.50	40.77	19.85	9.27	21.06

SOIL ANALYSIS DATA --

Management unit 21A, Study no: 23, Baker Canyon

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.1	7.1	48.0	27.4	24.6	1.0	16.8	140.8	0.6

PELLET GROUP DATA--
Management unit 21A, Study no: 23

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	7	32	86	32
Deer	13	9	15	-
Cattle	4	-	-	4

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
19 (47)	1 (2)	9 (23)	3 (7)
7 (17)	12 (30)	12 (30)	-

BROWSE CHARACTERISTICS--
Management unit 21A, Study no: 23

		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 tridentata wyomingensis									
85	**3998**	15	43	42	599	65	7	13	26/22
91	**199**	67	33	0	-	67	0	0	8/8
98	**780**	5	79	15	-	51	3	0	21/27
03	**560**	0	71	29	-	7	0	21	23/34
08	**580**	3	55	41	20	31	31	28	28/38
12	**500**	0	68	32	-	12	20	76	21/33
Chrysothamnus nauseosus hololeucus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**20**	0	100	0	-	0	0	0	43/80
03	**40**	100	0	0	-	0	0	0	27/44
08	**20**	0	100	0	-	0	0	0	29/41
12	**60**	0	67	33	-	33	0	33	24/34
Chrysothamnus viscidiflorus stenophyllus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**66**	0	100	0	-	100	0	0	10/4
98	**260**	0	100	0	-	0	0	0	10/13
03	**360**	0	89	11	-	0	0	0	11/20
08	**420**	5	81	14	20	5	0	10	13/21
12	**520**	15	85	0	-	4	0	85	11/21
Ephedra nevadensis									
85	**66**	0	100	0	-	100	0	0	19/21
91	**66**	0	100	0	-	0	0	0	30/43
98	**100**	40	60	0	-	20	20	0	26/49
03	**320**	69	25	6	-	6	13	6	24/44
08	**480**	50	33	17	-	25	17	4	25/51
12	**220**	0	100	0	-	73	9	45	24/43
Gutierrezia sarothrae									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	14/19
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/5

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Juniperus osteosperma									
85	**266**	100	0	-	133	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	50	50	-	-	0	0	0	-/-
03	**40**	50	50	-	-	0	0	0	-/-
08	**60**	33	67	-	20	0	0	0	-/-
12	**180**	0	100	-	20	0	0	89	-/-
Opuntia sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	11/25
08	**0**	0	0	-	-	0	0	0	2/8
12	**0**	0	0	-	-	0	0	0	-/-
Tetradymia canescens									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**40**	0	100	-	-	0	0	0	25/34
12	**0**	0	0	-	-	0	0	0	-/-

WILDLIFE MANAGEMENT SUBUNIT 21B - PAHVANT

Subunit Boundary Description

> **Millard and Sevier counties** - Boundary begins at I-70 and I-15; north on I-15 to US-50 (US-6); east on US-50 (US-6) to US-89; south on US-89 to I-70; west on I-70 to I-15 and beginning point.

Management Subunit Description

The Pahvant subunit is divided in half by I-15. The eastern half includes the southern two-thirds of the Pahvant Mountain range, which provides virtually all of the unit's deer summer range and most of the winter range. The western half is in the Black Rock Desert and contains only 40,000 acres of deer winter range. Deer habitat spans a range in elevation from above 10,000 feet on the summer range of the Pahvant Mountains down to 5,000 feet on the winter range in the Black Rock desert. The topography is steep and rugged at elevations of 6,000-8,000 feet, but more gentle with rolling slopes, hills, and flats above and below these contours. Meadow and Corn Creeks on the west side and Clear Creek along the southern boundary are the most important drainages. Other springs and intermittent streams are common throughout the summer range.

The majority of the deer range is on public land under BLM and US Forest Service management. Recreation, wood-cutting, geothermal, gas, oil and mineral exploration, and livestock grazing are the most important land uses. Cattle and sheep are grazed under rest-rotation and deferred-use programs. Stocking rates have been reduced in most allotments due to problems in the past with overgrazing, but it is still an issue in some local areas. Concentrations of deer on the winter range have also over-utilized key browse species in several areas where these species had already been browsed by livestock due to poor range conditions.

With these localized exceptions, both the summer and winter range are generally in good condition. Pinyon and juniper covers approximately 67% of the normal winter range. Dense pinyon and juniper stands at elevations of 5,000-6,000 feet have sparse understories and relatively low forage production rates. The browse-shrub type, which is generally found above the pinyon and juniper zone and above the upper limits of severe winter range, usually has the highest rates of forage production. The treated sagebrush and seeded types are most abundant in the lower portions of the severe wintering areas. These are critically important to deer during severe winters. While forage production is still good in most areas, a growing percentage of increasers and undesirable plants, especially cheatgrass, indicates overuse in many places and creates high fire hazards. Wildfires have burned portion of the subunit and are a concern for future fires due to prevalence of cheatgrass.

Range Trend Studies

Fourteen interagency range trend studies were sampled in Subunit 21B during the summer of 2012. A total of fifteen studies have been established within Subunit 21B since 1985. Eleven studies were established in 1985: Wood Canyon (21B-5), "M" Hill (21B-6), Bennett Field (21B-7), Smiths Ridge (21B-8), Wide Canyon BLM (21B-9), Wide Canyon DWR (21B-10), Dog Valley (21B-11), Dameron Canyon (21B-12), Meadow Canyon (21B-14), and Fillmore Cemetery East (21B-15); four studies were established in 1997: Pioneer Park (21B-17), Teeples Ridge (21B-18), Teeples Terrace (21B-18) and Corn Creek (21B-1).

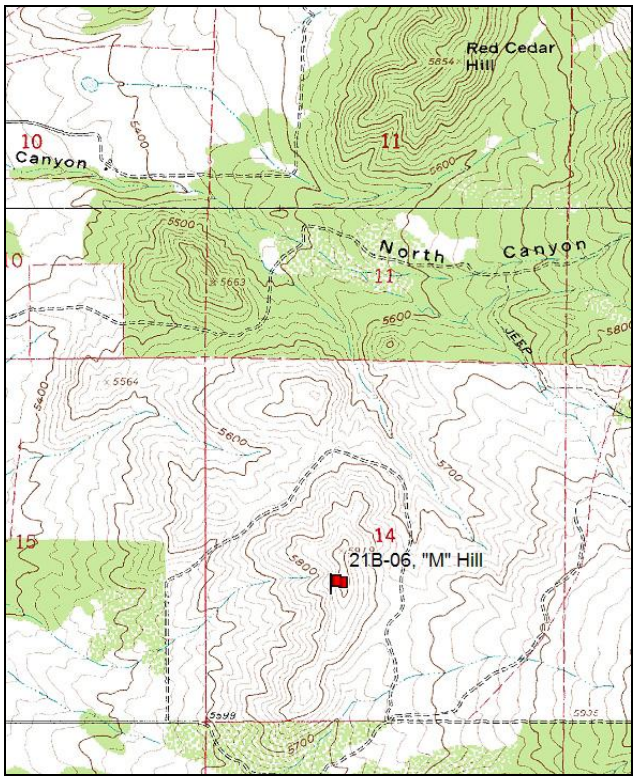
In 2003, one study (Wood Canyon) was suspended. This study was suspended for various reasons and if the need arises in the future this study can be sampled again. To access maps, discussions, and data tables for suspended studies see: http://www.wildlife.utah.gov/range.

"M" HILL - TREND STUDY NO. 21B-6-12

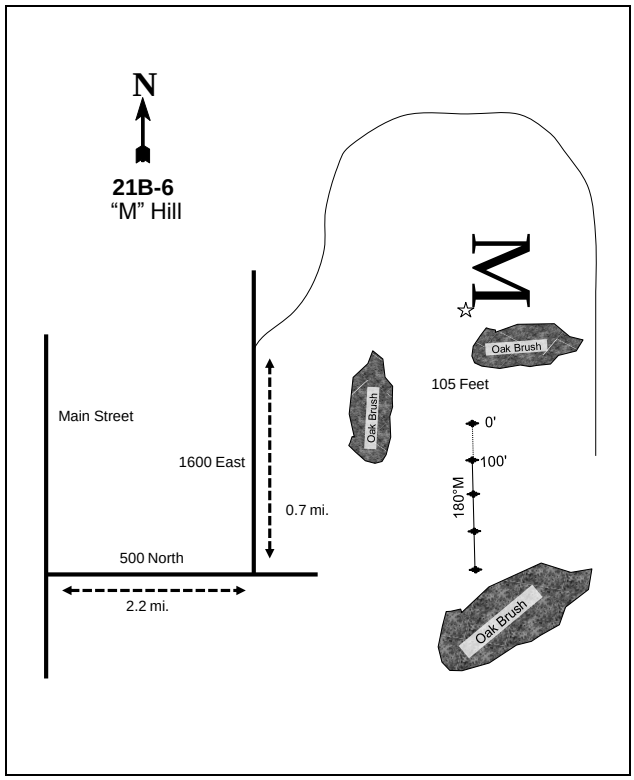
Vegetation Type: Mixed Mountain Brush
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Loam (Birchleaf Mountain Mahogany), R047XA309UT
Land Ownership: DWR
Elevation: 5,850 ft (1,783 m)
Aspect: West
Slope: 30-35%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: None

Directions:
This transect is located near the 'M' on the hill northeast of Fillmore. Starting at the junction of 500 North and Main Street in Fillmore, go east 2.2 miles to the base of 'M' Hill. The road that goes to the top of 'M' Hill has been closed. Turn left (north) at the gun range and drive 0.7 miles to the closed road. Hike to the 'M'. The frequency baseline starts 105 feet true south of the bottom of the south leg of the concrete 'M'. The baseline is marked by 2 ½ foot tall steel rebar. The 0-foot baseline stake is tagged #7112.

Map Name: Fillmore



Diagrammatic Sketch:



Township: 21S Range: 4W Section: 14

GPS: NAD 83, UTM 12S 389814 E 4315807 N

"M" HILL - TREND STUDY NO. 21B-6

Site Information

Site Description: The study is located on the Division of Wildlife Resources (DWR) Millard Wildlife Management Area (WMA) on the first large hill east of Fillmore. Further east, there are approximately two miles of rolling Utah juniper (*Juniperus osteosperma*) covered foothills below the 7,000-foot winter range limit. The study was chained more than 30 years ago, prior to the study establishment, and has since been dominated by a mixture of shrubs and reestablishing juniper trees. There is a shooting range approximately a quarter mile from the site. Cattle grazing was heavy in the past, but has decreased. Deer pellet groups were sampled in moderate abundance in 1998 and 2008, high abundance in 2003, and low abundance in 2012. Elk pellet groups have been sampled in low abundance since 1998. Cattle sign was sampled in low abundance in 1998, but has not been sampled in subsequent years (Table - Pellet Group Data).

Browse: The browse community is diverse. Gambel oak (*Quercus gambelii*), Utah juniper, and true mountain mahogany (*Cercocarpus montanus*) are the dominant species. Gambel oak occurs in dense, scattered patches of young and mature plants. Decadence and poor vigor are low in the oak population. Utilization of has been mostly light over the course of the study. True mountain mahogany occurs in low density scattered over the site. The mahogany population is mostly mature, but recruitment of young plants has been good throughout the study years. Mature mahogany plants averaged over 6 feet in height since 2003, making much of the plant unavailable to browsing deer. Decadence and poor vigor of mahogany have generally been low, but decadence was high in 2008 and poor vigor was high in 2012. Utilization of mahogany has ranged from light to moderate. A portion of the oak population was noted as being severely defoliated by grasshoppers in 1985. The herbaceous understory species and mountain mahogany were also heavily impacted by grasshoppers that same year. Other preferred browse species that are present in low density include Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), Utah serviceberry (*Amelanchier utahensis*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (Table - Browse Characteristics). Density of Utah juniper trees has remained relatively similar since 1998 (Table - Point-Quarter Tree Data), but cover has steadily increased since 2003 (Table - Canopy Cover - Line Intercept).

Herbaceous Understory: Perennial grass species are fairly abundant, but cover is dominated by a single species. Bluebunch wheatgrass (*Agropyron spicatum*) provides nearly all of the grass cover on the site. Other perennial grasses that have been sampled include Sandberg bluegrass (*Poa secunda*), Indian ricegrass (*Oryzopsis hymenoides*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*). The weedy perennial species bulbous bluegrass (*Poa bulbosa*) has been sampled with increasing abundance on the site. Cheatgrass (*Bromus tectorum*) is common on the site. There has been a moderate number of forb species sampled, though most species provide little cover. The dominant forbs have poor forage value and include pale alyssum (*Alyssum alyssoides*), rock goldenrod (*Petradoria pumila*), and desert phlox (*Phlox austromontana*) (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant very gravelly loam, which occurs on mountain slopes. These soils are formed from alluvium and colluvium derived from limestone and sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 6.9) (Table - Soil Analysis Data). Bare ground cover is low, with high amounts of vegetation, litter, rock, and pavement providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2008, but was moderate in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - stable (0):** The density of Gambel oak decreased 5% from 8,332 plants/acre to 7,932 plants/acre. However, the average height and crown measurements nearly doubled in size. The

population of mountain mahogany did not change, though plants with poor vigor decreased from 25% of the population to 0%. Mountain mahogany height and crown also increased.

- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Decadence of true mountain mahogany increased from 0% of the population to 8%, and young recruitment increased from 25% of the population to 54%. Stansbury cliffrose and mountain big sagebrush were sampled for the first time at low densities. The Gambel oak population remained stable with low decadence and high recruitment.
- **1998 to 2003 - stable (0):** True mountain mahogany density increased slightly from 260 plants/acre to 300 plants/acre, and cover remained similar at 4%. Recruitment of young mahogany plants decreased to 20% of the population. Stansbury cliffrose density also remained relatively stable, although decadence increased from 38% of the population to 83%. Mountain big sagebrush density decreased 64% from 220 plants/acre to 80 plants/acre and cover decreased from 1% to near 0%.
- **2003 to 2008 - slightly down (-1):** True mountain mahogany density decreased 33% to 200 plants/acre, and cover decreased to 3%. Recruitment of young mahogany plants decreased to 10%. Decadence of mahogany increased to 30%, and poor vigor increased from 0% to 10% of the population. Stansbury cliffrose density decreased 50% from 120 plants/acre to 60 plants/acre, and cover decreased from 1% to near 0%. Decadence of cliffrose decreased to 33% of the population.
- **2008 to 2012 - stable (0):** Density of true mountain mahogany decreased 40% to 120 plants/acre, but cover increased to 6%. Recruitment of young mahogany plants increased to 17% of the population. Decadence of mahogany decreased to 0%, but poor vigor increased to 50% of the population. Density of cliffrose increased to 140 plants/acre, but cover remained less than 1%. Decadence of cliffrose decreased to 29%, but poor vigor increased from 0% to 29% of the population.

Grass:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 14%.
- **1991 to 1998 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1998 to 2003 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased from 9% to 12%. Bulbous bluegrass was sampled for the first time at low frequency and cover. Cheatgrass decreased significantly in nested frequency, and cover decreased from 2% to near 0%.
- **2003 to 2008 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover increased to 13%.
- **2008 to 2012 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased to 19%. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 0% to 2%.

Forb:

- **1985 to 1991 - up (+2):** The sum of nested frequency of perennial forbs increased approximately 57%.
- **1991 to 1998 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1998 to 2003 - down (-2):** The sum of nested frequency for perennial forbs decreased 55%, and cover decreased from 6% to 2%.
- **2003 to 2008 - stable (0):** The sum of nested frequency of perennial forbs remained similar, though cover increased slightly to 3%.
- **2008 to 2012 - slightly down (-1):** The perennial forb sum of nested frequency decreased 18%, and cover decreased to 2%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 21B, 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
98	17.7	12.7	15.0	18.6	-1.6	10.0	0.0	**72.3**	Good
03	14.7	10.4	13.7	24.1	-0.1	4.6	0.0	**67.3**	Good
08	12.6	11.7	5.5	26.5	-0.2	5.5	0.0	**61.6**	Fair
12	18.5	14.5	15.0	30.0	-0.2	4.3	0.0	**82.1**	Excellent

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 6

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	ab169	ab207	ab198	a180	ab200	b215	8.30	10.81	12.62	17.15
G	Bromus japonicus (a)	-	-	b14	a-	b10	a-	.19	-	.02	-
G	Bromus tectorum (a)	-	-	c175	a28	ab55	b75	1.99	.13	.22	.32
G	Oryzopsis hymenoides	-	1	2	2	1	-	.38	.18	.21	.01
G	Poa bulbosa	a-	a-	a-	a7	a2	b52	-	.04	.00	2.42
G	Poa fendleriana	-	-	-	-	-	-	.00	-	-	-
G	Poa secunda	ab33	a17	ab37	b67	ab56	b65	.52	1.03	.36	1.95
G	Sitanion hystrix	-	5	7	1	4	4	.06	.01	.06	.16
Total for Annual Grasses		0	0	189	28	65	75	2.18	0.12	0.25	0.32
Total for Perennial Grasses		202	230	244	257	263	336	9.28	12.09	13.26	21.71
Total for Grasses		202	230	433	285	328	411	11.47	12.22	13.51	22.03
F	Agoseris glauca	-	-	7	-	-	-	.01	-	-	-
F	Alyssum alyssoides (a)	-	-	c234	a3	bc213	c246	1.81	.03	1.68	1.72
F	Arabis sp.	-	3	1	-	1	-	.01	-	.00	-
F	Astragalus sp.	a-	b22	b19	a2	a2	a-	.16	.00	.06	-
F	Calochortus nuttallii	-	-	-	-	2	-	-	-	.00	-
F	Cirsium sp.	-	-	3	1	4	-	.06	.00	.00	-
F	Collinsia parviflora (a)	-	-	-	3	4	6	-	.00	.01	.01
F	Cryptantha sp.	bc12	c14	abc6	a3	a3	ab2	.08	.03	.00	.01
F	Descurainia pinnata (a)	-	-	b24	b11	ab3	a-	.07	.08	.01	-
F	Draba sp. (a)	-	-	3	-	-	3	.00	-	-	.00
F	Erodium cicutarium (a)	-	-	1	-	3	-	.01	-	.00	-
F	Galium multiflorum	a-	a-	b44	a10	a7	a-	.50	.18	.15	-
F	Gilia sp. (a)	-	-	-	3	-	-	-	.00	-	-
F	Holosteum umbellatum (a)	-	-	-	-	3	-	-	-	.00	-
F	Lactuca serriola (a)	a-	ab1	b11	a-	a-	a-	.05	-	-	-
F	Linum lewisii	-	5	4	-	-	-	.06	-	-	-
F	Machaeranthera canescens	a3	b24	a-	a-	a-	a-	.00	-	-	-
F	Microsteris gracilis (a)	-	-	b26	a-	a-	a-	.12	-	-	-
F	Penstemon sp.	b9	ab5	a9	ab4	a-	a-	.05	.01	-	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
F	Petradoria pumila	$_{c}$110	$_{c}$119	$_{b}$70	$_{ab}$39	$_{a}$32	$_{a}$34	2.92	1.22	1.67	1.29
F	Phlox austromontana	$_{a}$13	$_{b}$53	$_{ab}$40	$_{a}$28	$_{a}$27	$_{a}$28	1.94	.64	.74	.61
F	Phlox longifolia	$_{a}$-	$_{a}$-	$_{b}$22	$_{ab}$15	$_{a}$5	$_{ab}$17	.14	.17	.01	.22
F	Physaria chambersii	-	-	4	-	-	-	.03	-	-	-
F	Ranunculus testiculatus (a)	-	-	8	-	-	8	.01	-	-	.04
F	Senecio multilobatus	$_{b}$10	$_{a}$-	$_{a}$-	$_{ab}$5	$_{a}$3	$_{a}$-	-	.01	.03	-
F	Streptanthus cordatus	6	9	14	3	14	1	.21	.01	.05	.00
F	Tragopogon dubius (a)	-	2	-	3	-	-	.00	.03	-	-
F	Unknown forb-perennial	-	2	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	3	307	23	226	263	2.08	0.15	1.71	1.77
Total for Perennial Forbs		163	256	243	110	100	82	6.21	2.29	2.75	2.15
Total for Forbs		163	259	550	133	326	345	8.29	2.44	4.46	3.93

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

BROWSE TRENDS--
Management unit 21B, Study no: 6

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Amelanchier utahensis	0	0	0	0	-	.38	-	-
B	Artemisia tridentata vaseyana	8	3	3	4	1.05	.03	.84	.88
B	Cercocarpus montanus	11	9	9	6	3.50	3.92	2.95	6.28
B	Cowania mexicana stansburiana	8	6	3	7	1.56	1.09	.09	.38
B	Gutierrezia sarothrae	23	11	20	13	1.33	.10	.51	.13
B	Juniperus osteosperma	8	12	10	10	6.07	3.24	3.42	5.46
B	Leptodactylon pungens	19	7	1	0	1.27	.21	.00	-
B	Opuntia sp.	0	0	1	0	-	-	-	-
B	Purshia tridentata	0	0	1	0	-	-	-	-
B	Quercus gambelii	24	25	27	26	8.83	6.56	6.94	7.42
Total for Browse		101	73	75	66	23.63	15.53	14.77	20.57

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 6

Species	Percent Cover			
	'98	'03	'08	'12
Artemisia tridentata vaseyana	-	.21	.66	1.01
Cercocarpus montanus	.40	6.06	5.40	7.51
Cowania mexicana stansburiana	-	1.64	.88	1.73
Gutierrezia sarothrae	-	.51	.56	.61
Juniperus osteosperma	10.60	8.33	9.96	14.30
Leptodactylon pungens	-	.01	-	-
Quercus gambelii	6.00	11.98	13.16	16.78

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 6

Species	Average leader growth (in)		
	'03	'08	'12
Cercocarpus montanus	2.6	1.1	1.3
Cowania mexicana stansburiana	2.0	0.7	2.3

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 6

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	121	132	136	140

Average diameter (in)			
'98	'03	'08	'12
6.9	5.8	4.7	5.6

BASIC COVER--
Management unit 21B, Study no: 6

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	7.75	6.00	41.14	27.70	32.21	46.25
Rock	13.50	14.00	11.11	12.27	13.34	11.13
Pavement	15.75	12.75	22.61	9.53	17.14	11.40
Litter	43.50	46.75	53.05	46.26	45.62	51.41
Cryptogams	0	0	.10	.27	.45	.41
Bare Ground	19.50	20.50	9.09	18.38	4.68	9.10

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 6, "M" Hill

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.9	6.9	51.2	27.4	21.3	4.0	8.4	89.6	0.7

PELLET GROUP DATA--
Management unit 21B, Study no: 6

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	16	15	39	3
Elk	3	1	2	2
Deer	16	24	27	6
Cattle	-	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
4 (10)	7 (17)	3 (8)	5 (13)
23 (57)	50 (122)	23 (56)	11 (28)
6 (15)	-	-	-

BROWSE CHARACTERISTICS--
Management unit 21B, 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 utahensis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	96/104
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Artemisia tridentata vaseyana									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**220**	0	82	18	-	9	0	0	31/38
03	**80**	0	75	25	-	0	0	0	25/39
08	**60**	0	100	0	-	0	0	0	31/43
12	**100**	20	80	0	-	0	0	20	28/42
Cercocarpus montanus									
85	**265**	25	75	0	66	25	0	25	69/35
91	**265**	25	75	0	-	75	0	0	87/70
98	**260**	54	38	8	80	0	0	0	56/55
03	**300**	20	73	7	-	27	27	0	77/89
08	**200**	10	60	30	-	60	0	10	78/85
12	**120**	17	83	0	20	0	17	50	76/92
Chrysothamnus nauseosus hololeucus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	12/15
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Cowania mexicana stansburiana									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**160**	0	63	38	20	75	0	0	53/48
03	**120**	0	17	83	-	17	83	17	66/71
08	**60**	0	67	33	-	33	0	0	50/44
12	**140**	0	71	29	20	29	14	29	40/40

		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									
85	**66**	0	0	100	-	0	0	0	-/-
91	**265**	25	75	0	-	0	0	0	12/10
98	**1740**	13	87	0	80	0	0	0	11/11
03	**400**	0	95	5	-	0	0	5	9/12
08	**1000**	0	96	4	20	0	0	0	10/14
12	**420**	10	43	48	-	0	0	48	7/12
Juniperus osteosperma									
85	**133**	0	100	0	66	0	0	0	69/71
91	**133**	0	100	0	66	0	0	0	157/197
98	**160**	25	63	13	-	0	0	0	-/-
03	**260**	38	62	0	20	0	0	0	-/-
08	**200**	30	70	0	40	0	0	0	-/-
12	**320**	25	75	0	20	0	0	0	-/-
Leptodactylon pungens									
85	**0**	0	0	0	-	0	0	0	-/-
91	**466**	0	100	0	-	0	0	0	8/10
98	**3400**	8	79	12	20	0	0	0	2/6
03	**380**	5	84	11	-	0	0	11	2/6
08	**20**	0	0	100	-	0	0	100	-/-
12	**0**	0	0	0	-	0	0	0	10/14
Opuntia sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	7/15
03	**0**	0	0	-	-	0	0	0	6/20
08	**20**	0	100	-	-	0	0	0	5/6
12	**0**	0	0	-	-	0	0	0	7/16
Purshia tridentata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**20**	100	0	-	-	0	0	0	17/18
12	**0**	0	0	-	-	0	0	0	20/28
Quercus gambelii									
85	**8332**	63	37	0	3799	0	0	0	35/17
91	**7931**	71	24	6	399	13	0	4	60/33
98	**3020**	46	53	1	60	19	0	0	51/41
03	**3080**	38	52	10	100	0	0	6	39/30
08	**4700**	13	83	4	260	.85	0	.42	42/47
12	**2740**	64	34	2	60	4	.72	1	36/43

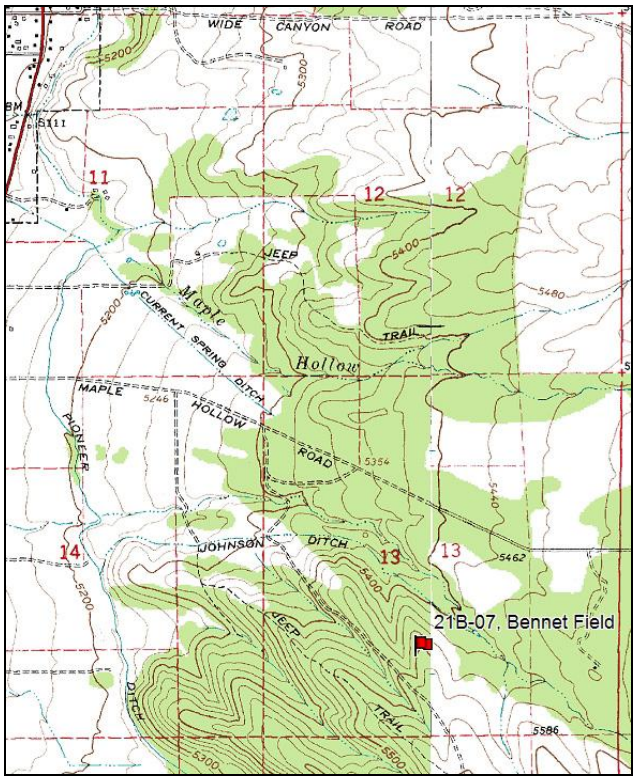
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Rhus trilobata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	55/124

BENNETT FIELD - TREND STUDY NO. 21B-7-12

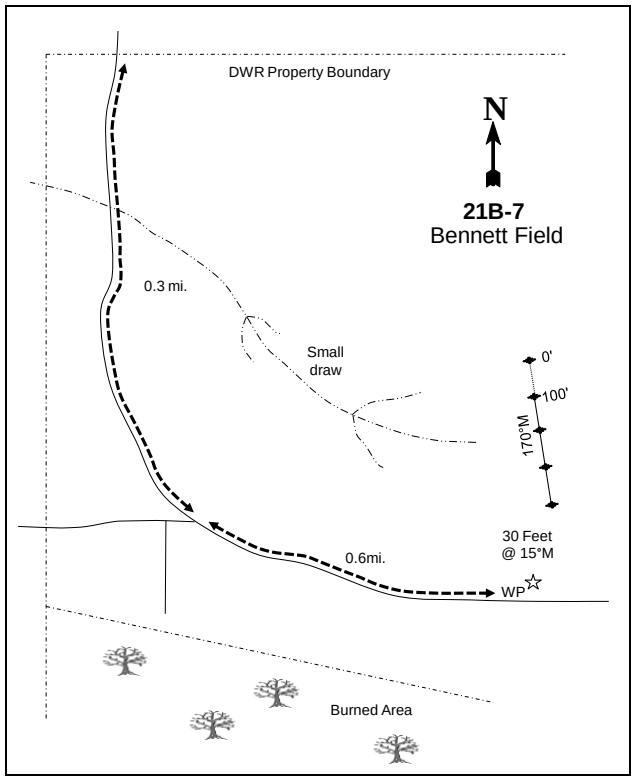
Vegetation Type: Basin Big Sagebrush
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Gravelly Loam (Wyoming Big Sagebrush), R028AY307UT
Land Ownership: DWR
Elevation: 5,500 ft (1,676 m)
Aspect: West
Slope: 10%
Transect bearing: 170° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
Take I-15 exit #174 south of Holden. From the interchange proceed 0.9 miles straight east on a dirt road (towards Maple Canyon). Just after the cattleguard, turn right. Go 0.1 miles to a gate to DWR property. Proceed 0.3 miles down across a wash and over to a 3-way split. Follow the main road which bends to the left. Go 0.6 miles near the top of a small ridge. There is a witness post (steel rebar 3 feet tall) on the left side of the road. The 400' stake is 30 feet away from the witness post, bearing 15 degrees magnetic. The frequency baseline starts 400 feet further north and the 0-foot stake is tagged #7184.

Map Name: Holden



Diagrammatic Sketch:



Township: 20S Range: 4W Section: 13

GPS: NAD 83, UTM 12S 391733 E 4325279 N

BENNETT FIELD - TREND STUDY NO. 21B-7

Site Information

Site Description: This study is located on the Division of Wildlife Resources (DWR) Millard Wildlife Management Area (WMA) two miles southeast of Holden. The area was chained in 1958 and is now dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), cliffrose (*Cowania mexicana* ssp. *stansburiana*), and scattered Utah juniper (*Juniperus osteosperma*). Much of the land to the south and west of the study was burned by the Swain fire in 2000. Livestock grazing was heavy in the past, but forage for livestock is currently limited. This study receives heavy deer use in the winter and spring. Deer pellet groups are dense and have literally covered the ground around the cliffrose plants at times. Deer pellet groups have been sampled in very high abundance since 1998. A deer carcass was found on the site in 2012. Elk pellet groups have been sampled in low abundance since 1998. Cattle sign was sampled in low abundance in 2008 (Table - Pellet Group Data).

Browse: Basin big sagebrush is the dominant preferred browse and provides the majority of the browse cover on the site (Table - Browse Trends). The sagebrush stand is comprised of a low density population of large, mature and decadent plants. Recruitment of young sagebrush plants has been poor over the course of the study. Poor vigor of sagebrush was low at the outset of the study, but has increased to moderate to high levels since 2003. Utilization of sagebrush has generally been moderate, but was moderate to heavy in 2012. The Stansbury cliffrose stand is comprised of a small density population of very large, mature and decadent plants. Most of the cliffrose on the site are tall (> 6 feet tall), tree-like forms that have been highlined, and are mostly unavailable to browsing animals. Recruitment of young cliffrose plants has generally been poor throughout the study years. Poor vigor of cliffrose has fluctuated from low to moderately high rates. Utilization of cliffrose has been moderate to heavy over the study years. In 1985, grasshoppers heavily damaged the new growth on the cliffrose, completely stripping the twigs of leaves (Table - Browse Characteristics). A few large, mature Utah juniper trees are scattered throughout the site (Table - Point-Quarter Tree Data).

Herbaceous Understory: The herbaceous understory is dominated by annual and weedy perennial species. The grass component is dominated by the annual grass species cheatgrass (*Bromus tectorum*). The weedy perennial species bulbous bluegrass (*Poa bulbosa*) has been steadily increasing on the site since 1998, and is one of the most prevalent grass species. The other prevalent perennial species is Sandberg bluegrass (*Poa secunda*). Bluebunch wheatgrass (*Agropyron spicatum*) is fairly common, but at much lower frequency and cover. Grasshopper damage on the grasses was very heavy in 1985. The forb component is comprised almost entirely of the annual species pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*). Perennial forb species are very rare (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant-Pahvant complex, which occurs on fan remnants. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a neutral soil reaction (pH 6.9) (Table - Soil Analysis Data). Bare ground cover is low, with a very high amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2008, but moderate in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Basin big sagebrush density decreased 10% from 3,332 plants/acre to 2,999 plants/acre. Decadence of sagebrush increased from 22% to 31%, and poor vigor increased from 2% to 9%. Stansbury cliffrose density decreased 14% from 465 plants/acre to 399 plants/acre. Decadence of cliffrose increased from 57% to 67%, but poor vigor decreased from 29% to 0%.

- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Basin big sagebrush decadence increased to 41%, and poor vigor increased to 12%. Stansbury cliffrose decadence decreased to 13%, and young recruitment increased from 0% to 13% of the population.
- **1998 to 2003 - stable (0):** Basin big sagebrush density decreased 8% from 1,960 plants/acre to 1,800 plants/acre, but cover increased from 10% to 16%. Decadence of sagebrush remained very high at 44%, and poor vigor increased to 20% of the population. Stansbury cliffrose density decreased 25% from 480 plants/acre to 360 plants/acre, and cover decreased from 4% to 3%. Decadence of cliffrose increased to 44%, and poor vigor increased from 0% to 17% of the population. Recruitment of young cliffrose plants decreased to 0% of the population.
- **2003 to 2008 - down (-2):** Basin big sagebrush density decreased 24% to 1,360 plants/acre, and cover decreased to 9%. Decadence of sagebrush increased to 57%, and poor vigor increased to 38% of the population. Stansbury cliffrose density remained relatively stable at 400 plants/acre, but cover decreased to 2%. Decadence of cliffrose increased to 60%, and poor vigor increased to 25% of the population. Young recruitment also increased from 0% of the population to 20%.
- **2008 to 2012 - slightly down (-1):** Density of sagebrush remained similar at 1,440 plants/acre, and cover remained similar at 9%. Decadence of sagebrush decreased to 36%, but is still considered high. Cliffrose density decreased 35% to 260 plants/acre, but cover remained similar at 2%. Decadence of cliffrose decreased to 23%, and poor vigor increased to 31% of the population. Recruitment of young cliffrose decreased to 0% of the population.

Grass:
- **1985 to 1991 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 11%.
- **1991 to 1998 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 21%.
- **1998 to 2003 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 40%, and cover increased from 5% to 10%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 28% to 13%.
- **2003 to 2008 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 29%, and cover decreased to 7%.
- **2008 to 2012 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased to 16%. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 3% to 12%.

Forb:
- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 21B, 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
98	19.2	5.1	2.9	9.0	-20.0	1.4	0.0	**17.6**	Poor
03	23.4	1.8	0.4	19.5	-9.8	1.2	0.0	**36.5**	Fair
08	14.1	-2.2	2.7	13.0	-11.1	0.1	0.0	**16.5**	Poor
12	13.1	4.8	0.4	30.0	-16.6	0.7	0.0	**32.4**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 7

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	a-	b17	c39	bc34	bc34	c34	.96	1.79	2.79	3.55
G	Aristida purpurea	-	-	-	-	-	-	-	-	.00	-
G	Bromus japonicus (a)	-	-	3	-	10	6	.00	-	.04	.01
G	Bromus tectorum (a)	-	-	b321	a305	ab319	ab306	27.62	13.06	14.77	22.16
G	Poa bulbosa	a-	a-	a4	b81	b66	c188	.04	2.94	3.05	11.82
G	Poa fendleriana	a-	a-	a-	a-	b24	ab11	-	-	.66	.84
G	Poa secunda	b241	b251	a165	b264	a152	a161	3.45	7.94	3.01	12.02
G	Secale cereale (a)	-	-	2	-	-	-	.00	-	-	-
G	Sitanion hystrix	-	-	9	-	3	-	.09	-	.00	-
Total for Annual Grasses		0	0	326	305	329	312	27.63	13.06	14.82	22.17
Total for Perennial Grasses		241	268	217	379	279	394	4.55	12.67	9.54	28.24
Total for Grasses		241	268	543	684	608	706	32.19	25.73	24.36	50.41
F	Allium sp.	-	-	4	6	4	-	.15	.06	.01	-
F	Alyssum alyssoides (a)	-	-	c341	b305	a235	b314	12.89	8.22	1.52	5.72
F	Astragalus sp.	-	-	-	-	-	-	-	.00	-	-
F	Calochortus nuttallii	a-	b17	a-	b18	a-	a-	-	.06	-	-
F	Castilleja linariaefolia	-	-	-	-	3	-	-	-	.00	-
F	Castilleja sp.	-	-	2	-	-	-	.03	-	-	-
F	Cirsium sp.	-	2	-	2	-	-	-	.00	-	-
F	Collinsia parviflora (a)	-	-	a-	b9	ab5	ab4	-	.02	.01	.01
F	Crepis acuminata	-	3	-	2	-	4	-	.03	-	.03
F	Erodium cicutarium (a)	-	-	b51	c121	c91	a3	.13	3.77	1.37	.03
F	Euphorbia sp.	-	-	-	-	3	-	-	-	.00	-
F	Galium sp.	-	-	-	3	-	-	-	.03	-	-
F	Holosteum umbellatum (a)	-	-	-	8	-	6	-	.01	-	.01
F	Lactuca serriola (a)	-	-	2	-	-	-	.00	-	-	-
F	Linum lewisii	-	1	6	3	-	1	.10	.00	-	.00
F	Lomatium sp.	a-	a5	a-	b27	a-	a-	-	.16	-	-
F	Petradoria pumila	-	-	4	3	-	4	.41	.15	-	.30
F	Phlox longifolia	a-	b13	a1	b11	ab2	a1	.01	.08	.01	.00
F	Ranunculus testiculatus (a)	-	-	a-	b73	a10	a-	-	.21	.01	-
F	Tragopogon dubius (a)	-	-	6	4	-	3	.21	.00	-	.04
F	Zigadenus paniculatus	-	-	-	4	-	2	-	.01	.00	.00
Total for Annual Forbs		0	0	400	520	341	330	13.23	12.25	2.92	5.82
Total for Perennial Forbs		0	41	17	79	12	12	0.69	0.60	0.03	0.34
Total for Forbs		0	41	417	599	353	342	13.93	12.85	2.95	6.16

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

BROWSE TRENDS--
Management unit 21B, Study no: 7

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata tridentata	71	63	57	57	10.39	15.50	9.39	8.53
B	Cowania mexicana stansburiana	1	0	0	0	4.11	2.66	1.58	1.64
B	Chrysothamnus viscidiflorus viscidiflorus	14	16	19	12	-	-	-	-
B	Gutierrezia sarothrae	32	8	11	4	.81	.09	.48	.15
B	Juniperus osteosperma	2	1	1	2	.15	.68	1.00	3.32
B	Purshia tridentata	0	0	0	1	-	-	-	-
Total for Browse		120	88	88	76	15.47	18.93	12.46	13.66

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 7

Species	Percent Cover			
	'98	'03	'08	'12
Artemisia tridentata tridentata	-	17.35	12.55	15.21
Cowania mexicana stansburiana	3.20	10.00	8.03	6.69
Gutierrezia sarothrae	-	-	.73	-
Juniperus osteosperma	1.00	1.78	5.40	3.66

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 7

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata tridentata	2.2	2.0	0.4
Cowania mexicana stansburiana	-	4.0	0.4

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 7

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	24	17	35	35

Average diameter (in)			
'98	'03	'08	'12
3.5	7.2	4.9	5.2

BASIC COVER--
Management unit 21B, Study no: 7

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	6.00	2.25	54.45	54.18	47.89	70.23
Rock	2.50	4.25	2.92	3.19	3.96	2.45
Pavement	11.75	7.25	5.23	1.27	2.28	1.14
Litter	62.00	74.25	70.33	39.44	55.15	58.72
Cryptogams	0	2.25	2.04	5.81	.67	.28
Bare Ground	17.75	9.75	5.70	14.69	3.10	2.25

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 7, Bennett Field

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.6	6.9	48.7	27.7	23.6	3.2	7.5	140.8	0.8

PELLET GROUP DATA--

Management unit 21B, Study no: 7

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	20	16	49	21
Elk	1	2	-	-
Deer	57	55	55	34
Cattle	3	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
2 (5)	-	1 (2)	3 (8)
131 (324)	162 (400)	145 (359)	89 (220)
-	-	2 (4)	-

BROWSE CHARACTERISTICS--

Management unit 21B, 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)
Artemisia tridentata tridentata									
85	**3332**	2	76	22	-	44	4	2	33/32
91	**2999**	4	64	31	-	33	2	9	28/27
98	**1960**	3	56	41	-	26	3	12	35/42
03	**1800**	1	54	44	-	24	6	20	35/42
08	**1360**	3	40	57	-	32	4	38	39/49
12	**1440**	1	63	36	-	38	40	39	37/49
Chrysothamnus nauseosus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	24/39
Chrysothamnus viscidiflorus viscidiflorus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**66**	0	100	-	-	0	0	0	18/31
98	**60**	33	67	-	-	0	0	0	8/10
03	**0**	0	0	-	-	0	0	0	13/16
08	**0**	0	0	-	-	0	0	0	15/28
12	**0**	0	0	-	-	0	0	0	18/24

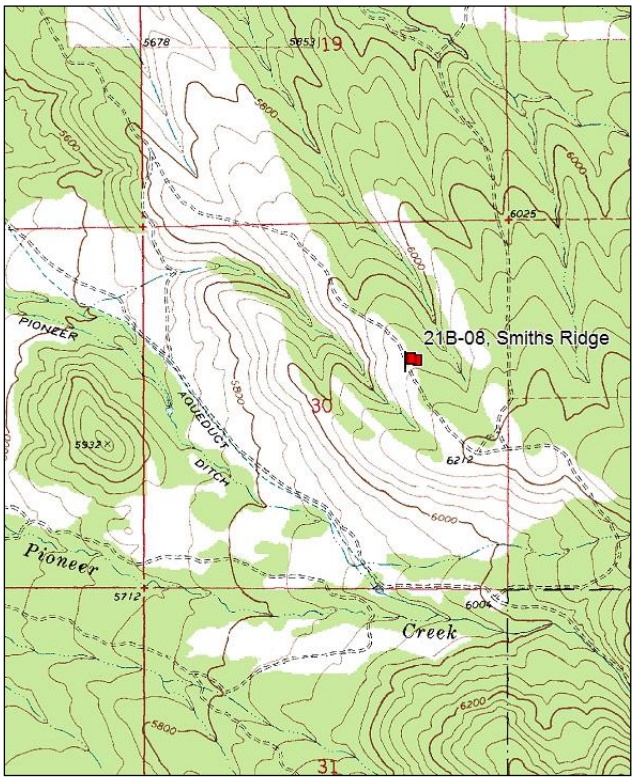
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Cowania mexicana stansburiana									
85	**465**	0	43	57	-	14	86	29	60/46
91	**399**	0	33	67	66	0	17	0	26/21
98	**480**	13	75	13	20	21	0	0	77/69
03	**360**	0	56	44	-	11	67	17	84/72
08	**400**	20	20	60	-	20	35	25	86/70
12	**260**	0	77	23	-	54	8	31	76/69
Gutierrezia sarothrae									
85	**532**	0	25	75	-	0	0	0	9/7
91	**1666**	20	80	0	-	0	0	0	10/9
98	**1080**	22	76	2	40	0	0	2	10/10
03	**220**	9	82	9	-	0	0	9	5/6
08	**260**	0	92	8	-	0	0	8	10/14
12	**120**	0	100	0	-	0	0	0	12/17
Juniperus osteosperma									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**40**	0	50	50	-	0	0	0	-/-
03	**20**	0	0	100	-	0	0	100	-/-
08	**20**	0	0	100	-	0	0	0	-/-
12	**40**	0	100	0	-	0	0	0	-/-
Purshia tridentata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	100	0	25/21
Rhus trilobata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	52/106

SMITHS RIDGE - TREND STUDY NO. 21B-8-12

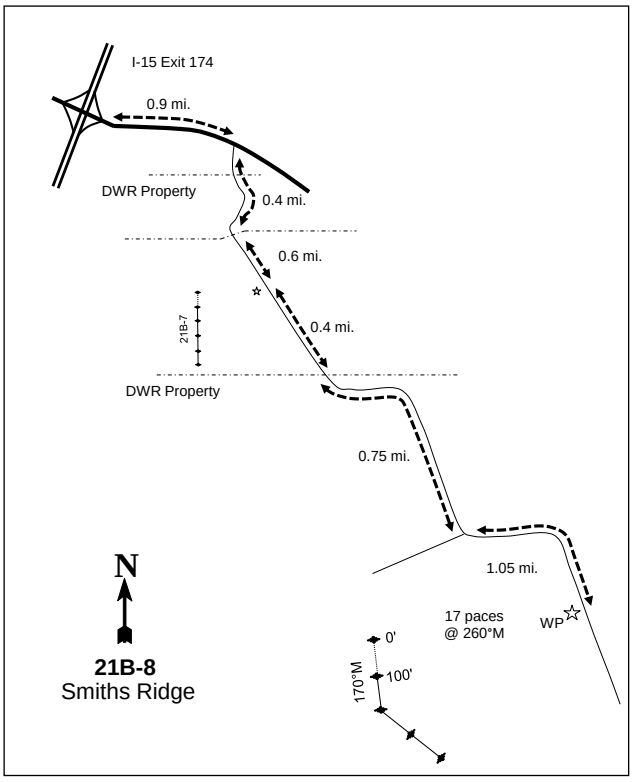
Vegetation Type: Perennial Grass
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Stony Loam (Mountain Big Sagebrush), R047XB336UT
Land Ownership: DWR
Elevation: 6,110 ft (1,862 m)
Aspect: West
Slope: 8-10%
Transect bearing: 170° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
From exit #174 on I-15 south of Holden, proceed to the east side of the freeway, then east on the Maple Canyon Road for 0.9 miles to a cattleguard. Just beyond the cattleguard, turn right and go 0.1 miles to DWR property. Proceed 0.3 miles across a wash and to a 3-way split in the road. Stay left and go 0.6 miles to the Bennett Field transect (21-7). From there, continue 0.4 miles to a gate at the eastern boundary of DWR property. Go another 0.75 miles through 2 more gates to a two track road. Turn left and go 1.05 miles to the witness post. From the witness post walk 17 paces at 260 degrees magnetic. The frequency baseline starts 100 feet due west of the cliffrose. The 0' stake is a 3 foot rebar with a browse tag #7072 attached.

Map Name: Coffee Peak



Diagrammatic Sketch:



Township: 20S Range: 23W Section: 30

GPS: NAD 83, UTM 12S 393805 E 4322630 N

SMITHS RIDGE - TREND STUDY NO. 21B-8

Site Information

Site Description: The study is located on the Division of Wildlife Resources (DWR) Millard Wildlife Management Area (WMA) on the foothills of the Pahvant Range. This area was part of the extensive chaining treatment completed by the DWR in the late 1950s and early 1960s. The Swains fire burned approximately 7,900 acres including the site and surrounding area in August 2000. Most of the burned areas were later seeded (Table - Seed Mix) and chained, though the transect itself was not chained. The chaining treatment went around patches of unburned Utah juniper (*Juniperus osteosperma*) trees that were in the immediate vicinity of the transect. The DWR Upper Smith pellet transect, which is located nearby, sampled deer pellet groups in generally high abundance from 1981 to 1991 (Jense et al 1985 and Jense et al 1991). Deer pellet groups were sampled in high abundance on the site from 1998 to 2008, but in moderate abundance in 2012. Elk pellet groups were sampled in moderate abundance in 1998, but in low abundance since 2003. In the past, herbaceous vegetation was often depleted by heavy early-season cattle grazing, but livestock grazing was reduced on the site in the early 1980's. Cattle sign has been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Prior to the Swains fire in 2000, the preferred browse species on the study included Stansbury cliffrose (*Cowania mexicana stansburiana*), antelope bitterbrush (*Purshia tridentata*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and low densities of Gambel oak (*Quercus gambelii*). The cliffrose and bitterbrush were reported to be hybridizing in 1985, which is commonly observed in the Holden area. Prior to the fire, the cliffrose and bitterbrush stands were both comprised of moderately dense populations of large mature plants. Utilization of both cliffrose and bitterbrush was mostly moderate. Prior to the fire, the mountain big sagebrush stand was comprised of a moderately dense stand of mostly mature plants. Utilization of sagebrush was mostly light to moderate. Following the fire, density of all three species was reduced markedly. The remaining cliffrose stand was comprised of a small density population of large mature plants. The bitterbrush stand has been mostly young plants in the subsequent sample years following the fire. The sagebrush stand was comprised of mostly young plants following the fire, but more mature plants have been sampled in each subsequent year. Utilization of cliffrose and bitterbrush increased to more moderate to heavy use, though sagebrush utilization remained light to moderate. Forage kochia (*Kochia prostrata*) was seeded after the burn and has been sampled since in moderate density and cover since 2003. Utilization of kochia has been moderate to heavy over that time (Table - Browse Characteristics). A patch of Utah juniper (*Juniperus osteosperma*) trees remained unburned on the study site and surrounding area. The surviving trees occur in low density, and a comprised of mostly mature plants (Table - Point-Quarter Tree Data).

Herbaceous Understory: Prior to the burn and subsequent seeding treatment, grass diversity was low. Diversity increased slightly following the seeding treatment, but most desirable perennial grass species remain rare on the site. Common perennial species include bluebunch wheatgrass (*Agropyron spicatum*), intermediate wheatgrass (*A. intermedium*), and Sandberg bluegrass (*Poa secunda*). The weedy perennial species bulbous bluegrass (*Poa bulbosa*) has increased over the course of the study, and was the dominant grass species in 2012. Cheatgrass (*Bromus tectorum*) is common, but has decreased on the site since 1998. Perennial forb species are rare, and most provide little cover. Annual forb species have dominated the forb component since the fire. Fourteen forb species were seeded (Table - Seed Mix), but only five have been sampled since 2003 including yarrow (*Achillea millefolium*), alfalfa *(Medicago sativa*), and small burnet (*Sanguisorba minor*). (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant-Pahvant complex, which occurs on fan remnants. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a sandy loam with a moderately acidic soil reaction (pH 5.7) (Table - Soil Analysis Data). Bare ground cover is moderately low with high amounts of vegetation and

litter providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Cliffrose density decreased 20% from 332 plants/acre to 266 plants/acre. Decadence of cliffrose increased from 20% of the population to 50%. Bitterbrush density decreased 50% from 532 plants/acre to 266 plants/acre. Decadence of bitterbrush increased from 12% of the population to 50%. Young recruitment of bitterbrush decreased from 25% of the population to 0%. Sagebrush density increased 15% from 1,331 plants/acre to 1,531 plants/acre, and decadence decreased from 60% to 30%. Young recruitment of sagebrush increased from 10% of the population to 39%.
- **1991 to 1998 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Cliffrose decadence decreased to 0%, and young recruitment increased from 0% to 18%. Bitterbrush decadence decreased to 0%, and poor vigor decreased from 25% to 0% of the population. Sagebrush decadence decreased to 14%, but young recruitment also decreased to 14% of the population.
- **1998 to 2003 - down (-2):** Cliffrose density decreased 73% after the fire from 220 plants/acre to 60 plants/acre, and cover decreased from 5% to 1%. Decadence of cliffrose increased from 0% of the population to 33%, and no young plants were sampled. Bitterbrush density decreased 90% from 600 plants/acre to 60 plants/acre, and cover decreased from 9% to 1%. Sagebrush density decreased 29% from 2,040 plants/acre to 1,440 plants/acre, and cover decreased from 6% to 1%. Recruitment of young sagebrush plants increased from 14% of the population to 61% following the seeding. Kochia was sampled for the first time at a density of 4,020 plants/acre, and cover of 2%.
- **2003 to 2008 - stable (0):** Bitterbrush density increased substantially to 240 plants/acre, but cover decreased to less than 1%. Decadence of bitterbrush also increased from 0% of the population to 33%. Recruitment of young bitterbrush plants increased from 0% of the population to 67%. Sagebrush density remained relatively stable at 1,400 plants/acre, but cover increased to 2%. Recruitment of young sagebrush plants decreased, but remained high at 27% of the population. Kochia density increased 49% to 6,000 plants/acre, though cover remained similar at 2%.
- **2008 to 2012 - slightly down (-1):** Bitterbrush density decreased to 100 plants/acre, and cover remained less than 1%. Decadence increased to 80% of the population. Sagebrush density decreased 6% to 1,320 plants/acre, but cover increased to 4%. Recruitment of young sagebrush plants decreased to 6% of the population. Kochia density decreased 41% to 3,540 plants/acre, and cover decreased slightly to 1%.

Grass:

- **1985 to 1991 - up (+2):** The sum of nested frequency of perennial grasses increased 93%.
- **1991 to 1998 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 44%.
- **1998 to 2003 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 22%, and cover decreased from 9% to 8%. Poa bulbosa increased significantly in nested frequency, and cover increased from less than 1% to 2%. Cheatgrass decreased significantly in nested frequency, but cover increased from 9% to 11%.
- **2003 to 2008 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 28%, and cover increased to 9%. Bulbous bluegrass decreased significantly in nested frequency, and cover decreased to less than 1%.
- **2008 to 2012 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 14%, and cover increased to 15%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 6% to 3%. However, bulbous bluegrass increased

significantly in nested frequency, and cover increased to 18%. Bulbous bluegrass is now the dominant grass on the site.

Forb:

- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - slightly up (+1):** Perennial forb species remained rare on the site, but cover increased from less than 1% to 2% due to an increase in cover of alfalfa. Annual forb sum of nested frequency increased substantially, and annual forb species dominate the forb component.
- **2003 to 2008 - slightly down (-1):** No perennial forb species were sampled.
- **2008 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 21B, 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
98	28.9	13.7	5.0	17.1	-7.0	0.3	0.0	**58.0**	Fair
03	8.0	12.7	14.1	15.4	-9.0	3.5	0.0	**44.7**	Poor
08	8.0	10.1	15.0	18.1	-4.8	0.0	0.0	**46.4**	Poor
12	8.2	13.8	4.6	28.9	-2.0	0.9	0.0	**54.4**	Fair

SEED MIX --
Management unit 21B, study no: 8

Project Name: Swains Fire Rehab					
Seed type		lbs in mix	Seed type		lbs in mix
G	Crested Wheatgrass 'Douglas'	373	F	Yellow Sweetclover	603
G	Crested Wheatgrass 'Ephraim'	100	F	Alfalfa 'Rangelander'	1300
G	Streambank Wheatgrass 'Sodar'	1950	F	Alfalfa 'Ladak'	1550
G	Western Wheatgrass 'Rosana'	2950	F	Alfalfa 'Nomad'	1800
G	Bluebunch Wheatgrass 'Goldar'	2350	F	Sainfoin VNS	7696
G	Bluebunch Wheatgrass	178	F	Sainfoin 'Remont'	493
G	Slender Wheatgrass 'San Luis'	500	F	White Dutch Clover	252
G	Orchardgrass 'Potomac'	3618	F	Strawberry Clover	366
G	Orchardgrass 'Paiute'	1765	F	Mammoth Red Clover	229
G	Intermediate Wheatgrass 'Oahe'	550	F	Medium Red Clover	81
G	Great Basin Wildrye 'Trailhead'	977	F	Red Clover	350
G	Sheep Fescue	1000	F	Small Burnet 'Delar'	2875
G	Hard Fescue 'Durar'	1675	F	Sunflower	250
G	Big Bluegrass 'Sherman'	497	B	Basin Big Sagebrush	2002
G	Sandberg Bluegrass 'Canbar'	250	B	Mountain Big Sagebrush	1000
F	Western Yarrow	465	B	Wyoming Sagebrush	2380
F	Cicer Milkvetch	455	B	Rabbitbrush	748
F	Rocky Mountain Beeplant	409	B	Forage Kochia 'Immigrant'	1000
F	Lewis Blue Flax	350	B	Fourwing Saltbush	150
Total Pounds:					45,537

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 8

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron intermedium	a-	a-	a-	a6	a27	b63	-	.24	1.58	3.44
G	Agropyron spicatum	a21	ab61	b97	ab56	b78	b81	4.71	3.84	3.67	4.06
G	Bromus japonicus (a)	-	-	-	3	5	5	-	.60	.01	.01
G	Bromus tectorum (a)	-	-	c304	b262	bc277	a135	9.32	11.38	6.44	2.70
G	Festuca ovina	-	-	-	2	1	8	-	.03	.03	.19
G	Poa bulbosa	a-	a1	a14	b50	a16	c209	.48	2.43	.29	17.45
G	Poa canbyi	-	-	-	-	3	-	-	-	.00	-
G	Poa fendleriana	a-	a-	a-	a-	b23	a7	-	-	.22	.31
G	Poa secunda	a72	b119	b138	ab105	ab121	b155	2.62	1.77	2.54	6.21
G	Sitanion hystrix	a13	ab23	c57	c59	bc39	ab18	1.20	1.81	.99	.23
Total for Annual Grasses		0	0	304	265	282	140	9.32	11.98	6.46	2.71
Total for Perennial Grasses		106	204	306	278	308	541	9.02	10.14	9.34	31.92
Total for Grasses		106	204	610	543	590	681	18.35	22.13	15.80	34.63
F	Achillea millefolium	-	-	-	3	-	-	-	.06	-	-
F	Agoseris glauca	a-	b16	a-	ab6	a-	ab5	-	.04	-	.01
F	Alyssum alyssoides (a)	-	-	b60	a1	c180	d298	.28	.00	.92	3.20
F	Arabis sp.	-	9	7	-	-	-	.09	-	-	-
F	Astragalus sp.	-	-	3	-	-	-	.00	-	-	-
F	Calochortus nuttallii	-	4	2	1	-	1	.00	.00	-	.00
F	Chaenactis douglasii	b24	a-	a-	a-	a-	a-	-	-	-	-
F	Cirsium sp.	-	-	-	-	-	-	-	.00	-	.00
F	Collinsia parviflora (a)	-	-	a-	a-	a3	b20	-	-	.00	.04
F	Erodium cicutarium (a)	-	-	a4	d163	c107	b45	.06	9.48	2.33	.81
F	Hedysarum boreale	-	-	-	2	-	3	-	.03	-	.00
F	Helianthus annuus (a)	-	-	-	1	-	-	-	.03	-	-
F	Holosteum umbellatum (a)	-	-	a-	a-	a-	b35	-	-	-	.10
F	Lactuca serriola (a)	-	9	-	3	-	6	-	.00	-	.01
F	Linum lewisii	-	-	8	3	-	3	.04	.01	-	.03
F	Lomatium sp.	a-	b13	a-	b14	a-	b17	-	.10	-	.07
F	Medicago sativa	a-	a-	a-	c15	a-	b11	-	1.37	-	.30
F	Microsteris gracilis (a)	-	-	-	1	-	2	-	.00	-	.00
F	Phlox longifolia	-	-	-	-	-	1	-	-	-	.00
F	Ranunculus testiculatus (a)	-	-	12	-	4	-	.04	-	.00	-
F	Sanguisorba minor	-	-	-	3	-	-	-	.09	-	-
F	Tragopogon dubius (a)	-	-	3	-	2	7	.00	-	.15	.08
F	Zigadenus paniculatus	4	2	-	-	-	1	-	.00	-	.00
Total for Annual Forbs		0	9	79	169	296	413	0.39	9.52	3.42	4.26
Total for Perennial Forbs		28	44	20	47	0	42	0.14	1.73	0	0.44
Total for Forbs		28	53	99	216	296	455	0.54	11.26	3.42	4.71

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

BROWSE TRENDS--
Management unit 21B, Study no: 8

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	55	38	35	39	6.17	1.01	2.32	3.99
B	Chrysothamnus nauseosus hololeucus	0	3	0	1	-	-	-	-
B	Cowania mexicana stansburiana	8	3	3	2	5.19	1.16	1.41	.41
B	Gutierrezia sarothrae	41	41	29	46	1.73	1.54	.53	1.35
B	Juniperus osteosperma	5	4	2	3	5.94	5.33	5.23	4.18
B	Kochia prostrata	0	45	55	46	-	2.04	1.81	1.43
B	Opuntia sp.	1	3	3	4	-	.03	.06	.03
B	Purshia tridentata	18	2	3	2	8.60	1.29	.18	.30
B	Quercus gambelii	0	1	1	0	.53	-	.03	-
B	Rhus glabra cismontana	3	0	0	0	-	-	-	-
B	Ribes sp.	1	0	0	0	-	-	-	-
Total for Browse		132	140	131	143	28.19	12.42	11.58	11.71

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 8

Species	Percent Cover			
	'98	'03	'08	'12
Artemisia tridentata vaseyana	-	.83	3.20	7.06
Cowania mexicana stansburiana	.80	1.41	1.79	.83
Gutierrezia sarothrae	-	3.21	.23	1.46
Juniperus osteosperma	15.00	8.50	11.91	10.46
Kochia prostrata	-	1.83	1.54	.88
Opuntia sp.	-	.01	.08	-
Purshia tridentata	-	1.13	.28	.48
Quercus gambelii	-	.05	.10	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 8

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	-	2.6	1.5
Cowania mexicana stansburiana	2.6	-	2.8

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 8

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	46	26	33	33

Average diameter (in)			
'98	'03	'08	'12
6.9	12.3	13.4	10.4

BASIC COVER--
Management unit 21B, Study no: 8

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	1.00	4.75	45.84	47.30	35.79	53.89
Rock	5.25	6.75	5.48	9.83	8.59	9.70
Pavement	5.25	3.00	7.62	6.87	4.42	4.62
Litter	66.75	74.50	52.99	35.81	49.83	41.31
Cryptogams	.25	0	4.07	.09	.21	.11
Bare Ground	21.50	11.00	11.92	17.36	11.80	9.97

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 8, Smiths Ridge

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.9	5.7	62.0	19.4	18.6	3.5	12.0	76.8	0.4

PELLET GROUP DATA--
Management unit 21B, Study no: 8

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	8	10	44	20
Elk	11	3	5	5
Deer	15	41	66	31
Cattle	-	3	3	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
28 (69)	12 (30)	3 (8)	3 (7)
70 (173)	90 (222)	140 (346)	27 (66)
-	2 (4)	12 (29)	2 (4)

BROWSE CHARACTERISTICS--
Management unit 21B, 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)
Artemisia tridentata vaseyana									
85	**1331**	10	30	60	-	25	0	10	28/25
91	**1531**	39	30	30	266	13	4	13	16/17
98	**2040**	14	73	14	-	48	.98	12	20/27
03	**1440**	61	31	8	40	31	8	3	14/18
08	**1400**	27	70	3	20	20	0	1	16/21
12	**1320**	6	94	0	80	44	39	5	18/29
Chrysothamnus nauseosus hololeucus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	-/-
03	**80**	0	100	0	-	0	0	0	12/13
08	**0**	0	0	0	-	0	0	0	25/30
12	**20**	0	0	100	-	100	0	100	31/50

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Cowania mexicana stansburiana									
85	**332**	0	80	20	-	80	0	0	68/81
91	**266**	0	50	50	133	75	0	0	142/53
98	**220**	18	82	0	-	64	0	0	56/106
03	**60**	0	67	33	-	67	33	0	57/94
08	**80**	25	25	50	-	0	0	25	67/57
12	**40**	0	100	0	-	100	0	0	44/63
Gutierrezia sarothrae									
85	**2464**	3	81	16	-	0	0	30	13/12
91	**2665**	15	85	0	133	0	0	0	12/11
98	**3160**	20	80	0	-	0	0	0	10/13
03	**2740**	2	92	6	-	3	0	5	10/12
08	**1500**	13	60	27	300	0	1	21	7/11
12	**2060**	2	98	0	-	0	0	25	8/12
Juniperus osteosperma									
85	**133**	0	100	-	-	0	0	0	69/109
91	**133**	0	100	-	-	0	0	0	144/111
98	**100**	0	100	-	20	0	0	0	-/-
03	**80**	0	100	-	-	0	0	0	-/-
08	**40**	0	100	-	-	0	0	0	-/-
12	**60**	0	100	-	-	0	0	0	-/-
Kochia prostrata									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	-/-
03	**4020**	46	54	0	100	57	2	0	9/14
08	**6000**	35	62	3	780	36	22	1	6/10
12	**3540**	23	77	1	1920	24	33	4	5/9
Opuntia sp.									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**20**	0	0	100	-	0	0	100	8/17
03	**80**	50	50	0	-	0	0	0	6/9
08	**80**	0	100	0	-	0	0	0	6/14
12	**140**	29	71	0	-	0	0	43	5/19
Purshia tridentata									
85	**532**	25	63	12	-	75	0	0	25/23
91	**266**	0	50	50	-	75	0	25	30/51
98	**600**	3	97	0	-	67	20	0	42/90
03	**60**	0	100	0	-	67	33	0	46/88
08	**240**	67	0	33	-	0	33	8	32/62
12	**100**	0	20	80	20	0	100	0	20/37

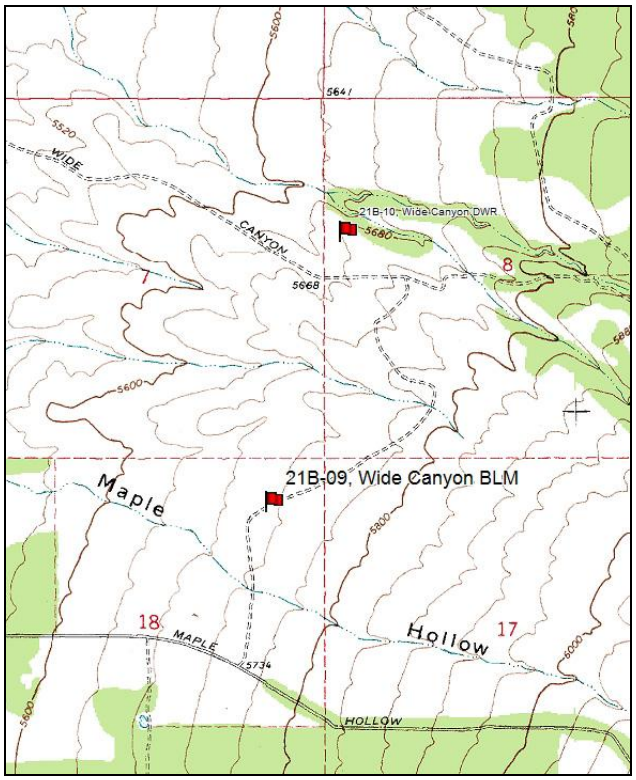
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Quercus gambelii									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	83/69
03	**20**	0	100	-	-	0	0	0	16/12
08	**40**	50	50	-	-	0	0	0	-/-
12	**0**	0	0	-	40	0	0	0	16/21
Rhus glabra cismontana									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**60**	0	0	100	-	100	0	67	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	18/35
12	**0**	0	0	0	-	0	0	0	14/12
Ribes sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**200**	0	100	-	-	0	0	0	11/14
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

WIDE CANYON BLM - TREND STUDY NO. 21B-9-12

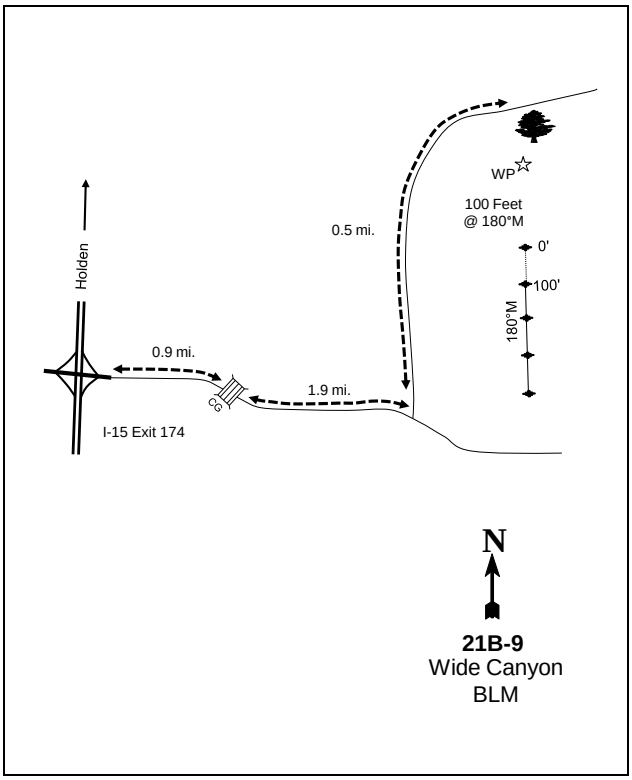
Vegetation Type: Wyoming Big Sagebrush and Cliffrose
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Loam (Wyoming Big Sagebrush), R028AY309UT
Land Ownership: BLM
Elevation: 5,710 ft (1,740 m)
Aspect: Southwest
Slope: 2-5%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 4ft.

Directions:
From exit #174 on I-15 south of Holden, go 0.9 miles east to a cattleguard. Continue 1.9 miles to a dirt road turning off to the left. Follow this dirt road 0.5 miles to a witness post (rebar) 3 feet off the right side of the road, about 10 feet beyond a juniper. The frequency baseline starts 100 feet south of the witness post. The 0-foot stake is rebar with browse tag #7107 attached.

Map Name: Coffee Peak



Diagrammatic Sketch:



Township: 20S Range: 3W Section: 18

GPS: NAD 83, UTM 12S 394027 E 326278 N

WIDE CANYON BLM - TREND STUDY NO. 21B-9

Site Information

Site Description: The study samples important deer winter range managed by the Bureau of Land Management (BLM) as part of the Holden Spring allotment in the Maple Hollow and Wide Canyon area. An extensive area of this relatively flat bench was chained in the 1960s and is now dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). A bullhog treatment was also implemented by the BLM in 2006 to reduce Utah juniper (*Juniperus osteosperma*) density. Division of Wildlife Resources (DWR) pellet groups transect near the study sampled deer pellet groups in generally high abundance from 1981 to 1991 (Jense et al. 1985 and Jense et al. 1991). Deer pellet groups have been sampled in very high abundance on the site since 1998. Elk pellet groups have been sampled in low abundance since 2008. Cattle sign has been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Preferred browse is provided primarily by Wyoming big sagebrush and Stansbury cliffrose, with a low density of antelope bitterbrush (*Purshia tridentata*). Sagebrush provides the majority of the browse cover on the site. The sagebrush is comprised of a moderately dense stand of mature and decadent plants. Recruitment of young sagebrush plants was good in the early years of the study, but has generally been poor since 2003. Sagebrush decadence has been moderately high to high over the course of the study, and poor vigor has increased from low rates to more moderate rates in later sample years. Utilization of sagebrush has been mostly light to moderate, though with several years of heavy use. The cliffrose stand is comprised of a low density population of large, mature plants. Density of cliffrose has been generally decreasing over the course of the study years. Recruitment of young cliffrose plants has generally been poor, except for in 1985 and 2008. Utilization of cliffrose has been mostly light to moderate. The large stature of many of the cliffrose plants makes them unavailable for browsing (Table - Browse Characteristics). Density of juniper trees has remained similar over the study years (Table - Point-Quarter Tree Data), but cover of juniper was reduced following the bullhog treatment (Table - Canopy Cover, Line Intercept).

Herbaceous Understory: Cheatgrass (*Bromus tectorum*) dominates the grass component on the site. The majority of the perennial grass cover has been provided by Sandberg bluegrass (*Poa secunda*) and crested wheatgrass (*Agropyron cristatum*). The weedy perennial species bulbous bluegrass (*Poa bulbosa*) is common on the site, and has been increasing in frequency and cover since 1998. The forb component is also dominated by annual forb species. Perennial forb species are very rare on the site (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant-Pahvant complex, which occurs on fan remnants. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a sandy loam with a neutral soil reaction (pH 6.9) (Table - Soil Analysis Data). Bare ground cover is low on the site, with high amounts of vegetation and litter providing protective ground cover. The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - stable (0):** Sagebrush density remained similar at approximately 1,400 plants/acre. Cliffrose density decreased from 999 plants/acre to 865 plants/acre. Recruitment of young cliffrose plants decreased from 20% to 8% of the population.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Recruitment of young sagebrush plants increased from 19% to 26% of the population, but decadence increased from 10% to 23% of the population. Cliffrose decadence decreased from 15% to 0%, but young recruitment also decreased to 0% of the population.

- **1998 to 2003 - slightly down (-1):** Sagebrush density decreased 21% from 2,400 plants/acre to 1,900 plants/acre, but cover increased from 10% to 14%. Recruitment of young sagebrush plants deceased to 3% of the population. Decadence of sagebrush remained moderate at 25%, and poor vigor increased from 6% to 13% of the population. Cliffrose density decreased from 180 plants/acre to 160 plants/acre, but cover increased from 4% to 7%.
- **2003 to 2008 - slightly down (-1):** Sagebrush density decreased 24% to 1,440 plants/acre, and cover decreased to 7%. Decadence of sagebrush increased to 43%, and poor vigor increased to 18% of the population. Cliffrose density increased three-fold to 480 plants/acre, but cover decreased to 5%. Recruitment of young cliffrose plants comprised 50% of the population. Decadence also increased from 0% to 17%, and poor vigor increased from 0% to 4% of the population.
- **2008 to 2012 - slightly down (-1):** Sagebrush density remained similar at 1,340 plants/acre, and cover remained similar at 8%. Decadence of sagebrush decreased to 22%, but poor vigor increased to 25%. Cliffrose density decreased to 40 plants/acre, and cover decreased to 1%.

Grass:

- **1985 to 1991 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1991 to 1998 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1998 to 2003 - up (+2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 31%, and cover increased from 3% to 8%. Cheatgrass decreased significantly in nested frequency, but cover increased from 15% to 19%.
- **2003 to 2008 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover decreased to 4%.
- **2008 to 2012 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 21%, and cover increased to 12%. However, bulbous bluegrass has been steadily increasing in cover on the site since 1998.

Forb:

- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 21B, study no: 9

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
98	17.6	10.0	9.3	5.3	-11.4	0.3	0.0	**31.2**	Fair
03	27.5	10.0	1.0	15.0	-14.3	0.2	0.0	**39.4**	Fair
08	16.4	5.2	10.8	8.1	-13.2	0.0	0.0	**27.3**	Fair
12	11.8	9.2	6.6	23.6	-16.4	0.1	0.0	**34.9**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 9

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	ab19	b36	ab24	a8	ab25	ab25	.90	.26	.52	1.32
G	Bromus tectorum (a)	-	-	b370	a329	a336	a333	15.22	19.06	17.58	21.90
G	Carex sp.	-	-	-	3	-	-	-	.15	-	-
G	Poa bulbosa	a-	a-	a3	b29	ab23	b42	.00	.83	1.01	3.42
G	Poa secunda	ab130	a114	a102	c198	bc175	c221	1.32	7.09	3.40	10.43
G	Sitanion hystrix	a11	ab15	b34	a-	a11	a10	.39	-	.12	.04
Total for Annual Grasses		0	0	370	329	336	333	15.22	19.06	17.58	21.90
Total for Perennial Grasses		160	165	163	238	234	298	2.63	8.34	5.05	15.21
Total for Grasses		160	165	533	567	570	631	17.85	27.40	22.64	37.12
F	Agoseris glauca	-	8	-	5	-	1	-	.03	-	.00
F	Alyssum alyssoides (a)	-	-	a-	a5	b42	c118	-	.18	.78	.26
F	Astragalus sp.	-	-	3	-	-	-	.15	-	-	-
F	Calochortus nuttallii	-	4	-	5	-	3	-	.01	-	.00
F	Chenopodium sp. (a)	-	-	2	-	-	-	.00	-	-	-
F	Collinsia parviflora (a)	-	-	a34	a31	a15	b92	.18	.14	.05	.28
F	Descurainia pinnata (a)	-	-	-	1	-	4	-	.00	-	.01
F	Draba sp. (a)	-	-	a-	a-	a-	b43	-	-	-	.08
F	Erodium cicutarium (a)	-	-	a25	c217	c189	b92	.12	11.55	6.40	2.08
F	Holosteum umbellatum (a)	-	-	a-	a-	a-	b56	-	-	-	.13
F	Lactuca serriola (a)	a-	ab10	a-	a3	b23	ab10	-	.03	.25	.02
F	Lepidium sp. (a)	-	-	b218	a-	a5	a4	1.14	-	.02	.01
F	Microsteris gracilis (a)	-	-	bc18	ab5	a2	c24	.07	.01	.00	.14
F	Montia perfoliata (a)	-	-	a-	b19	a-	a-	-	.07	-	-
F	Phacelia sp.	-	-	-	8	-	-	-	.04	-	-
F	Phlox longifolia	-	1	-	3	-	5	-	.00	-	.03
F	Ranunculus testiculatus (a)	-	-b	a26	a9	a11	1	.06	.02	.04	.03
F	Tragopogon dubius (a)	-	1	2	-	-	2	.00	-	-	.01
F	Zigadenus paniculatus	-	-	-	1	-	2	.00	.00	-	.00
Total for Annual Forbs		0	11	325	290	287	446	1.60	12.01	7.56	3.06
Total for Perennial Forbs		0	13	3	22	0	11	0.15	0.09	0	0.05
Total for Forbs		0	24	328	312	287	457	1.75	12.10	7.56	3.11

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

BROWSE TRENDS--
Management unit 21B, Study no: 9

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata wyomingensis	68	63	48	51	9.60	13.78	7.36	8.13
B	Chrysothamnus nauseosus hololeucus	6	4	3	3	.56	.00	1.01	1.37
B	Cowania mexicana stansburiana	8	8	13	2	3.72	6.86	4.83	1.11
B	Gutierrezia sarothrae	60	8	9	8	6.02	.06	.18	.23
B	Juniperus osteosperma	3	3	0	0	1.54	2.34	-	.15
B	Opuntia sp.	1	1	0	1	.00	-	-	-
B	Purshia tridentata	0	0	0	0	.03	-	-	-
Total for Browse		146	87	73	65	21.49	23.06	13.40	11.00

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 9

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata wyomingensis	10.00	7.83	12.14
Chrysothamnus nauseosus hololeucus	.35	.76	1.46
Cowania mexicana stansburiana	11.53	13.01	4.06
Gutierrezia sarothrae	-	.45	.25
Juniperus osteosperma	5.86	-	.63
Opuntia sp.	.13	-	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 9

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata wyomingensis	2.0	1.3	1.2

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 9

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	33	22	23	23

Average diameter (in)			
'98	'03	'08	'12
7.4	6.2	5.7	6.4

BASIC COVER--
Management unit 21B, Study no: 9

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	2.50	2.00	48.18	58.09	49.73	56.67
Rock	4.75	5.50	10.57	10.47	8.21	9.21
Pavement	.50	.25	1.12	.21	.36	.15
Litter	68.00	59.25	56.50	34.65	49.05	64.19
Cryptogams	.25	.75	2.17	1.46	.01	.33
Bare Ground	24.00	32.25	9.02	16.09	4.86	4.48

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 9, Wide Canyon BLM

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
5.8	6.9	56.7	25.7	17.6	2.9	18.4	163.2	0.7

PELLET GROUP DATA--
Management unit 21B, Study no: 9

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	22	22	40	10
Grouse	-	-	1	-
Elk	-	1	6	-
Deer	60	58	73	45
Cattle	1	5	1	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
-	-	-	-
-	-	13 (33)	1 (2)
155 (383)	167 (413)	140 (346)	54 (134)
12 (30)	2 (5)	11 (27)	15 (38)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 9

		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 tridentata wyomingensis									
85	**1397**	29	57	14	-	5	0	0	30/33
91	**1398**	19	71	10	-	38	0	5	29/50
98	**2400**	26	52	23	60	23	0	6	31/39
03	**1900**	3	72	25	-	35	25	13	28/36
08	**1440**	3	54	43	-	18	3	18	32/37
12	**1340**	15	63	22	40	45	13	25	27/41
Chrysothamnus nauseosus hololeucus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**140**	0	86	14	-	14	0	0	29/43
03	**80**	0	75	25	-	0	75	0	20/26
08	**60**	0	100	0	-	0	0	0	26/38
12	**60**	0	100	0	-	0	0	0	27/55

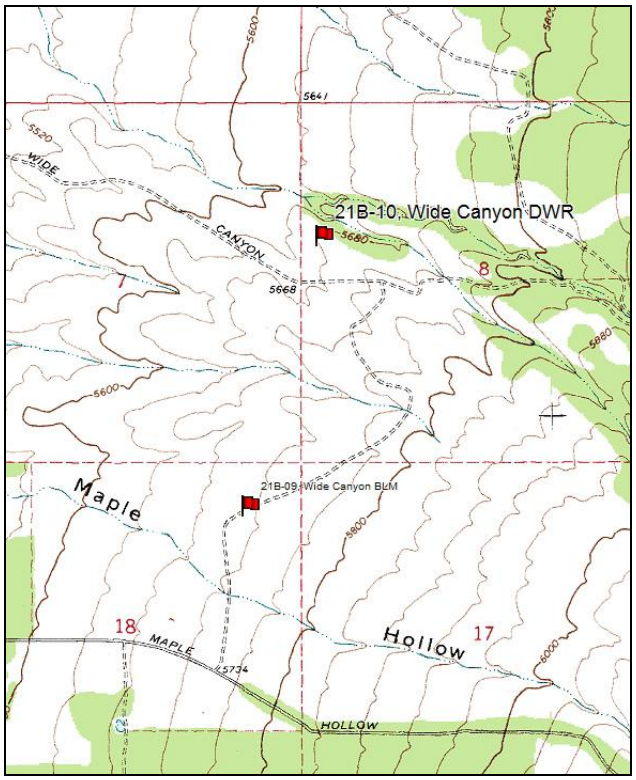
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Cowania mexicana stansburiana									
85	**998**	20	67	13	-	73	7	0	48/49
91	**865**	8	77	15	-	54	0	0	56/58
98	**180**	0	100	0	-	33	0	0	83/91
03	**160**	0	100	0	-	25	50	0	82/89
08	**480**	50	33	17	-	13	17	4	89/96
12	**40**	0	100	0	-	50	0	50	90/125
Gutierrezia sarothrae									
85	**1331**	50	45	5	-	0	5	5	10/13
91	**2265**	26	74	0	-	0	0	0	13/16
98	**5720**	2	98	0	-	0	0	0	13/17
03	**220**	9	91	0	-	0	0	0	5/5
08	**300**	7	93	0	20	0	0	0	11/18
12	**340**	24	76	0	-	0	0	0	10/18
Juniperus osteosperma									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**60**	0	100	-	-	0	0	0	-/-
03	**60**	0	100	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Opuntia sp.									
85	**199**	0	100	0	-	0	0	0	6/8
91	**132**	0	50	50	-	0	0	0	8/15
98	**20**	0	100	0	20	0	0	0	6/12
03	**20**	0	100	0	-	0	0	0	6/14
08	**0**	0	0	0	-	0	0	0	7/18
12	**20**	0	100	0	-	0	0	0	6/16
Purshia tridentata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	91/93
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

WIDE CANYON DWR - TREND STUDY NO. 21B-10-12

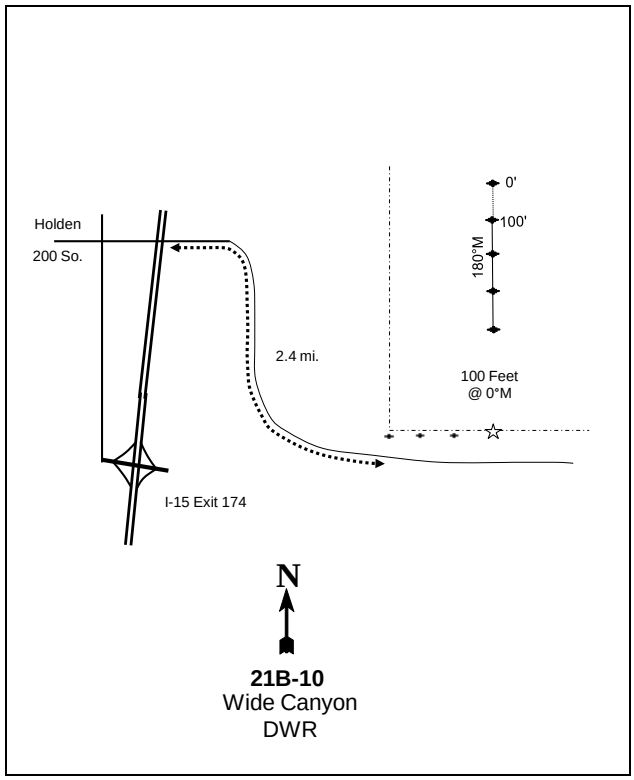
Vegetation Type: Wyoming Big Sagebrush and Cliffrose
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Loam (Wyoming Big Sagebrush), R028AY309UT and Upland Stony Loam (Wyoming Big Sagebrush), R047XA338UT
Land Ownership: DWR
Elevation: 5,710 ft (1,740 m)
Aspect: West
Slope: 5-10%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
From the south Holden exit off I-15, go north into town and turn right at 200 South. Follow the road 1 block east, then north a few yards, then immediately east again up the hill to an overpass. From the overpass go 2.4 miles east to the fence corner of DWR property. Not including the corner posts, count to the third wooden post to the east. Measure 100 feet due north of the fence to the 400-foot stake. The 0-foot stake is a 2 foot tall fencepost marked by browse tag #7070. The other stakes are rebar.

Map Name: Coffee Peak



Diagrammatic Sketch:



Township: 20S Range: 3W Section: 8

GPS: NAD 83, UTM 12S 394374 E 4327487 N

WIDE CANYON DWR - TREND STUDY NO. 21B-10

Site Information

Site Description: The study samples important deer winter range on land owned and managed by the Division of Wildlife Resources (DWR) as part of the Millard Wildlife Management Area (WMA). The area was cabled, chained and/or bulldozed in the late 1950's like much of the area along the west side of the Pahvant Range. The site appears to have been chained again between the 1998 and 2003 sample years, removing many of the large Utah juniper (*Juniperus osteosperma*) trees from the site. The vegetation is a big sagebrush (*Artemisia tridentata spp.*) community intermixed with Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). This site is important wintering habitat for big game, primarily mule deer. The DWR Wide Canyon deer pellet group transect located approximately one mile to the east of the trend study generally sampled high deer pellet group abundance from 1985 to 1991 (Jense et al. 1985 and Jense et al. 1991). Deer pellet groups have been sampled in very high abundance on the site since 1998. Elk pellet groups have been sampled in minimal abundance since 1998. Cattle sign has been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Preferred browse consists of big sagebrush, Stansbury cliffrose, and antelope bitterbrush (*Purshia tridentata*). The sagebrush appears to be a hybrid between Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but was all classified as Wyoming big sagebrush. The sagebrush stand has been decreasing in density since 1998, and is now comprised of a small density population of mature and decadent plants. Recruitment of young sagebrush plants has been poor over the course of the study. Poor vigor was low at the outset of the study, but has increased to high rates in subsequent sample years. Utilization of sagebrush has been moderate with several years of heavy use. The cliffrose stand is comprised of a small density of large, mature plants. Decadence has generally been high in the population, but vigor is generally good. Utilization of cliffrose has been moderate with some years of heavy use. The cliffrose plants are tall enough that they may have limited availability for browsing by wildlife. Bitterbrush was sampled for the first time in 1998 when the baseline was extended. The bitterbrush occurs in low density, and typically receives heavy use (Table - Browse Characteristics). Utah juniper trees are scattered throughout the site at moderate density (Table - Point-Quarter Tree Data). Pictures show many of the mature trees were removed following the chaining treatment between 1998 and 2003.

Herbaceous Understory: Grass species are abundant on the site, but cover is dominated by the weedy perennial species bulbous bluegrass (*Poa bulbosa*). Bulbous bluegrass has steadily increased on the site in frequency and cover since the outset of the study. Other common perennial grass species include bluebunch wheatgrass (*Agropyron spicatum*), intermediate wheatgrass (*A. intermedium*), and Sandberg bluegrass (*Poa secunda*). Cheatgrass (*Bromus tectorum*) is present at low frequency and cover. Forb species are very rare on the site (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant-Pahvant complex, which occurs on fan remnants. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 7.0). Bare ground cover is low, with a high amount of vegetation and litter providing protective ground cover (Table - Basic Cover).

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Sagebrush density decreased 8% from 2,598 plants/acre to 2,398 plants/acre. Recruitment of young sagebrush plants decreased from 18% to 6% of the population. Decadence of sagebrush increased from 33% to 36%, and plants displaying poor vigor increased from

3% to 17% of the population. Cliffrose density remained similar at 133 plants/acre. Decadence increased of cliffrose increased from 50% to 100% of the population.

- **1991 to 1998 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence increased to 57%, and poor vigor increased to 20%. Cliffrose decadence decreased, but remained high at 31% of the population. Young plants were sampled for the first time and comprised 8% of the population.
- **1998 to 2003 - down (-2):** Sagebrush density decreased 51% from 2,180 plants/acre to 1,080 plants/acre, and cover decreased from 9% to 5%. Decadence of sagebrush remained high at 52%. Cliffrose density decreased 23% from 260 plants/acre to 200 plants/ace, but cover increased from 2% to 3%. Decadence of cliffrose decreased to 10%, but poor vigor increased from 0% to 10% of the population. Bitterbrush density increased, but remained low at 140 plants/acre. Decadence decreased from 100% of the population to 0%.
- **2003 to 2008 - slightly down (-1):** Sagebrush density decreased 15% to 920 plants/acre, and cover decreased to 4%. Decadence of sagebrush remained high at 54%, and poor vigor increased to 46% of the population. Cliffrose density increased slightly to 240 plants/acre, but cover decreased to 2%. Decadence of cliffrose increased to 42%, but recruitment of young plants increased from 0% of the population to 17%. Bitterbrush density decreased slightly to 100 plants/acre, and cover decreased from 3% to 2%.
- **2008 to 2012 - slightly down (-1):** Sagebrush density decreased 17% to 760 plants/acre, but cover increased slightly to 5%. Decadence of sagebrush decreased to 34% and poor vigor decreased to 42%, but both rates are still considered high. Cliffrose density decreased to 140 plants/acre, and cover decreased to 1%. Bitterbrush density remained similar at 120 plants/acre, but cover decreased to less than 1%.

Grass:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 16%. Bulbous bluegrass was sampled for the first time.
- **1991 to 1998 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased slightly. Bulbous bluegrass increased significantly in nested frequency.
- **1998 to 2003 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 17%, but cover increased from 16% to 17%. Intermediate wheatgrass decreased significantly in nested frequency, while bulbous bluegrass increased significantly in nested frequency. Bulbous bluegrass cover increased from 5% to 14%.
- **2003 to 2008 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased to 19%.
- **2008 to 2012 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, but cover increased to 21%. Bulbous bluegrass increased in cover from 16% to 39%.

Forb:

- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 21B, 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
98	13.5	0.8	1.0	30.0	-0.1	0.4	0.0	**45.5**	Fair-Good
03	14.1	6.9	1.7	30.0	-0.6	0.5	0.0	**52.6**	Good
08	10.3	8.7	2.7	30.0	-0.9	0.1	0.0	**51.0**	Good
12	8.0	4.3	3.9	30.0	0.0	0.1	0.0	**46.3**	Fair-Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 10

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	b24	b24	ab18	a1	ab7	a2	.29	.06	.19	.04
G	Agropyron intermedium	a67	a66	c144	ab92	bc128	d230	5.27	4.63	5.95	14.88
G	Agropyron spicatum	ab140	bc181	b172	bc188	c221	a105	6.10	9.59	12.09	5.77
G	Bromus tectorum (a)	-	-	a40	a52	b82	a29	.17	.82	1.14	.06
G	Oryzopsis hymenoides	-	3	-	-	-	-	-	-	-	-
G	Poa bulbosa	a-	b99	c158	d271	de298	e320	5.06	13.61	15.67	39.19
G	Poa secunda	bc135	c157	bc129	b106	a34	a32	4.01	2.42	.25	.45
G	Sitanion hystrix	6	2	10	5	4	1	.04	.03	.15	.03
Total for Annual Grasses		0	0	40	52	82	29	0.17	0.81	1.14	0.06
Total for Perennial Grasses		372	532	631	663	692	690	20.80	30.36	34.31	60.37
Total for Grasses		372	532	671	715	774	719	20.97	31.18	35.45	60.43
F	Alyssum alyssoides (a)	-	-	47	25	42	46	.20	.06	.16	.21
F	Astragalus calycosus	-	-	3	2	-	3	.03	.03	-	.01
F	Astragalus sp.	-	6	-	2	1	-	-	.03	.03	-
F	Calochortus nuttallii	ab2	b7	a-	a-	ab3	a-	-	.00	.00	-
F	Castilleja chromosa	-	2	-	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	ab10	b23	a2	a-	.02	.19	.00	-
F	Crepis acuminata	3	-	-	-	-	-	-	-	-	-
F	Cryptantha sp.	2	2	-	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	5	-	2	-	.01	-	.00
F	Erodium cicutarium (a)	-	-	-	-	-	1	-	-	-	.00
F	Holosteum umbellatum (a)	-	-	-	3	-	4	-	.01	-	.04
F	Lactuca serriola (a)	-	1	-	-	-	-	-	-	-	-
F	Microsteris gracilis (a)	-	-	ab3	b11	ab6	a-	.00	.02	.01	-
F	Petradoria pumila	-	-	5	3	1	1	.18	.15	.03	.03
F	Ranunculus testiculatus (a)	-	-	a8	b27	a-	a-	.01	.10	-	-
F	Streptanthus cordatus	-	6	-	3	-	-	-	.00	-	-
F	Tragopogon dubius (a)	-	1	-	-	-	3	.00	-	-	.03
F	Zigadenus paniculatus	2	-	-	4	-	3	-	.01	-	.00

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
Total for Annual Forbs		0	2	68	94	50	56	0.24	0.40	0.17	0.28
Total for Perennial Forbs		9	23	8	14	5	7	0.21	0.23	0.06	0.04
Total for Forbs		9	25	76	108	55	63	0.46	0.64	0.23	0.33

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

BROWSE TRENDS--
Management unit 21B, Study no: 10

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata wyomingensis	71	44	37	33	9.01	4.99	4.01	4.50
B	Chrysothamnus nauseosus	1	0	0	0	-	-	-	-
B	Cowania mexicana stansburiana	13	10	11	7	1.46	2.71	1.92	1.02
B	Gutierrezia sarothrae	31	4	11	7	1.19	.00	.15	.15
B	Juniperus osteosperma	5	3	4	2	3.94	1.96	3.07	.66
B	Leptodactylon pungens	3	2	3	0	.00	-	-	-
B	Opuntia sp.	1	1	1	1	-	.00	-	-
B	Purshia tridentata	2	6	4	5	-	2.54	1.59	.56
B	Ribes sp.	1	0	0	0	-	-	-	-
Total for Browse		128	70	71	55	15.62	12.22	10.77	6.90

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 10

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata wyomingensis	6.15	6.44	7.25
Cowania mexicana stansburiana	2.73	2.34	2.79
Gutierrezia sarothrae	-	.36	.38
Juniperus osteosperma	3.31	5.51	7.75
Leptodactylon pungens	-	.03	-
Purshia tridentata	2.31	2.13	.18

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 10

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata wyomingensis	1.3	1.0	0.5
Cowania mexicana stansburiana	2.8	1.0	1.7
Purshia tridentata	3.1	0.7	1.3

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 10

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	76	54	53	68

Average diameter (in)			
'98	'03	'08	'12
4.7	4.0	4.7	3.6

BASIC COVER--
Management unit 21B, Study no: 10

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	7.75	5.00	43.12	48.72	53.05	67.69
Rock	3.50	3.00	2.75	3.05	1.31	1.81
Pavement	12.50	3.75	2.53	4.41	1.12	.96
Litter	62.00	66.25	57.06	48.25	49.25	66.12
Cryptogams	0	.25	1.15	1.19	1.15	1.53
Bare Ground	14.25	21.75	10.89	11.63	6.98	3.55

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 10, Wide Canyon DWR

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.4	7.0	36.7	34.7	28.6	2.6	9.7	92.8	1.0

PELLET GROUP DATA--
Management unit 21B, Study no: 10

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	52	23	32	7
Elk	1	1	-	3
Deer	53	45	71	28
Cattle	4	1	3	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
3 (7)	-	-	-
122 (301)	165 (407)	297 (734)	42 (103)
9 (22)	1 (4)	9 (22)	8 (20)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 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)
Amelanchier utahensis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**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)
Artemisia tridentata wyomingensis									
85	**2598**	18	49	33	-	13	3	3	21/23
91	**2398**	6	58	36	-	22	8	17	24/30
98	**2180**	1	42	57	-	40	5	20	28/35
03	**1080**	0	48	52	-	41	15	20	30/34
08	**920**	2	43	54	-	33	9	46	32/39
12	**760**	3	63	34	-	53	39	42	32/50
Chrysothamnus nauseosus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**20**	0	0	100	-	0	100	0	17/47
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	15/21
12	**0**	0	0	0	-	0	0	0	23/31
Chrysothamnus viscidiflorus stenophyllus									
85	**66**	0	100	-	-	0	0	0	11/12
91	**266**	50	50	-	-	25	0	0	12/14
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	23/22
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	16/33
Cowania mexicana stansburiana									
85	**132**	0	50	50	-	100	0	0	22/18
91	**133**	0	0	100	-	100	0	0	-/-
98	**260**	8	62	31	20	38	15	0	56/64
03	**200**	0	90	10	-	20	60	10	49/50
08	**240**	17	42	42	-	0	8	8	57/56
12	**140**	29	71	0	-	57	14	14	69/75
Gutierrezia sarothrae									
85	**3464**	23	65	12	-	0	0	2	9/8
91	**799**	0	100	0	66	0	0	0	10/7
98	**1960**	6	93	1	20	0	0	0	11/12
03	**100**	20	60	20	-	0	0	0	9/7
08	**360**	0	100	0	60	0	0	0	8/12
12	**200**	10	90	0	-	0	0	80	9/14
Juniperus osteosperma									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**100**	20	60	20	20	0	0	0	-/-
03	**60**	100	0	0	20	0	0	0	-/-
08	**80**	75	25	0	-	0	0	0	-/-
12	**40**	50	50	0	-	0	0	0	-/-

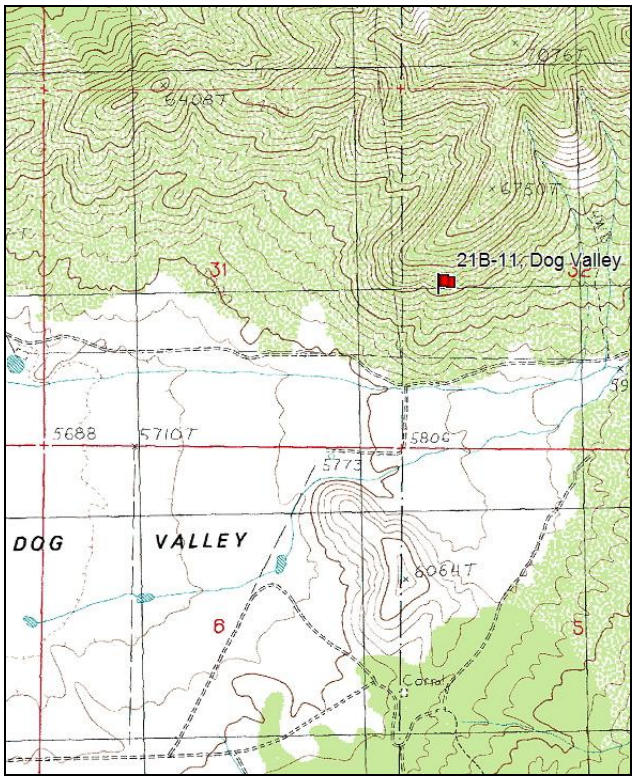
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Leptodactylon pungens									
85	**132**	50	50	0	-	0	0	0	9/7
91	**66**	0	100	0	-	0	0	0	11/7
98	**140**	0	0	100	-	0	0	86	8/9
03	**80**	0	100	0	-	0	0	0	2/4
08	**120**	17	67	17	-	0	0	100	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Opuntia sp.									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**20**	0	100	0	-	0	0	0	6/9
03	**20**	0	100	0	-	0	0	0	8/13
08	**20**	0	0	100	-	0	0	0	6/14
12	**20**	0	100	0	-	0	0	0	6/15
Purshia tridentata									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**40**	0	0	100	-	50	50	0	30/41
03	**140**	14	86	0	-	29	43	0	34/57
08	**100**	0	100	0	-	20	40	0	34/56
12	**120**	0	100	0	-	33	67	50	28/41
Ribes sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

DOG VALLEY - TREND STUDY NO. 21B-11-12

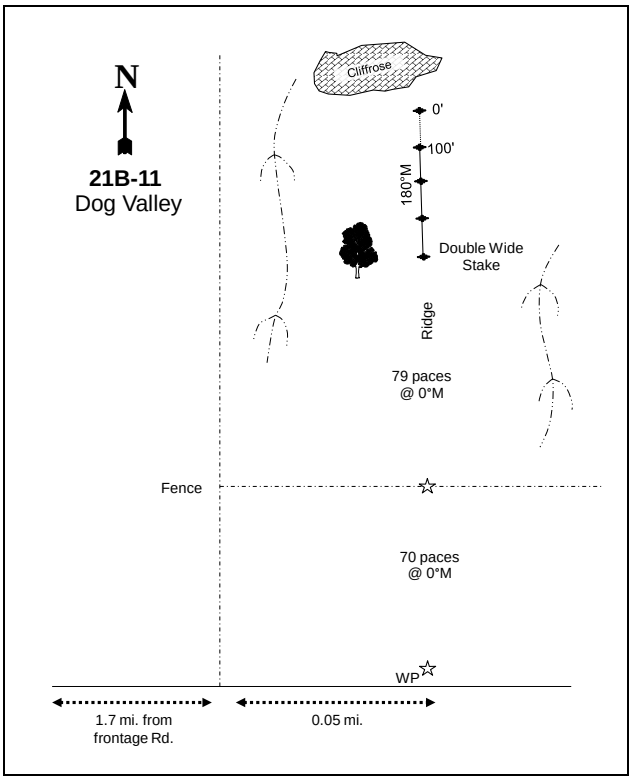
Vegetation Type: Annual Grass
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Stony Loam (Mountain Big Sagebrush), R047XB336UT
Land Ownership: USFS
Elevation: 6,169 ft (1,878 m)
Aspect: South
Slope: 30-35%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 3 on 5ft. and belt 5 on 2ft.

Directions:
Head south on I-15 out of Kanosh. Take the first ranch exit south of Kanosh (exit #138). Drive under the freeway to the east side. Turn and drive north on the frontage road parallel to the interstate for 1.2 miles to a cattleguard. Just past the cattleguard turn right and go east 1.7 miles to a fence. From the fence continue 0.05 miles east to a witness post on the north side of the road by a large juniper. The witness post is a steel full high stake approximately 3 feet tall and 8 feet off the road. From the witness post, go 852 feet due north. You should use a tape to measure the 852 feet north to the 400' stake.

Map Name: Cove Fort



Diagrammatic Sketch:



Township: 24S Range: 6W Section: 32

GPS: NAD 83, UTM 12S 364297 E 4282178 N

DOG VALLEY - TREND STUDY NO. 21B-11

Site Information

Site Description: The study samples deer winter range on the slopes north of the sagebrush flats and cultivated fields of Dog Valley. The land is administered by the U.S. Forest Service (USFS) as part of the Grass Creek allotment. The study was established in a Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) community, but the Dog Valley Peak fire burned the entire area in July of 1996 removing most of the browse species from the site. The area, including the valley bottom, burned again as part of the Dog Valley fire in 2006 that burned 28,674 acres. The Division of Wildlife Resources (DWR) Dog Valley pellet group transect measured deer presence on the same slope that this study samples. Deer pellet group abundance varied between years, but in general, there was moderate to high pellet group abundance between 1985 and 1990 (Jense et al. 1990). Deer pellet groups were sampled on the site in moderate abundance in 1998, high abundance in 2003 and 2008, and low abundance in 2012. Elk pellet groups have been sampled in low abundance since 1998. Cattle sign has been sampled in low abundance in several sample years since 2003 (Table - Pellet Group Data). Mormon crickets (*Anabrus simplex*) were very abundant in June 2003 when the study was sampled.

Browse: Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) was the dominant browse species before the fire in 1996. Prior to the fire, the cliffrose stand was a moderately dense stand of large, mature plants that received heavy use. The cliffrose was beginning to reestablish on the site in low density when the second fire burned the site in 2006 and removed most of the remaining plants. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) also provided preferred browse prior to the burn. It occurred at low density with moderate to heavy use. The 1996 fire removed all sagebrush from the site. Other browse species that are present, but sparse, include true mountain mahogany (*Cercocarpus montanus*), Rocky Mountain smooth sumac (*Rhus glabra* ssp. *cismontana*), blue elderberry (*Sambucus cerulea*), broom snakeweed (*Gutierrezia sarothrae*), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics). Utah juniper (*Juniperus osteosperma*) is also scattered throughout the study at low cover (Table - Canopy Cover, Line Intercept).

Herbaceous Understory: Cheatgrass (*Bromus tectorum*) has dominated the grass component since the study was established. Other grass species are rare on the site. Bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), purple three-awn (*Aristida purpurea*), and galleta (*Hilaria jamesii*) have also been sampled, but have provided little cover. The forb component is also dominated by annuals. Perennial forb species are very rare on the site. Annual forb species dominate the forb component. Field bindweed (*Convolvulus arvensis*), a noxious weed, has increased on the site since 2003, and is the dominant perennial forb on the site (Table - Herbaceous Trend).

Soil: The soil is likely part of the Kersick series, which occurs on ridges and mountain slopes. These soils are formed from residuum weathered from limestone and calcareous sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of vegetation, litter, and rock cover providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** The browse trend is slightly down. Sagebrush density decreased 83% from 398 plants/acre to 66 plants/acre. Cliffrose density increased 12% from 533 plants/acre to 598 plants/acre.
- **1991 to 1998 - down (-2):** The fire in 1996 eliminated nearly all of the browse species from the site.

- **1998 to 2003 - slightly up (+1):** Cliffrose density increased from no plants to 260 plants/acre. Cover was sampled at less than 1%. The majority of the plants were mature.
- **2003 to 2008 - down (-2):** The fire in 2006 removed most of the cliffrose that had reestablished on the site. Density of cliffrose decreased 85% to 40 plants/acre, with no measurable cover.
- **2008 to 2012 - stable (0):** Browse species remain very rare on the site.

Grass:

- **1985 to 1991 - stable (0):** Perennial grasses are very rare on the site. Cheatgrass dominates the grass component.
- **1991 to 1998 - stable (0):** Perennial grasses are very rare on the site. Cheatgrass dominates the grass component.
- **1998 to 2003 - stable (0):** Perennial grasses are very rare on the site. Cheatgrass dominates the grass component.
- **2003 to 2008 - stable (0):** Perennial grasses are very rare on the site. Cheatgrass dominates the grass component.
- **2008 to 2012 - stable (0):** Perennial grasses are very rare on the site. Cheatgrass dominates the grass component.

Forb:

- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site. Field bindweed was sampled for the first time.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - slightly down (-1):** Desirable perennial forb species are very rare on the site. Field bindweed increased significantly on the site, and cover increased from less than 1% to 2%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 21B, 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
98	0.0	0.0	0.0	2.7	-20.0	1.2	0.0	**-16.0**	Very Poor
03	0.8	0.0	0.0	0.9	-6.5	0.1	-2.0	**-6.8**	Very Poor
08	0.0	0.0	0.0	1.3	-15.5	0.4	-2.0	**-15.9**	Very Poor
12	0.0	0.0	0.0	4.3	-20.0	3.3	-2.0	**-14.4**	Very Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 11

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	16	16	20	9	9	9	.42	.22	.18	.44
G	Aristida purpurea	$_{a}$3	$_{ab}$5	$_{a}$-	$_{a}$3	$_{ab}$7	$_{b}$14	-	.15	.41	1.72
G	Bromus tectorum (a)	-	-	$_{c}$387	$_{a}$290	$_{b}$361	$_{c}$381	46.88	8.72	20.71	54.74
G	Hilaria jamesii	-	-	4	-	-	1	.85	-	-	.00
G	Poa secunda	$_{a}$7	$_{b}$17	$_{a}$6	$_{a}$4	$_{a}$1	$_{a}$-	.06	.04	.03	-
G	Sitanion hystrix	-	5	4	2	-	-	.03	.03	-	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
Total for Annual Grasses		0	0	387	290	361	381	46.88	8.72	20.71	54.74
Total for Perennial Grasses		26	43	34	18	17	24	1.36	0.44	0.63	2.17
Total for Grasses		26	43	421	308	378	405	48.25	9.17	21.34	56.91
F	Alyssum alyssoides (a)	-	-	$_{c}$253	$_{a}$1	$_{b}$95	$_{b}$95	2.61	.00	.32	.26
F	Ambrosia psilostachya	-	-	-	2	-	-	-	.03	-	-
F	Antennaria rosea	-	-	4	-	-	-	.03	-	-	-
F	Astragalus calycosus	-	-	9	-	-	-	.06	-	-	-
F	Cirsium sp.	-	-	2	-	-	3	.24	-	-	.15
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{ab}$2	$_{a}$-	$_{b}$9	-	.00	-	.02
F	Convolvulus arvensis	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$5	$_{a}$14	$_{b}$44	-	.01	.10	1.47
F	Draba sp. (a)	-	-	$_{a}$11	$_{a}$5	$_{b}$43	$_{b}$43	.01	.01	.13	.11
F	Epilobium brachycarpum (a)	-	-	3	-	-	3	.01	-	-	.03
F	Erodium cicutarium (a)	-	-	$_{a}$176	$_{c}$330	$_{b}$247	$_{a}$192	5.56	36.07	6.86	7.52
F	Euphorbia sp.	-	-	-	-	-	2	-	-	-	.00
F	Holosteum umbellatum (a)	-	-	-	-	-	2	-	-	-	.03
F	Lactuca serriola (a)	$_{a}$-	$_{a}$-	$_{c}$74	$_{a}$7	$_{b}$25	$_{b}$21	.49	.02	1.28	.17
F	Machaeranthera canescens	-	-	-	-	7	-	-	-	.04	-
F	Phlox longifolia	-	-	-	-	2	-	-	-	.00	-
F	Polygonum douglasii (a)	-	-	-	-	1	-	-	-	.00	-
F	Ranunculus testiculatus (a)	-	-	-	-	-	1	-	-	-	.00
F	Solanum sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$8	$_{a}$-	-	-	.04	.00
F	Tragopogon dubius (a)	-	-	-	-	3	2	-	-	.03	.01
F	Unknown forb-perennial	$_{a}$3	$_{a}$-	$_{b}$18	$_{a}$-	$_{a}$-	$_{a}$-	.28	-	-	-
Total for Annual Forbs		0	0	517	345	414	368	8.70	36.12	8.64	8.17
Total for Perennial Forbs		3	0	33	7	31	49	0.62	0.03	0.19	1.63
Total for Forbs		3	0	550	352	445	417	9.32	36.16	8.84	9.81

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

BROWSE TRENDS--
Management unit 21B, Study no: 11

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Cowania mexicana stansburiana	0	11	2	2	.01	.53	-	-
B	Gutierrezia sarothrae	1	0	0	1	-	-	-	.03
B	Juniperus osteosperma	0	0	0	0	-	3.42	-	-
B	Tetradymia canescens	4	3	1	6	.15	-	-	.06
Total for Browse		5	14	3	9	0.16	3.95	0	0.09

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 11

Species	Percent Cover		
	'03	'08	'12
Cowania mexicana stansburiana	.80	-	.01
Juniperus osteosperma	4.00	2.31	3.95
Tetradymia canescens	-	-	.76

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 11

Species	Average leader growth (in)		
	'03	'08	'12
Cowania mexicana stansburiana	4.1	-	-

BASIC COVER--
Management unit 21B, Study no: 11

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	1.25	2.00	54.39	50.29	36.90	66.93
Rock	11.50	16.25	18.90	15.23	18.12	14.12
Pavement	8.25	9.25	6.03	7.13	6.25	1.41
Litter	72.25	63.75	66.49	36.77	44.54	49.05
Cryptogams	0	0	.04	0	0	.39
Bare Ground	6.75	8.75	2.25	4.92	1.82	.21

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 11, Dog Valley

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.2	6.8	40.7	29.7	29.6	2.6	20.7	121.4	0.8

PELLET GROUP DATA--
Management unit 21B, Study no: 11

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	13	2	13	3
Elk	1	2	14	1
Deer	35	43	69	12
Cattle	-	1	-	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
4 (10)	-	6 (15)	2 (5)
47 (116)	116 (286)	95 (235)	15 (38)
-	6 (1)	-	4 (9)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 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)
Artemisia tridentata vaseyana									
85	**398**	33	50	17	-	33	0	0	20/26
91	**66**	0	100	0	-	0	100	0	12/21
98	**0**	0	0	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Cercocarpus montanus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	8/19
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Cowania mexicana stansburiana									
85	**533**	0	100	0	-	63	0	0	69/75
91	**598**	11	67	22	66	44	56	0	82/70
98	**0**	0	0	0	40	0	0	0	-/-
03	**260**	8	92	0	-	23	69	0	21/23
08	**40**	50	0	50	-	0	50	50	16/22
12	**40**	0	100	0	-	100	0	50	31/35
Echinocereus sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/17
Gutierrezia sarothrae									
85	**0**	0	0	-	-	0	0	0	-/-
91	**66**	0	100	-	-	0	0	0	6/4
98	**20**	100	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	12/25
08	**0**	0	0	-	-	0	0	0	9/11
12	**20**	0	100	-	-	0	0	0	11/19

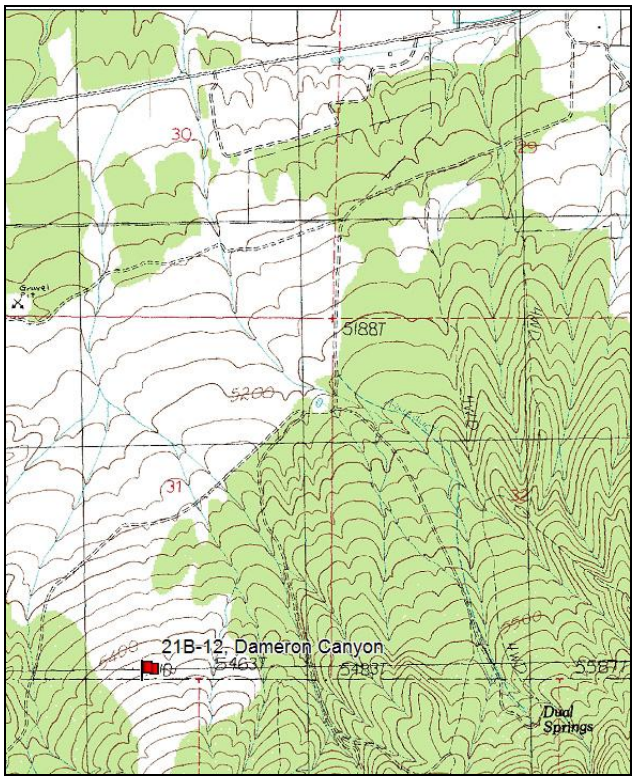
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Rhus glabra cismontana									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	33/40
12	**0**	0	0	-	-	0	0	0	31/52
Sambucus cerulea									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	26/13
03	**0**	0	0	-	-	0	0	0	18/22
08	**0**	0	0	-	-	0	0	0	57/83
12	**0**	0	0	-	-	0	0	0	74/90
Sclerocactus sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	6/12
12	**0**	0	0	-	-	0	0	0	-/-
Tetradymia canescens									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**120**	17	83	0	-	0	0	0	10/20
03	**80**	25	75	0	-	0	0	0	10/21
08	**40**	50	50	0	-	0	0	100	10/22
12	**200**	0	90	10	-	0	0	20	13/32

DAMERON CANYON - TREND STUDY NO. 21B-12-12

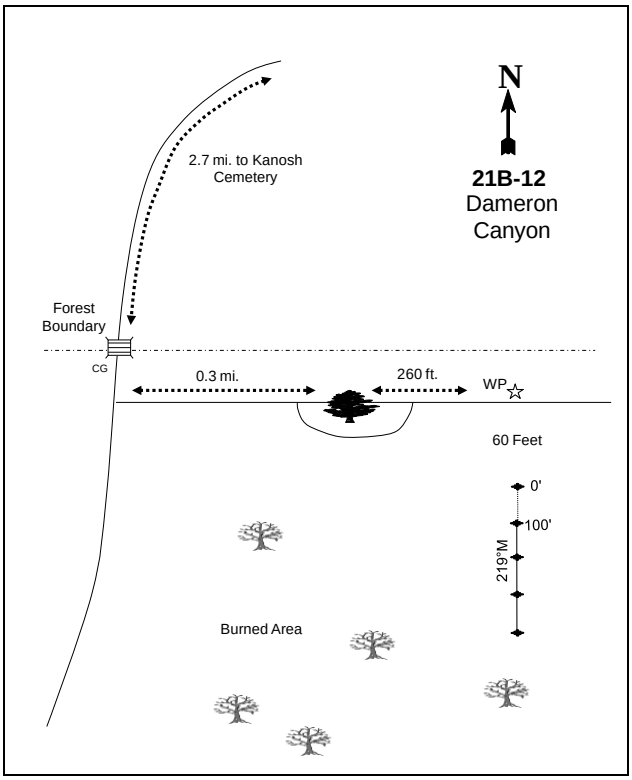
Vegetation Type: Annual Grass
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Loam (Mountain Big Sagebrush), R028AY310UT
Land Ownership: USFS
Elevation: 5,460 ft (1,664 m)
Aspect: North
Slope: 3-5%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 1ft.

Directions:
Go south on the main road from Kanosh. Continue south on a dirt road towards the cemetery when the main road turns west towards the interstate. From the northeast corner of the Kanosh cemetery (1/2 mile south of town), follow the main road south for 2.7 miles to a cattleguard. Just past the cattleguard turn left and go 0.3 miles along the fence to a faint road. Where the road rejoins, go 260 feet to a witness post on the left side of the road by the fence. The witness post is a steel rebar stake 2 l/2 feet tall. From the witness post go 60 feet due south to the start of the frequency baseline. The 0-foot baseline stake is tagged #7109. The 100-foot end of the baseline is marked by a stake that is actually only 98 feet south, so the tape must be adjusted at that end.

Map Name: Fillmore



Diagrammatic Sketch:



Township: 24S Range: 5W Section: 4

GPS: NAD 83, UTM 12S 373188 E 4291142 N

DAMERON CANYON - TREND STUDY NO. 21B-12

Site Information

Site Description: The study samples a fairly flat area in the foothills south of Kanosh. The study is on land administered by the U.S. Forest Service (USFS) as part of the Kanosh allotment. Part of the baseline, including the first frequency belt, was chained following the 1985 sampling. The study and surrounding area burned in 2008 as part of the Dry Wash fire, which burned 324 acres just before the 2008 sampling. In the past, the Forest Service has allowed free-use firewood cutting here to help reduce juniper competition with the more desirable browse species. The Division of Wildlife Resources (DWR) Dameron pellet groups transect, located approximately one mile to the west of the study, sampled moderate deer pellet group abundance between 1985 and 1990 (Jense et al. 1990). Deer pellet groups were sampled in very high abundance in 1998 and 2003, but have been sampled in minimal abundance since 2008. Elk pellet groups were sampled in low abundance in 1998. Cattle sign has been sampled in low abundance in several years since 2003 (Table - Pellet Group Data).

Browse: Prior to the fire, preferred browse was provided primarily by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*). Sagebrush occurred in a moderately dense population of healthy young and mature plants. Utilization of sagebrush was mostly moderate. Bitterbrush occurred in a low density population of healthy, mature plants. Utilization of bitterbrush was moderate to heavy. Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), wax current (*Ribes cereum* ssp. *cereum*), blue elderberry (*Sambucus cerulea*), and skunkbush sumac (*Rhus trilobata*) were also present in low densities. A few Utah juniper (*Juniperus osteosperma*) trees were also scattered over the site. However, the fire eliminated most of these browse species from the site. The only common browse species following the fire was Rocky Mountain smooth sumac (*Rhus glabra* ssp. *cismontana*).

Herbaceous Understory: Grass composition is poor on the site. Cheatgrass (*Bromus tectorum*) has often dominated the grass component. The only common perennial grass was Sandberg bluegrass (*Poa secunda*), but perennial species have been very rare since the fire in 2008. Bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2003 at low frequency and cover. Desirable perennial forb species have been very rare on the site. The weedy perennial species bigbracht verbena (*Verbena bracteata*) was the only common perennial forb sampled following the 2008 fire. Annual forb species were common and dominated the forb component following the 2008 fire (Table - Herbaceous Trends).

Soil: The soil is likely part of the Donnardo series, which occurs on fan remnants. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as deep and well drained (Soil Survey 2011). The soil texture is a loam with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). Bare ground cover has been low, except immediately following the fire in 2008. High amounts of vegetation, litter, and pavement provide protective ground cover. The increase in pavement cover in 2008 suggests that some wind erosion may have occurred (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2008, but was moderate in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Sagebrush density decreased 8% from 5,199 plants/acre to 4,798 plants/acre. Decadence of sagebrush increased from 14% to 24%, and poor vigor increased from 4% to 13% of the population. Bitterbrush density decreased 40% from 332 plants/acre to 199 plants/acre.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence decreased slightly to 18%, and poor vigor decreased to 2%. Recruitment of young sagebrush plants decreased

from 22% to 12% of the population. Bitterbrush decadence increased slightly from 0% of the population to 5%, and vigor remained excellent.

- **1998 to 2003 - stable (0):** Sagebrush density decreased 10% from 2,840 plants/acre to 2,560 plants/acre, but cover increased from 14% to 17%. Recruitment of young sagebrush plants decreased to just 2% of the population. Decadence of sagebrush increased to 24%, and poor vigor increased to 9%. Bitterbrush density decreased 10% from 400 plants/acre to 360 plants/acre, but cover increased from 6% to 7%. Decadence of bitterbrush increased to 17%, and poor vigor increased from 0% of the population to 6%.
- **2003 to 2008 - down (-2):** The fire eliminated all of the sampled browse on the study site.
- **2008 to 2012 - stable (0):** Preferred browse species remained very rare on the site. The only common species on sampled was Rocky Mountain smooth sumac.

Grass:

- **1985 to 1991 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 11%.
- **1991 to 1998 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1998 to 2003 - up (+2):** The sum of nested frequency of perennial grasses increased 74%, and cover increased from 5% to 15%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 20% to 8%.
- **2003 to 2008 - down (-2):** Very few grasses were sampled immediately following the fire.
- **2008 to 2012 - slightly down (-1):** Perennial grasses remain very rare on the site. Cheatgrass increased significantly on the site, and cover was high at 36%.

Forb:

- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - stable (0):** Desirable perennial forb species are very rare on the site. The weedy perennial bigbracht verbena is common.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 21B, 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
98	25.9	4.6	12.0	9.9	-15.0	0.2	0.0	**37.6**	Poor
03	30.0	8.5	1.0	29.0	-6.3	0.0	0.0	**62.2**	Fair
08	0.0	0.0	0.0	1.0	0.0	0.0	0.0	**1.0**	Very Poor
12	3.0	0.0	0.0	0.8	-20.0	4.4	0.0	**-11.8**	Very Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 12

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	-	-	3	-	-	-	.03	-	-	-
G	Agropyron spicatum	a-	a3	ab11	b12	a-	ab8	.21	.39	-	.18
G	Bromus brizaeformis (a)	-	-	-	-	-	10	-	-	-	.09
G	Bromus japonicus (a)	-	-	11	6	-	-	.21	.07	-	-
G	Bromus tectorum (a)	-	-	c349	b264	a3	c368	19.84	8.28	.00	36.13
G	Poa bulbosa	-	-	-	7	-	9	-	.18	-	.09
G	Poa secunda	b193	b189	b168	c299	a43	a20	4.42	13.53	.50	.20
G	Secale montanum	-	-	2	-	-	-	.00	-	-	-
G	Sitanion hystrix	b26	a2	a14	b26	a-	a-	.29	.58	-	-
Total for Annual Grasses		0	0	360	270	3	378	20.04	8.35	0.00	36.23
Total for Perennial Grasses		219	194	198	344	43	37	4.97	14.69	0.50	0.47
Total for Grasses		219	194	558	614	46	415	25.02	23.04	0.50	36.71
F	Allium sp.	-	-	1	-	-	-	.00	-	-	-
F	Alyssum alyssoides (a)	-	-	b48	b22	a-	c148	.48	.05	-	1.00
F	Arabis sp.	-	-	7	-	-	-	.01	-	-	-
F	Argemone munita	-	-	-	-	-	2	-	-	-	.00
F	Astragalus calycosus	-	-	3	-	-	-	.00	-	-	-
F	Calochortus nuttallii	-	-	8	-	-	-	.02	-	-	-
F	Collinsia parviflora (a)	-	-	-	4	-	-	-	.01	-	-
F	Draba sp. (a)	-	-	b55	a9	a-	a-	.19	.01	-	-
F	Epilobium brachycarpum (a)	-	-	6	-	-	2	.01	-	-	.03
F	Erodium cicutarium (a)	-	-	a-	a8	a-	b306	-	.21	-	20.26
F	Euphorbia sp.	-	-	-	-	-	5	-	-	-	.01
F	Holosteum umbellatum (a)	-	-	c223	b32	a-	a1	2.42	.17	-	.00
F	Lactuca serriola (a)	a-	b55	a1	a-	a-	a5	.00	-	-	.04
F	Lomatium sp.	-	-	3	-	-	-	.03	-	-	-
F	Machaeranthera canescens	-	-	8	-	-	-	.01	-	-	-
F	Microsteris gracilis (a)	-	-	b16	ab6	a-	a-	.03	.02	-	-
F	Phlox longifolia	4	-	5	-	-	-	.01	-	-	-
F	Polygonum douglasii (a)	-	-	3	-	-	-	.01	-	-	-
F	Ranunculus testiculatus (a)	-	-	b39	b19	a-	a3	.12	.08	-	.00
F	Tragopogon dubius (a)	-	-	b15	a-	a-	a1	.19	-	-	.00
F	Unknown forb-perennial	4	-	-	-	-	-	-	-	-	-
F	Verbena bracteata	a-	a-	a-	a-	a-	b20	-	-	-	2.20
F	Zigadenus paniculatus	-	1	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	55	406	100	0	466	3.46	0.56	0	21.35
Total for Perennial Forbs		8	1	35	0	0	27	0.10	0	0	2.21
Total for Forbs		8	56	441	100	0	493	3.56	0.56	0	23.57

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

BROWSE TRENDS--
Management unit 21B, Study no: 12

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	74	73	0	0	13.55	16.64	-	-
B	Chrysothamnus nauseosus	1	0	0	0	1.00	-	-	-
B	Cowania mexicana stansburiana	2	1	0	1	.33	.15	-	-
B	Gutierrezia sarothrae	77	31	0	8	8.80	1.67	-	.06
B	Juniperus osteosperma	1	2	0	0	1.63	.78	-	-
B	Purshia tridentata	17	14	0	0	5.50	6.99	-	-
B	Rhus glabra cismontana	0	0	0	16	-	-	-	3.01
B	Ribes cereum cereum	1	0	0	0	.15	-	-	-
B	Sambucus cerulea	1	0	0	0	-	-	-	-
Total for Browse		174	121	0	25	30.98	26.23	0	3.08

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 12

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	19.43	-	-
Cowania mexicana stansburiana	-	-	.08
Gutierrezia sarothrae	1.11	-	.41
Juniperus osteosperma	2.43	-	-
Purshia tridentata	10.19	-	-
Rhus glabra cismontana	-	-	3.71

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 12

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.6	-	-
Purshia tridentata	3.1	-	-

BASIC COVER--
Management unit 21B, Study no: 12

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	3.00	3.50	49.84	51.87	.51	59.21
Rock	4.50	5.25	5.39	4.44	9.53	6.84
Pavement	7.50	12.00	6.49	6.28	42.18	14.59
Litter	64.25	52.50	61.09	40.47	10.92	40.29
Cryptogams	0	.25	1.30	.00	.00	.63
Bare Ground	20.75	26.50	9.62	15.61	46.14	4.61

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 12, Dameron Canyon

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.6	6.8	44.7	30.7	24.6	3.7	11.9	163.2	0.9

PELLET GROUP DATA--

Management unit 21B, Study no: 12

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	8	1	-	8
Elk	2	-	-	-
Deer	50	37	5	3
Cattle	1	1	-	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
1 (2)	-	-	-
143 (353)	175 (431)	-	-
-	5 (13)	-	4 (11)

BROWSE CHARACTERISTICS--

Management unit 21B, 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)
Artemisia tridentata vaseyana									
85	**5199**	26	60	14	66	12	0	4	28/29
91	**4798**	22	54	24	3666	43	6	13	24/26
98	**2840**	12	70	18	60	17	.70	2	26/31
03	**2560**	2	74	24	-	30	9	9	30/36
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	9/11
Chrysothamnus nauseosus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**80**	75	25	-	-	0	0	0	34/48
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	23/36
Cowania mexicana stansburiana									
85	**66**	0	0	100	-	0	100	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**80**	25	75	0	-	100	0	0	78/107
03	**20**	100	0	0	-	0	0	0	62/82
08	**0**	0	0	0	-	0	0	0	-/-
12	**20**	100	0	0	-	0	100	0	13/35

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae									
85	**1532**	35	61	4	266	0	0	0	9/13
91	**7198**	29	70	1	599	0	0	0	10/9
98	**10540**	9	90	1	320	0	0	.18	9/9
03	**1320**	2	88	11	80	0	0	8	9/10
08	**0**	0	0	0	-	0	0	0	-/-
12	**220**	9	73	18	160	0	0	9	10/16
Juniperus osteosperma									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	100	0	-	-	0	0	0	-/-
03	**40**	0	100	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Purshia tridentata									
85	**332**	0	80	20	-	0	100	20	46/43
91	**199**	0	100	0	-	33	33	0	43/66
98	**400**	0	95	5	40	50	25	0	51/67
03	**360**	0	83	17	-	11	67	6	57/72
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Rhus glabra cismontana									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**440**	27	73	-	20	5	0	0	31/40
Rhus trilobata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	72/96
03	**0**	0	0	-	-	0	0	0	58/60
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Ribes cereum cereum									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**20**	0	0	100	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-

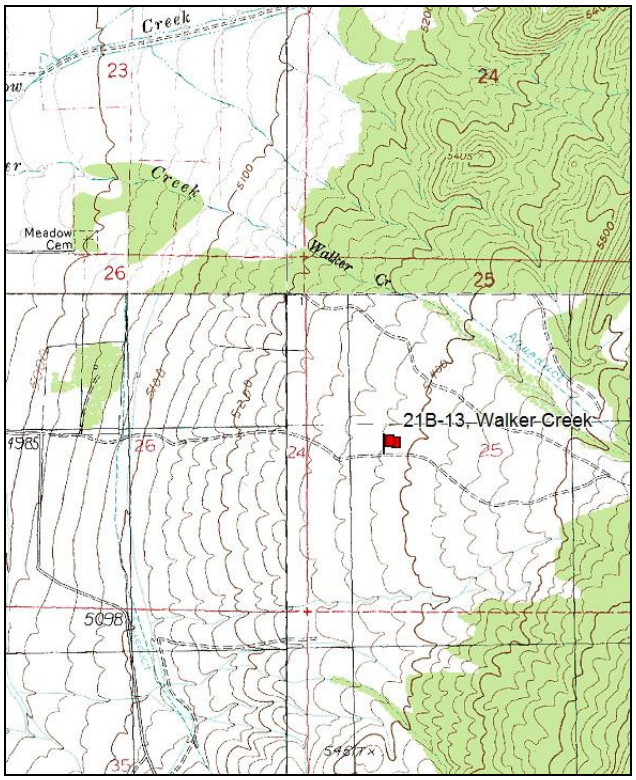
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Sambucus cerulea									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	0	100	-	-	100	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	69/151

WALKER CREEK - TREND STUDY NO. 21B-13-12

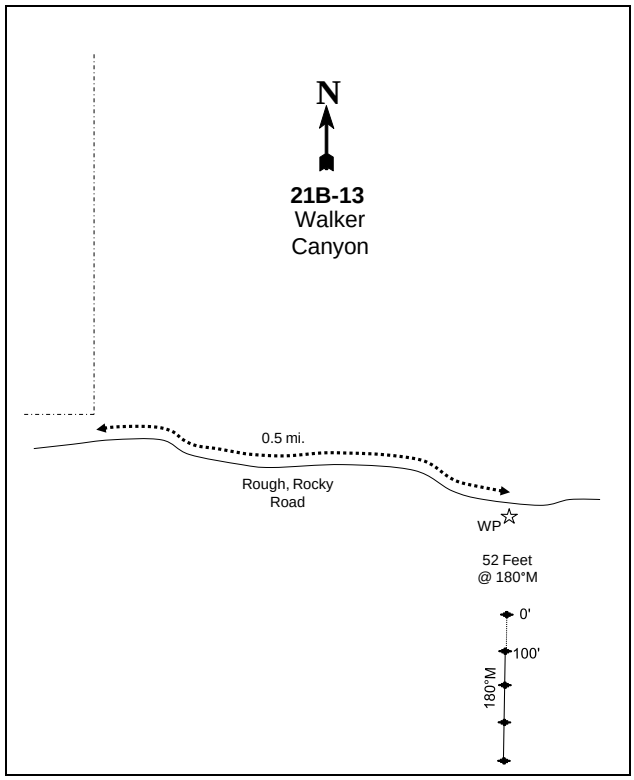
Vegetation Type: Basin Big Sagebrush and Cliffrose
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Stony Loam (Wyoming Big Sagebrush), R047XA338UT
Land Ownership: BLM
Elevation: 5,370 ft (1,637 m)
Aspect: West
Slope: 2-5%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 3ft., belt 3 on 6ft., belt 4 on 1ft., and belt 5 on 6ft.

Directions:
Go south from Meadow (southwest of Fillmore) on SR 133 to mile marker 6. Go approximately 0.05 miles further south on SR 133 and turn east on a gravel road (4400 S). Go east 0.8 miles to a junction. Turn right and follow this road (2600 W) for 1 mile around several bends until the main road turns back to the south. Instead of turning south, continue straight east for 0.1 miles to a fork. Keep right and go 0.15 miles to a concrete aqueduct. Continue on the road 0.25 miles to a fence corner on the left, and travel another 0.5 miles to a cairn on the right side of the road. The 0-foot baseline stake is 51.5 feet south of the rebar and rock cairn. The 0-foot stake is a 2 ½ foot tall rebar tagged #7074. A 4X4 vehicle is advisable for the rough roads.

Map Name: Fillmore



Diagrammatic Sketch:



Township: 22S Range: 24W Section: 17

GPS: NAD 83, UTM 12S 381088 E 4303068 N

WALKER CREEK - TREND STUDY NO. 21B-13

Site Information

Site Description: The study is located on the foothills below the Pahvant Range southeast of Meadow. The area is administered by the Bureau of Land Management (BLM) as part of the Meadow Spring allotment. In 1966, about 270 acres in the Walker Creek area were treated by bulldozing individual Utah juniper (*Juniperus osteosperma*) trees and leaving all other desirable browse species. Many juniper trees were removed by hand cutting on the extended portion of the transect prior to 1998. Big game pellet groups were abundant and well-distributed throughout the area in 1985. Deer pellet groups have been sampled in high abundance since 1998. Two deer carcasses were found on the site in 1991, and one was found in 2008. Resting and escape cover is widely available. Water is available in Meadow Creek about 0.5 miles to the north. Grazing was permitted in the past, but the area receives very little cattle use. There has been no evidence of cattle use since 1998 (Table - Pellet Group Data).

Browse: Preferred browse is provided by big sagebrush (*Artemisia tridentata spp.*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Although the big sagebrush was classified as basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), some of the plants are likely hybrids with mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). The sagebrush occurs in a moderately dense population of mature and decadent plants. Recruitment of young sagebrush plants was good at the outset of the study, but has been generally poor since 1998. Decadence has been mostly moderate to high levels, and poor vigor has generally been low. Utilization was mostly light to moderate in the early years of the study, but has been moderate to heavy since 2008. Cliffrose occurs in a moderately dense population of large, mature plants. Cliffrose plants have steadily increased in height since 1985. Recruitment of young cliffrose plants was good at the outset of the study, but has been generally poor since 1998. Decadence of cliffrose has fluctuated from low to high rates over the course of the study. Utilization of cliffrose has been mostly moderate to heavy throughout the sample years (Table - Browse Characteristics). Utah juniper trees are scattered throughout the site. The hand thinning removed many of the mature trees prior to 1998, but cover of juniper has been increasing on the site since 2003 indicating a maturing population (Table - Canopy Cover, Line Intercept).

Herbaceous Understory: Grasses are abundant on the site, but composition is poor. Cheatgrass (*Bromus tectorum*) has been the dominant grass species over the course of the study. A number of perennial grass species are present on the site, but Sandberg bluegrass (*Poa secunda*) was the only common perennial species. Bottlebrush squirreltail (*Sitanion hystrix*), crested wheatgrass (*Agropyron cristatum*), purple three-awn (*Aristida purpurea*), and bluebunch wheatgrass (*Agropyron spicatum*) have also been sampled, but contributed little cover. Perennial forb species are rare, and annual forb species typically dominate the forb component (Table - Herbaceous Trends).

Soil: The soil is classified as either a Donnardo very stony loam or Collord gravelly loam. Both soils are formed from alluvium, and are characterized as deep and well drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover was low. There was a high amount of vegetation, litter, and rock providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - stable (0):** Sagebrush density decreased slightly from 1,864 plants/acre to 1,731 plants/acre. Decadence of sagebrush decreased from 32% to 27%, and young recruitment remained stable at 15% of the population. Plants displaying poor vigor increased from 4% of the population to 12%. Cliffrose density remained stable at 465 plants/acre, but decadence increased from 0% of the population to 14%. Young recruitment decreased from 29% to 14% of the population.

- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence decreased slightly to 22%, but young recruitment also decreased to 2% of the population. Plants exhibiting poor vigor decreased to 7% of the population. Cliffrose decadence increased to 3%, and young to 7% of the population.
- **1998 to 2003 - slightly down (-1):** Sagebrush density decreased 20% from 2,560 plants/acre to 2,060 plants/acre, but cover increased from 16% to 19%. Decadence of sagebrush increased to 32%, and poor vigor increased to 11% of the population. Cliffrose density decreased 10% from 580 plants/acre to 520 plants/acre, and cover decreased from 7% to 3%. Decadence of cliffrose increased to 46% of the population.
- **2003 to 2008 - stable (0):** Sagebrush density remained at 2,060 plants/acre, but cover decreased to 12%. Decadence of sagebrush increased to 49%, and poor vigor increased to 13% of the population. Cliffrose density increased slightly to 540 plants/acre, and cover remained similar at 13%. Decadence of cliffrose decreased to 22%, and plants displaying poor vigor slightly increased from 4% to 7% of the population.
- **2008 to 2012 - stable (0):** Sagebrush density decreased 12% to 1,820 plants/acre, and cover decreased to 10%. However, recruitment of young sagebrush plants increased from 2% to 11% of the population. Decadence of sagebrush decreased to 18%, though poor vigor increased to 18% of the population. Cliffrose density increased 11% to 600 plants/acre, and cover increased to 8%. Recruitment of young cliffrose plants increased from 4% to 10% of the population. Decadence of cliffrose decreased to 17%, but poor vigor increased to 20% of the population.

Grass:
- **1985 to 1991 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 35%, but perennial grasses remain fairly rare on the site.
- **1991 to 1998 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 55%, but remain relatively rare on the site.
- **1998 to 2003 - up (+2):** The sum of nested frequency of perennial grasses increased 70%, and cover increased from 4% to 10%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 32% to 10%.
- **2003 to 2008 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased 19%, and cover decreased to 7%. Cheatgrass increased significantly in nested frequency, and cover increased to 14%.
- **2008 to 2012 - slightly up (+1):** The perennial grass sum of nested frequency increased 13%, and cover increased to 16%. Cheatgrass nested frequency remained similar, but cover increased to 20%.

Forb:
- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 12B, 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
98	30.0	10.2	1.8	7.4	-20.0	0.3	0.0	**29.7**	Fair
03	28.8	4.8	0.6	20.9	-7.5	0.0	0.0	**47.5**	Good
08	20.4	2.1	1.2	12.9	-10.1	0.6	0.0	**27.2**	Fair
12	24.8	9.8	5.2	30.0	-15.5	0.1	0.0	**54.5**	Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 13

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	a1	ab2	b17	ab10	ab11	ab11	.80	.22	.45	.51
G	Agropyron spicatum	-	-	1	4	4	6	.00	.15	.06	.53
G	Aristida purpurea	4	1	1	10	5	13	.15	.83	.60	1.08
G	Bromus tectorum (a)	-	-	c374	a287	b358	b329	32.18	10.02	13.51	19.85
G	Festuca myuros (a)	-	-	a-	a-	a-	b17	-	-	-	.75
G	Poa bulbosa	-	-	-	-	-	4	-	-	-	.06
G	Poa secunda	a74	a101	a111	c229	b189	bc223	2.03	8.33	4.65	13.83
G	Sitanion hystrix	a3	ab7	c42	c40	bc29	ab13	.72	.89	.68	.15
G	Vulpia octoflora (a)	-	-	b29	a1	a-	a-	.46	.00	-	-
Total for Annual Grasses		0	0	403	288	358	346	32.64	10.03	13.51	20.60
Total for Perennial Grasses		82	111	172	293	238	270	3.71	10.43	6.45	16.18
Total for Grasses		82	111	575	581	596	616	36.36	20.47	19.96	36.79
F	Alyssum alyssoides (a)	-	-	a2	a2	b26	c122	.00	.00	.10	1.31
F	Asclepias asperula	2	-	-	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	ab24	bc44	a5	c65	.08	1.52	.01	.19
F	Draba sp. (a)	-	-	b14	a-	a-	ab3	.03	-	-	.01
F	Eriogonum cernuum (a)	-	-	-	3	-	-	-	.15	-	-
F	Eriogonum racemosum	2	-	-	-	-	-	-	-	-	-
F	Erodium cicutarium (a)	-	-	a1	b34	b50	a-	.03	.94	.29	-
F	Helianthus annuus (a)	2	-	-	-	-	-	-	-	-	-
F	Holosteum umbellatum (a)	-	-	b19	b30	a-	c138	.06	.07	-	1.45
F	Lactuca serriola (a)	-	-	2	-	-	-	.00	-	-	-
F	Microsteris gracilis (a)	-	-	b38	a5	a-	a13	.14	.01	-	.03
F	Phlox longifolia	-	-	8	-	-	1	.07	-	-	.00
F	Ranunculus testiculatus (a)	-	-	b18	ab10	a-	a-	.08	.02	-	-
F	Tragopogon dubius (a)	-	-	-	-	-	5	-	-	-	.03
F	Zigadenus paniculatus	6	1	7	5	5	8	.07	.02	.31	.07
Total for Annual Forbs		2	0	118	128	81	346	0.44	2.74	0.41	3.03
Total for Perennial Forbs		10	1	15	5	5	9	0.14	0.01	0.31	0.07

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
Total for Forbs		12	1	133	133	86	355	0.58	2.75	0.72	3.11

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

BROWSE TRENDS--
Management unit 21B, Study no: 13

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata tridentata	78	63	61	59	15.96	18.90	12.10	9.84
B	Cowania mexicana stansburiana	27	24	25	26	7.35	3.42	3.54	7.99
B	Ephedra nevadensis	0	0	0	0	-	-	-	.38
B	Gutierrezia sarothrae	35	7	11	4	1.35	.30	.33	.38
B	Juniperus osteosperma	4	5	5	4	4.09	6.76	2.59	6.38
B	Opuntia sp.	2	0	1	0	.30	-	-	-
B	Purshia tridentata	0	1	0	0				
Total for Browse		146	100	103	93	29.06	29.39	18.58	24.98

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 13

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata tridentata	19.63	20.10	19.83
Cowania mexicana stansburiana	5.98	6.40	12.55
Gutierrezia sarothrae	.65	.81	.38
Juniperus osteosperma	8.46	7.01	7.59
Purshia tridentata	.08	-	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 13

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata tridentata	1.3	1.0	1.9
Cowania mexicana stansburiana	3.4	5.1	2.6

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 13

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	145	95	81	138

Average diameter (in)			
'98	'03	'08	'12
2.9	4.2	7.7	4.4

BASIC COVER--
Management unit 21B, Study no: 13

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	1.75	1.00	58.23	54.36	43.36	64.82
Rock	7.50	12.25	13.37	15.63	11.08	13.31
Pavement	3.75	4.25	3.85	2.12	.58	.43
Litter	65.50	64.50	70.77	46.40	65.00	62.70
Cryptogams	0	0	.69	.00	.14	.14
Bare Ground	21.50	18.00	3.53	5.86	.50	1.64

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 13, Walker Canyon

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.5	6.4	60.0	17.4	22.6	2.5	9.0	108.8	0.9

PELLET GROUP DATA--
Management unit 21B, Study no: 13

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	20	7	21	12
Elk	-	-	-	4
Deer	44	39	43	21

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
-	-	-	13 (31)
94 (232)	124 (306)	114 (281)	37 (91)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 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)
Artemisia tridentata tridentata									
85	**1864**	14	54	32	133	39	14	4	23/29
91	**1731**	15	58	27	-	12	4	12	25/32
98	**2560**	2	77	22	-	2	0	7	29/38
03	**2060**	0	68	32	-	36	5	11	30/40
08	**2060**	2	50	49	20	17	24	13	30/44
12	**1820**	11	71	18	20	21	22	18	33/48
Cowania mexicana stansburiana									
85	**466**	29	71	0	-	57	0	0	43/42
91	**465**	14	72	14	-	57	29	0	49/45
98	**580**	7	90	3	40	69	0	0	62/66
03	**520**	8	46	46	20	19	50	4	61/72
08	**540**	4	74	22	-	52	26	7	63/62
12	**600**	10	73	17	-	50	17	20	70/66

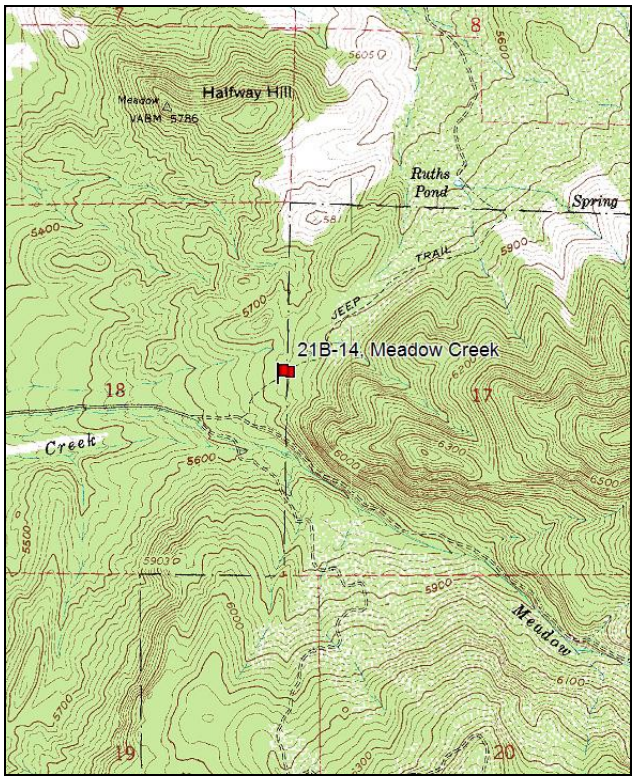
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae									
85	**1999**	13	87	0	599	0	0	0	9/10
91	**2864**	14	79	7	266	0	0	19	11/12
98	**2080**	16	82	2	80	0	0	2	8/11
03	**260**	0	100	0	-	0	0	0	8/10
08	**500**	0	92	8	-	0	0	4	10/14
12	**240**	33	67	0	80	0	0	92	9/13
Juniperus osteosperma									
85	**798**	50	50	-	133	0	0	8	69/56
91	**999**	67	33	-	-	33	0	0	75/49
98	**80**	50	50	-	-	0	0	0	-/-
03	**100**	40	60	-	-	0	0	0	-/-
08	**100**	20	80	-	-	0	0	20	-/-
12	**80**	50	50	-	20	0	0	0	-/-
Opuntia sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	0	100	-	-	0	0	0	7/17
03	**0**	0	0	-	-	0	0	0	6/18
08	**20**	0	100	-	-	0	0	0	6/21
12	**0**	0	0	-	-	0	0	0	2/4
Purshia tridentata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	100	0	8/12
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Quercus gambelii									
85	**0**	0	0	-	66	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Rhus trilobata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	55/98
08	**0**	0	0	-	-	0	0	0	58/61
12	**0**	0	0	-	-	0	0	0	49/110

MEADOW CREEK - TREND STUDY NO. 21B-14-12

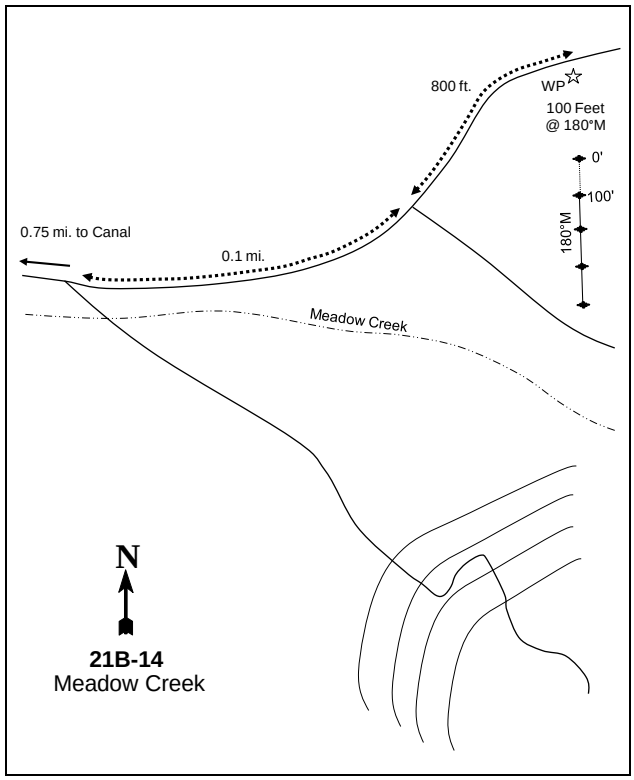
Vegetation Type: Juniper
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Loam (Mountain Big Sagebrush), R028AY310UT
Land Ownership: BLM
Elevation: 5,710 ft (1,740 m)
Aspect: West
Slope: 4-8%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
From the corner of 100 North and 200 East in Meadow, travel 0.5 miles north to the Meadow Creek Road. Turn right and go 2.75 miles east. Drive across the canal and continue 0.75 miles to a fork in the road. Turn left and go 0.1 miles to another fork. Turn left and drive up about 0.15 miles (800 feet) to a rebar witness post on the right side of the road. The baseline starts 100 feet south of the witness post. The 0-foot baseline stake is a rebar with browse tag #7110 attached.

Map Name: Fillmore



Diagrammatic Sketch:



Township: 22S Range: 4W Section: 17

GPS: NAD 83, UTM 12S 383982 E 4306364 N

MEADOW CREEK - TREND STUDY NO. 21B-14

Site Information

Site Description: The study samples crucial deer winter range on land administered by the Bureau of Land Management (BLM) as part of the Meadow Spring allotment located on the foothills at the mouth of Meadow Canyon. The area was two-way chained and seeded in 1966, but Utah juniper (*Juniperus osteosperma*) has reestablished since the study began, and now dominates the overstory. The Division of Wildlife Resources (DWR) Meadow Creek pellet group transect showed moderate to heavy deer pellet abundance from 1980 to 1990 (Jense et al. 1985 and Jense et al. 1990). Two deer carcasses were found on the study during the 1985 sampling. Deer pellet groups have been sampled on the study in moderate to high abundance since 1998. Cattle sign has been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Preferred browse is provided by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), antelope bitterbrush (*Purshia tridentata*), and Gambel oak (*Quercus gambelii*). Scattered Utah serviceberry (*Amelanchier utahensis*), true mountain mahogany (*Cercocarpus montanus*), and green ephedra (*Ephedra viridis*) are also present. Cover of preferred browse species has been decreasing as Utah juniper cover has been increasing since 1998 (Table - Browse Trends). Sagebrush occurs in a moderately dense population of mature and decadent plants. Recruitment of young sagebrush plants was high at the outset of the study, but has been poor since 1998. Decadence and poor vigor of sagebrush was low at the outset of the study, but has been high since 2003. Utilization of sagebrush has been mostly light to moderate since the outset of the study. Cliffrose occurs as a low density population of mature and decadent plants. Utilization has been mostly light to moderate on cliffrose. Antelope bitterbrush was sampled for the first time in 1998 when the baseline was lengthened and occurs at low density (Table - Browse Characteristics). Utah juniper density has remained similar since 1998 (Table - Point-Quarter Tree Data), but trees have been increasing in size and the canopy has begun to close in. Canopy cover has steadily increased since 2003 (Table - Canopy Cover, Line Intercept).

Herbaceous Understory: Perennial grass species provide the majority of the grass cover on the site. Crested wheatgrass (*Agropyron cristatum*), bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass (*Poa secunda*), and bottlebrush squirreltail (*Sitanion hystrix*) are the most abundant perennial grasses. Bulbous bluegrass (*Poa bulbosa*) has been sampled at low frequency and cover. Cheatgrass (*Bromus tectorum*) is common on the site at moderate frequency and cover. Perennial forb species are rare on the site, and the forb component is dominated by annual forb species (Table - Herbaceous Trends).

Soil: The soil is classified as a Current Spring gravelly loam, which occurs on mountain slopes and hills. These soils are formed from alluvium and colluvium derived from limestone, sandstone, and quartzite, and are characterized as deep and well drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a slightly acidic soil reaction (pH 6.3) (Table - Soil Analysis Data). Bare ground cover is moderate on the site, with a high amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2008, but was moderate in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - stable (0):** Sagebrush density decreased from 13,600 plants/acre to 7,399 plants/acre. However, 96% of the population in 1985 was young, and the decrease in density in 1991 was attributed to self-thinning as plants grew to maturity. Young recruitment remained high in 1991 at 22% of the population. Decadence increased slightly from 0% of the population to 6%, and plants exhibiting poor vigor also increased slightly from 0% of the population to 4%.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence increased to

18%, and poor vigor increased to 11% of the population. Recruitment of young sagebrush plants decreased to 5% of the population.

- **1998 to 2003 - down (-2):** Sagebrush density decreased 21% from 1,640 plants/acre to 1,300 plants/acre, and cover decreased from 9% to 7%. Decadence of sagebrush increased to 57%, and poor vigor increased to 28% of the population.
- **2003 to 2008 - down (-2):** Sagebrush density decreased 25% to 980 plants/acre, and cover decreased to 3%. Decadence remained high at 47% of the population, and poor vigor increased to 35%.
- **2008 to 2012 - stable (0):** The density of sagebrush increased to 37% to 1,340 plants/acre, but cover remained similar at 3%. Decadence of sagebrush increased to 52%, and poor vigor increased to 42% of the population.

Grass:

- **1985 to 1991 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1991 to 1998 - stable (0):** The sum of nested frequency of perennial grasses remained similar.
- **1998 to 2003 - stable (0):** The sum of nested frequency of perennial grasses remained similar, but cover decreased from 11% to 6%. Bulbous bluegrass was sampled for the first time.
- **2003 to 2008 - stable (0):** The sum of nested frequency of perennial grasses remained similar, and cover remained similar at 6%.
- **2008 to 2012 - up (+2):** The perennial grass sum of nested frequency increased 32%, and cover increased to 12%.

Forb:

- **1985 to 1991 - stable (0):** Perennial forb species are very rare on the site.
- **1991 to 1998 - stable (0):** Perennial forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Perennial forb species are very rare on the site.
- **2003 to 2008 - stable (0):** Perennial forb species are very rare on the site.
- **2008 to 2012 - stable (0):** Perennial forb species are very rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 21B, 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
98	16.1	11.3	9.0	21.9	-2.0	0.4	0.0	**56.6**	Fair
03	12.0	0.4	1.4	11.3	-1.0	0.1	0.0	**24.2**	Very Poor
08	6.3	4.5	7.7	12.0	-1.4	0.2	0.0	**29.4**	Very Poor
12	5.8	0.0	0.0	23.6	-2.3	0.2	0.0	**27.2**	Very Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 14

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	$_{a}$101	$_{ab}$111	$_{b}$147	$_{a}$92	$_{a}$110	$_{a}$103	7.93	2.69	3.97	5.84
G	Agropyron smithii	-	2	-	3	-	-	-	.15	.03	-
G	Agropyron spicatum	$_{b}$102	$_{ab}$89	$_{ab}$66	$_{a}$58	$_{a}$54	$_{ab}$72	2.36	1.71	1.60	2.09
G	Bouteloua gracilis	3	-	-	-	-	-	-	-	-	-
G	Bromus japonicus (a)	-	-	6	5	16	12	.03	.03	.45	.05

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Bromus tectorum (a)	-	-	$_{b}$191	$_{a}$142	$_{b}$190	$_{ab}$185	2.62	1.34	1.39	3.01
G	Festuca myuros (a)	-	-	$_{a}$-	$_{a}$3	$_{a}$-	$_{b}$13	-	.00	-	.05
G	Poa bulbosa	-	-	-	4	-	8	-	.06	-	.21
G	Poa fendleriana	-	3	1	2	-	-	.03	.00	-	-
G	Poa secunda	$_{a}$15	$_{ab}$31	$_{ab}$31	$_{cd}$85	$_{bc}$62	$_{d}$116	.39	1.08	.36	3.69
G	Sitanion hystrix	13	3	5	6	1	-	.21	.01	.03	-
G	Vulpia octoflora (a)	-	-	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$-	.05	-	-	-
Total for Annual Grasses		0	0	209	150	206	210	2.70	1.38	1.85	3.12
Total for Perennial Grasses		234	239	250	250	227	299	10.93	5.73	6.00	11.84
Total for Grasses		234	239	459	400	433	509	13.64	7.11	7.85	14.97
F	Allium sp.	-	-	-	10	-	-	-	.01	-	-
F	Alyssum alyssoides (a)	-	-	$_{b}$222	$_{a}$158	$_{b}$241	$_{b}$252	2.38	.77	1.02	3.75
F	Arabis sp.	$_{a}$-	$_{a}$2	$_{a}$2	$_{a}$1	$_{b}$14	$_{ab}$5	.03	.00	.05	.05
F	Astragalus sp.	-	-	-	-	-	2	.00	-	-	.00
F	Calochortus nuttallii	-	5	-	2	-	3	-	.00	-	.00
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{b}$20	$_{a}$3	$_{ab}$7	-	.04	.00	.02
F	Cryptantha sp.	-	-	3	-	-	3	.15	-	-	.01
F	Descurainia pinnata (a)	-	-	5	3	-	-	.04	.00	-	-
F	Draba sp. (a)	-	-	$_{ab}$13	$_{b}$14	$_{a}$-	$_{a}$-	.04	.03	-	-
F	Galium sp.	-	-	-	6	-	-	-	.02	-	-
F	Holosteum umbellatum (a)	-	-	$_{b}$11	$_{bc}$29	$_{a}$-	$_{c}$61	.02	.14	-	.25
F	Microsteris gracilis (a)	-	-	21	5	14	13	.04	.01	.04	.02
F	Phlox longifolia	-	3	-	3	8	3	-	.01	.07	.03
F	Plantago patagonica (a)	-	-	3	-	1	-	.00	-	.00	-
F	Polygonum douglasii (a)	-	-	-	-	3	-	-	-	.00	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$2	$_{b}$32	$_{ab}$23	$_{ab}$15	.01	.11	.04	.03
F	Streptanthus cordatus	-	-	-	-	-	1	-	-	-	.00
F	Tragopogon dubius (a)	6	-	-	-	-	-	-	-	-	-
F	Unknown forb-perennial	2	-	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	-	3	-	-	2	-	-	-	.00	-
Total for Annual Forbs		6	0	277	261	285	348	2.54	1.13	1.11	4.07
Total for Perennial Forbs		2	13	5	22	24	17	0.19	0.05	0.12	0.10
Total for Forbs		8	13	282	283	309	365	2.74	1.19	1.24	4.18

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

BROWSE TRENDS--
Management unit 21B, Study no: 14

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	45	44	40	45	8.82	7.20	3.00	2.49
B	Chrysothamnus nauseosus hololeucus	7	1	0	0	1.67	.03	-	-
B	Chrysothamnus viscidiflorus stenophyllus	0	0	1	1	-	-	.15	.15
B	Cowania mexicana stansburiana	2	3	1	2	1.62	.59	.38	.38
B	Gutierrezia sarothrae	10	1	4	0	.01	-	.15	-
B	Juniperus osteosperma	16	20	20	22	12.07	14.86	17.45	22.13
B	Opuntia sp.	1	1	1	1	-	-	-	-
B	Pinus edulis	0	0	0	0	-	-	.15	-
B	Purshia tridentata	2	2	1	1	.15	.63	.53	.38
B	Quercus gambelii	6	5	5	6	2.38	1.14	1.18	1.53
Total for Browse		89	77	73	78	26.76	24.46	23.00	27.06

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 14

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	5.09	3.54	3.65
Chrysothamnus nauseosus hololeucus	.10	-	-
Chrysothamnus viscidiflorus stenophyllus	.01	.20	-
Cowania mexicana stansburiana	2.70	1.04	1.36
Juniperus osteosperma	24.29	32.25	35.61
Opuntia sp.	.03	.03	-
Purshia tridentata	.21	.90	1.25
Quercus gambelii	2.70	2.43	2.33

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 14

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.0	0.9	0.9
Cowania mexicana stansburiana	3.0	2.0	1.0

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 14

Species	Trees per Acre				Average diameter (in)			
	'98	'03	'08	'12	'98	'03	'08	'12
Juniperus osteosperma	367	354	370	359	3.6	6.4	6.3	5.8

BASIC COVER--
Management unit 21B, Study no: 14

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	11.00	11.75	42.72	35.57	33.05	44.03
Rock	3.75	4.50	5.43	4.32	5.36	3.70
Pavement	4.25	6.50	6.07	2.23	3.74	3.43
Litter	63.50	61.25	55.46	49.52	61.42	60.10
Cryptogams	2.25	1.00	3.31	.81	1.75	3.01
Bare Ground	15.25	15.00	18.19	26.92	16.92	13.70

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 14, Meadow Creek

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.2	6.3	58.0	17.4	24.6	2.4	7.6	118.4	0.8

PELLET GROUP DATA--
Management unit 21B, Study no: 14

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	46	11	31	21
Deer	22	16	34	15
Cattle	1	3	3	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
56 (138)	71 (175)	119 (294)	46 (112)
8 (20)	4 (9)	-	-

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 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)
Amelanchier utahensis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	68/54
12	**0**	0	0	-	-	0	0	0	37/31
Artemisia tridentata vaseyana									
85	**13598**	96	4	0	1666	.98	0	0	15/18
91	**7398**	22	72	6	-	10	7	4	6/6
98	**1640**	5	77	18	20	15	2	11	25/37
03	**1300**	0	43	57	-	14	2	28	22/32
08	**980**	2	51	47	20	27	0	35	22/33
12	**1340**	0	48	52	-	46	7	42	24/36

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Cercocarpus montanus									
85	**66**	0	100	-	-	0	100	0	25/30
91	**66**	100	0	-	-	0	100	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	88/83
08	**0**	0	0	-	-	0	0	0	68/80
12	**0**	0	0	-	-	0	0	0	56/57
Chrysothamnus nauseosus hololeucus									
85	**865**	8	31	62	-	54	0	15	13/16
91	**333**	0	0	100	-	40	0	60	-/-
98	**160**	13	13	75	-	0	0	38	27/35
03	**20**	0	0	100	-	0	0	100	23/10
08	**0**	0	0	0	-	0	0	0	16/24
12	**0**	0	0	0	-	0	0	0	9/7
Chrysothamnus viscidiflorus stenophyllus									
85	**331**	20	60	20	-	0	0	20	8/13
91	**465**	14	72	14	-	0	0	0	14/12
98	**0**	0	0	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	10/12
08	**20**	0	0	100	-	0	0	100	-/-
12	**20**	0	0	100	-	0	0	100	13/21
Cowania mexicana stansburiana									
85	**199**	33	67	0	-	67	33	0	20/28
91	**199**	67	33	0	-	67	0	0	35/39
98	**40**	50	50	0	-	0	0	0	55/63
03	**120**	0	17	83	-	17	0	17	67/64
08	**20**	0	0	100	-	100	0	0	67/63
12	**60**	0	67	33	-	33	0	33	49/60
Ephedra viridis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	26/71
08	**0**	0	0	-	-	0	0	0	42/79
12	**0**	0	0	-	-	0	0	0	37/61
Gutierrezia sarothrae									
85	**6998**	35	59	6	399	0	0	.95	8/9
91	**2131**	9	78	12	-	0	0	3	8/7
98	**260**	8	92	0	20	0	0	0	6/7
03	**20**	0	100	0	-	0	0	0	8/10
08	**80**	0	75	25	-	0	0	25	9/14
12	**0**	0	0	0	-	0	0	0	6/6

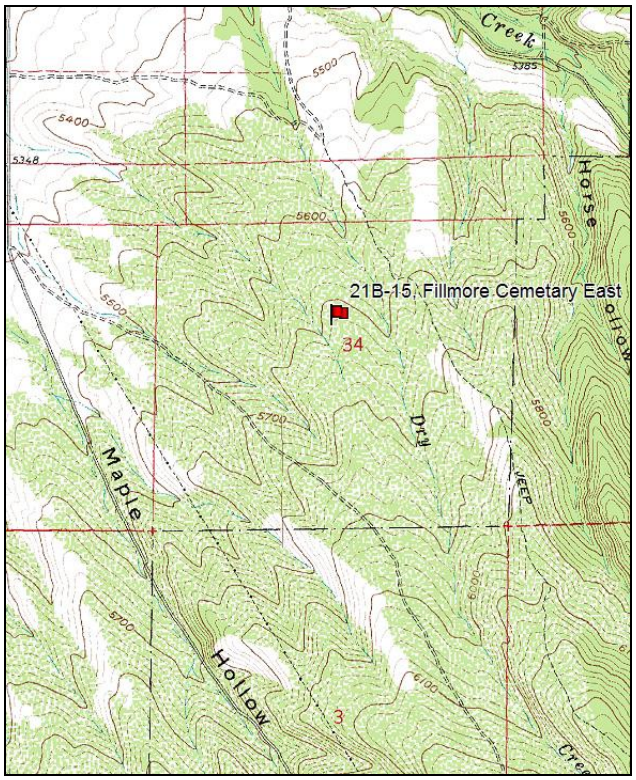
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Juniperus osteosperma									
85	**465**	43	57	0	-	0	0	0	64/69
91	**532**	25	75	0	-	13	0	13	121/91
98	**380**	21	79	0	-	0	0	0	-/-
03	**500**	0	100	0	-	0	0	0	-/-
08	**500**	16	84	0	-	0	0	0	-/-
12	**500**	20	76	4	-	0	0	16	-/-
Opuntia sp.									
85	**531**	37	12	50	-	0	0	38	5/9
91	**465**	43	57	0	66	0	0	0	3/4
98	**20**	0	100	0	-	0	0	0	8/13
03	**20**	0	100	0	-	0	0	0	7/14
08	**20**	0	100	0	-	0	0	0	7/16
12	**20**	0	100	0	-	0	0	100	5/12
Purshia tridentata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**60**	0	100	-	-	100	0	0	35/58
03	**100**	0	100	-	-	0	0	0	28/42
08	**40**	0	100	-	-	0	100	0	33/62
12	**40**	0	100	-	-	100	0	0	31/67
Quercus gambelii									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**780**	46	54	0	-	0	0	0	43/29
03	**800**	23	73	5	-	0	0	0	35/26
08	**1040**	56	29	15	-	13	0	2	41/34
12	**640**	53	47	0	80	0	0	0	27/27

FILLMORE CEMETERY EAST - TREND STUDY NO. 21B-15-12

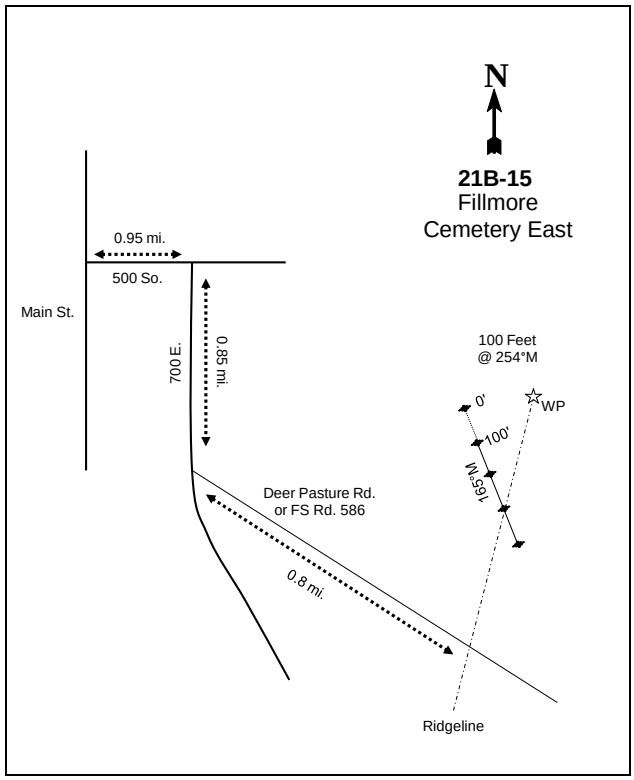
Vegetation Type: Gamble Oak
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R047XA430UT and Mountain Loam (Oak), R047XA432UT
Land Ownership: DWR
Elevation: 5,720 ft (1,743 m)
Aspect: Northwest
Slope: 5-10%
Transect bearing: 165° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
From 500 South and Main in Fillmore (the bend in the road), go east for 0.95 miles past the LDS Church and the cemetery to an intersection. Turn right (south) and go 0.85 miles to F.S. Road #386. Turn left and follow this road 0.8 miles to the ridgeline. From the ridgeline, walk north about 1/3 of a mile to a witness post (full high rebar). The frequency baseline starts 100 feet west (254°M) of the cairn. The 0' foot stake is a rebar tagged #7073.

Map Name: Fillmore



Diagrammatic Sketch:



Township: 21S Range: 4W Section: 34

GPS: NAD 83, UTM 12S 388216 E 4311293 N

Site Information

Site Description: The study is located in the center of a part of the Division of Wildlife Resources (DWR) Millard Wildlife Management Area (WMA) southeast of Fillmore. The area was chained and seeded in 1973 prior to study establishment. The study was treated again as part of the Fillmore WMA Juniper Thinning (WRI Project #408) in November of 2008 using a one-way harrow and seeding (Table - Seed Mix) treatment (WRI 2013). Pellet group data from the DWR South Chalk transect sampled moderate deer pellet abundance from 1981 to 1990 (Jense et al. 1985 and Jense et al. 1991). Deer pellet groups were sampled in high abundance from 1998 to 2003, but more moderate abundance in 2012. Elk pellet groups have been sampled in low abundance since 2003 (Table - Pellet Group Data). Cattle grazed the allotment in the late 1970s, but it has been rested since 1981.

SEED MIX --
Management unit 21B, study no: 15

Project Name: Fillmore WMA Juniper Thinning WRI Database #: 408			
Application: Broadcast		Acres:	315
Seed type		lbs in mix	lbs/acre
G	Crested Wheatgrass 'Douglas'	150	0.48
G	Western Wheatgrass 'Arriba'	150	0.48
G	Siberian Wheatgrass 'Vavilov'	150	0.48
G	Bluebunch WG 'Anatone'	250	0.79
G	Orchardgrass 'Paiute'	32	0.10
G	Snake River Wheatgrass 'Secar'	150	0.48
G	Canby Bluegrass 'Canbar'	32	0.10
F	Western Yarrow	16	0.05
F	Blue Flax 'Maple Grove'	75	0.24
F	Alfalfa 'Ladak'	100	0.32
F	Alfalfa 'Ranger'	100	0.32
F	Alfalfa 'Spredor 4'	100	0.32
F	Sainfoin 'Eski'	600	1.90
F	Small Burnet 'Delar'	600	1.90
B	Sagebrush, Wyoming--Beaver UT	150	0.48
B	Stansbury Cliffrose	30	0.10
Total Pounds:		2685	8.52
PLS Pounds:			7.25

Browse: Preferred browse includes mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*). A portion of the sagebrush population appears to be a hybrid with basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), but all big sagebrush was classified as mountain big sagebrush. The sagebrush occurs in a moderately dense population. Prior to the treatment, the population was mostly mature with limited recruitment of young plants and high decadence. Following the treatment, the population was mostly young with low decadence. Utilization of sagebrush has been mostly light to moderate over the course of the study. Antelope bitterbrush was first sampled in 1998 when the baseline was lengthened. The bitterbrush occurs in a small density population of mostly mature plants. Recruitment of young bitterbrush plants has been poor throughout the sample years. Utilization of bitterbrush has been mostly

moderate, with some years of heavy use. Gambel oak (*Quercus gambelii*) also occurs in scattered clones throughout the study (Table - Browse Characteristics).

Herbaceous Understory: Grasses are fairly abundant on the site, but composition is poor. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) has steadily increased on the site since 1991, and dominated the grass component in 2012. The annual grass species cheatgrass (*Bromus tectorum*) and Japanese chess (*Bromus japonicus*) are common, and provide substantial cover on the site. The other common perennial grass species include crested wheatgrass (*Agropyron cristatum*), bluebunch wheatgrass (*A. spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and Sandberg bluegrass (*Poa secunda*). The forb component is diverse, but composition is poor. Annual forb species and weedy perennial species dominate the forb component. The only common perennial forb species is Cainville thistle (*Cirsium calcareum*) (Table - Herbaceous Trends).

Soil: The soil is classified as a Borvant-Pahvant complex, which occurs on fan remnants. These soils are formed from alluvium derived from limestone and sandstone, and are characterized as shallow and well drained (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a slightly acidic soil reaction (pH 6.5) (Table - Soil Analysis Data). Bare ground cover is fairly low on the site, with high amounts of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Sagebrush density increased from 2,465 plants/acre to 2,532 plants/acre. However, decadence increased from 41% to 68%, and poor vigor increased from 5% to 32% of the population.
- **1991 to 1998 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence decreased to 33%, and poor vigor decreased to 7% of the population. Bitterbrush was sampled with the larger sample area.
- **1998 to 2003 - stable (0):** Sagebrush density decreased 9% from 2,680 plants/acre to 2,440 plants/acre, but cover remained similar at 17%. Decadence of sagebrush increased to 41%, and poor vigor increased to 19% of the population.
- **2003 to 2008 - slightly down (-1):** Sagebrush density remained similar 2,420 plants/acre, but cover decreased to 8%. Decadence of sagebrush increased to 60%, and poor vigor increased to 28% of the population.
- **2008 to 2012 - slightly up (+1):** Density of sagebrush increased 29% to 3,120 plants/acre following the treatment, but cover decreased to 4%. Decadence and poor vigor of sagebrush both decreased to 6% of the population. Recruitment of young sagebrush plants increased from 6% to 64% of the population. Bitterbrush density increased 28% from 360 plants/acre to 460 plants/acre, but cover decreased from 6% to 3%.

Grass:

- **1985 to 1991 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased slightly, but perennial grasses are rare on the site.
- **1991 to 1998 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased slightly.
- **1998 to 2003 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 16%, and cover increased from 3% to 5%. However, cheatgrass and bulbous bluegrass increased significantly in nested frequency. Annual grass cover increased from 7% to 11%, and bulbous bluegrass cover increased from 1% to 2%.
- **2003 to 2008 - stable (0):** The sum of nested frequency and cover of perennial grasses, excluding bulbous bluegrass, remained similar.

- **2008 to 2012 - down (-2):** Perennial grasses' sum of nested frequency, excluding bulbous bluegrass, decreased 27%, though cover remained similar at 5%. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 1% to 15%.

Forb:

- **1985 to 1991 - stable (0):** Desirable perennial forb species are rare on the site.
- **1991 to 1998 - stable (0):** Desirable perennial forb species are rare on the site.
- **1998 to 2003 - stable (0):** Desirable perennial forb species are rare on the site.
- **2003 to 2008 - stable (0):** Desirable perennial forb species are rare on the site.
- **2008 to 2012 - stable (0):** Desirable perennial forb species are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 21B, 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
98	30.0	8.5	6.8	6.6	-5.1	2.3	0.0	**49.1**	Poor-Fair
03	30.0	6.6	2.4	9.6	-8.0	1.6	0.0	**42.2**	Poor
08	23.5	7.0	4.7	9.1	-7.5	1.6	0.0	**38.3**	Poor
12	15.9	13.7	15.0	10.2	-6.0	3.9	0.0	**52.7**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 15

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	22	11	28	23	24	21	1.03	.96	1.74	1.62
G	Agropyron spicatum	$_{a}$-	$_{a}$3	$_{a}$4	$_{a}$10	$_{a}$-	$_{b}$28	.03	.91	.00	1.53
G	Bromus japonicus (a)	-	-	$_{ab}$155	$_{a}$133	$_{a}$157	$_{b}$199	2.98	1.03	2.30	3.37
G	Bromus tectorum (a)	-	-	$_{b}$266	$_{c}$292	$_{c}$295	$_{a}$200	3.80	9.64	7.62	4.59
G	Festuca myuros (a)	-	-	$_{a}$-	$_{a}$8	$_{b}$23	$_{a}$-	-	.02	.10	-
G	Oryzopsis hymenoides	-	-	-	-	-	3	-	-	-	.24
G	Poa bulbosa	$_{a}$-	$_{a}$8	$_{b}$26	$_{c}$66	$_{c}$73	$_{d}$202	1.16	2.07	1.20	15.10
G	Poa fendleriana	-	-	3	-	3	-	.03	-	.01	-
G	Poa pratensis	-	-	-	-	-	1	-	-	-	.00
G	Poa secunda	$_{a}$16	$_{ab}$26	$_{bc}$55	$_{bc}$52	$_{c}$78	$_{ab}$40	.87	.89	1.69	1.03
G	Sitanion hystrix	$_{a}$22	$_{ab}$45	$_{ab}$50	$_{b}$77	$_{b}$75	$_{a}$39	1.35	2.04	1.09	.64
G	Vulpia octoflora (a)	-	-	7	-	-	-	.01	-	-	-
Total for Annual Grasses		0	0	428	433	475	399	6.80	10.70	10.03	7.97
Total for Perennial Grasses		60	93	166	228	253	334	4.48	6.88	5.75	20.19
Total for Grasses		60	93	594	661	728	733	11.29	17.59	15.78	28.16
F	Alyssum alyssoides (a)	-	-	$_{b}$157	$_{a}$86	$_{b}$144	$_{c}$213	1.03	.45	.55	1.50
F	Arabis sp.	-	-	3	-	-	-	.03	-	-	-
F	Asclepias sp.	-	-	7	-	-	-	.18	-	-	-
F	Astragalus argophyllus	2	3	3	-	-	-	.03	-	-	-
F	Astragalus cibarius	1	1	3	-	2	1	.04	-	.03	.03

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
F	Astragalus lentiginosus	-	-	-	-	1	-	-	-	.00	-
F	Calochortus nuttallii	a-	b8	a-	a-	ab3	ab1	-	-	.00	.00
F	Chaenactis douglasii	-	4	-	-	-	-	-	-	-	-
F	Cirsium calcareum	ab17	b34	ab15	a5	a7	c79	.70	.21	.10	1.50
F	Collinsia parviflora (a)	-	-	8	5	3	11	.02	.01	.01	.02
F	Collomia linearis (a)	-	-	-	-	1	-	-	-	.00	-
F	Crepis acuminata	-	-	1	-	-	2	.00	-	-	.00
F	Cryptantha sp.	-	3	-	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	13	1	3	5	.02	.00	.00	.01
F	Draba sp. (a)	-	-	b43	a-	a-	a3	.42	-	-	.00
F	Epilobium brachycarpum (a)	-	-	a3	a-	a-	b18	.00	-	-	.03
F	Eriogonum racemosum	-	5	-	-	4	-	-	-	.01	-
F	Galium boreale	a-	a-	a4	a6	a-	b25	.01	.30	-	.07
F	Holosteum umbellatum (a)	-	-	b27	a3	a-	a9	.06	.00	-	.01
F	Lactuca serriola (a)	a-	b9	a-	a-	ab1	b10	-	-	.03	.02
F	Linum lewisii	14	2	6	6	1	9	.04	.01	.06	.02
F	Lithospermum ruderale	6	7	-	5	4	3	.00	.16	.15	.06
F	Lotus utahensis	-	-	-	-	2	-	-	-	.00	-
F	Machaeranthera canescens	1	3	3	-	-	-	.00	-	-	-
F	Microsteris gracilis (a)	-	-	6	-	-	1	.04	-	-	.00
F	Phlox longifolia	3	5	2	1	-	4	.01	.00	-	.04
F	Polygonum douglasii (a)	-	-	a-	a-	b16	b13	-	-	.04	.05
F	Ranunculus testiculatus (a)	-	-	b49	a9	a3	a-	.13	.01	.00	-
F	Sphaeralcea coccinea	-	-	2	-	3	4	.00	-	.15	.18
F	Streptanthus cordatus	-	-	1	3	-	-	.00	.00	-	-
F	Tragopogon dubius (a)	-	-	-	-	-	3	-	-	-	.03
F	Zigadenus paniculatus	6	17	6	10	12	6	.07	.13	.27	.04
Total for Annual Forbs		0	9	306	104	171	286	1.74	0.49	0.64	1.70
Total for Perennial Forbs		50	92	56	36	39	134	1.14	0.82	0.79	1.95
Total for Forbs		50	101	362	140	210	420	2.89	1.31	1.44	3.66

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

BROWSE TRENDS--
Management unit 21B, Study no: 15

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	80	68	71	57	16.78	17.32	7.88	3.52
B	Gutierrezia sarothrae	41	18	27	30	2.22	.54	.25	.54
B	Juniperus osteosperma	0	0	0	1	-	1.16	1.62	.78
B	Opuntia sp.	2	2	3	4	.15	-	.15	.03
B	Purshia tridentata	12	12	15	13	6.00	5.68	5.85	3.15
B	Quercus gambelii	16	19	22	24	2.68	3.82	4.84	6.74
Total for Browse		151	119	138	129	27.84	28.55	20.62	14.77

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 15

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	13.69	12.93	4.73
Gutierrezia sarothrae	.50	.76	1.56
Juniperus osteosperma	2.68	3.70	3.11
Opuntia sp.	-	-	.03
Purshia tridentata	6.56	8.51	4.23
Quercus gambelii	6.88	10.13	11.93

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 21B, Study no: 15

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.8	1.4	0.4
Purshia tridentata	2.3	0.7	1.9

POINT-QUARTER TREE DATA--
Management unit 21B, Study no: 15

Species	Trees per Acre			
	'98	*'03	'08	'12
Juniperus osteosperma	7	-	20	21

Average diameter (in)			
'98	*'03	'08	'12
8.7	-	6.9	12.9

*Point-Quarter Tree Density Data not sampled

BASIC COVER--
Management unit 21B, Study no: 15

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	1.75	2.75	39.64	44.63	41.96	50.75
Rock	4.75	6.75	6.26	5.70	5.78	5.37
Pavement	17.25	12.50	16.35	9.59	9.30	8.97
Litter	57.25	57.00	54.25	43.54	51.06	55.09
Cryptogams	0	0	1.10	.57	1.25	.01
Bare Ground	19.00	21.00	15.75	16.76	4.27	8.10

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 15, Fillmore Cemetery East

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.7	6.5	46.0	27.4	26.6	2.8	23.4	169.6	0.8

PELLET GROUP DATA--
Management unit 21B, Study no: 15

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	15	6	21	18
Horse	1	-	-	-
Elk	-	-	3	-
Deer	51	35	51	28
Cattle	-	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
-	-	-	-
-	1 (3)	1 (2)	-
80 (198)	62 (152)	111 (274)	44 (109)
1 (2)	-	-	-

BROWSE CHARACTERISTICS--
Management unit 21B, 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)
Artemisia tridentata vaseyana									
85	**2465**	0	59	41	66	38	0	5	26/29
91	**2532**	0	32	68	266	13	0	32	31/35
98	**2680**	7	60	33	80	15	0	7	28/38
03	**2440**	0	59	41	-	16	7	19	26/34
08	**2420**	6	34	60	-	40	5	28	28/37
12	**3120**	64	29	6	400	10	4	6	18/28
Ceanothus fendleri									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	17/56
12	**0**	0	0	-	-	0	0	0	-/-
Cercocarpus ledifolius									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	26/23
Cercocarpus montanus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	26/44
12	**0**	0	0	-	-	0	0	0	-/-

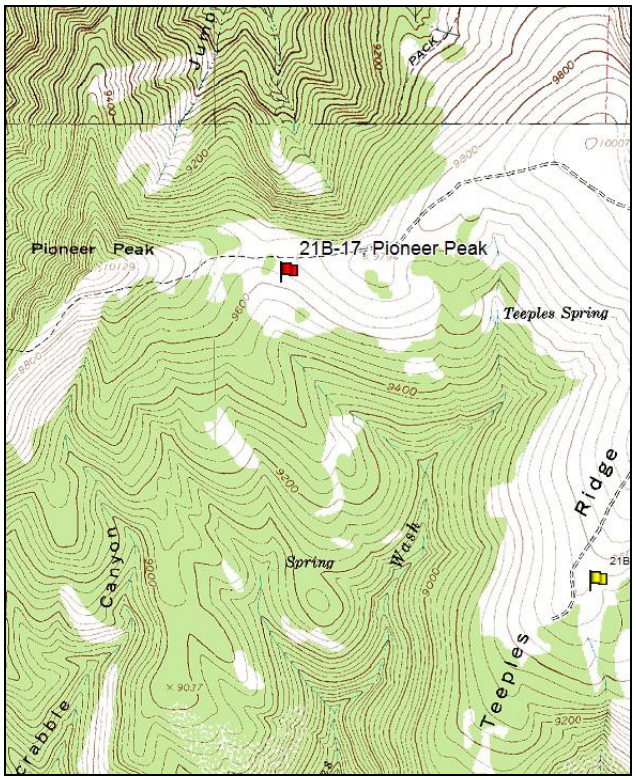
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae									
85	**1399**	67	33	0	266	5	0	14	7/6
91	**2865**	14	81	5	466	0	0	0	9/11
98	**5100**	13	87	0	60	0	0	0	7/9
03	**980**	6	90	4	-	0	0	2	7/9
08	**1000**	12	78	10	80	2	0	8	8/13
12	**1440**	21	74	6	380	0	0	3	8/14
Juniperus osteosperma									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	20	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	-/-
Opuntia sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	0	100	-	-	0	0	0	7/16
03	**40**	0	100	-	-	0	0	0	6/19
08	**60**	0	100	-	-	0	0	33	7/21
12	**80**	25	75	-	-	0	0	0	5/18
Purshia tridentata									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**360**	17	83	0	-	67	17	0	21/46
03	**340**	0	100	0	-	0	100	0	25/87
08	**360**	0	100	0	-	67	6	0	24/62
12	**460**	0	91	9	-	78	0	9	19/56
Quercus gambelii									
85	**9065**	81	18	1	8066	2	0	7	66/45
91	**8931**	63	25	12	2266	7	0	7	72/38
98	**1500**	47	53	0	180	0	0	0	50/35
03	**2280**	34	54	11	60	10	.87	5	34/27
08	**3780**	26	69	5	80	5	0	1	44/46
12	**2500**	36	63	1	20	8	0	.80	29/26

PIONEER PEAK - TREND STUDY NO. 21B-17-12

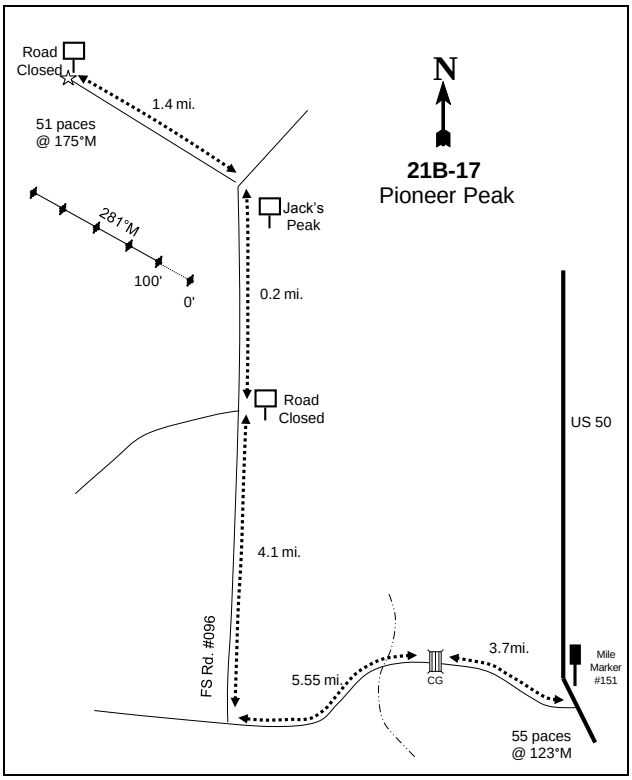
Vegetation Type: Dry Meadow
Range Type: Crucial Deer Summer, Crucial Elk Summer
NRCS Ecological Site Description: High Mountain Loam (Mountain Big Sagebrush), R047XA516UT
Land Ownership: USFS
Elevation: 9,600 ft (2,926 m)
Aspect: South
Slope: 15-20%
Transect bearing: 281° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: none

Directions:
From Highway 50 at mile marker 151, drive west 3.7 miles to a cattlegaurd. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road # 096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Drive 0.2 miles to Jack's Peak. From here, turn left and drive 1.4 miles to the end of the road and a "road closed" sign. From this sign, walk 51 paces at 175° M to the 500-foot stake. The 0-foot stake is 500 feet away at 101° M next to a big fir tree.

Map Name: Mt. Catherine



Diagrammatic Sketch:



Township: 21S Range: 3W Section: 11

GPS: NAD 83, UTM 12S 4316480 E 399264 N

PIONEER PEAK - TREND STUDY NO. 21B-17

Site Information

Site Description: The study is located on the east side of the Pahvant Plateau near Pioneer Peak. The area is administered by the U.S. Forest Service (USFS) as part of the Pioneer allotment. The study samples a dry meadow bordered on two sides by aspen (*Populus tremuloides*), and is located on a saddle that was contour furrowed and seeded in the past. Deer pellet groups have been sampled in minimal abundance on the site since 1997. Elk pellet groups were sampled in moderate abundance in 1997 and 2012, but low abundance in 2003. Cattle sign has been sampled in moderate abundance since 1997 (Table - Pellet Group Data). Cattle have been on the site during each reading since 1997.

Browse: Browse species are very rare on the site. The aspen surrounding the site has the appearance of being high-lined.

Herbaceous Understory: The plant composition is made up almost entirely of grass and forb species. There are a number of seeded perennial grass species on the site including intermediate wheatgrass (*Agropyron intermedium*), smooth brome (*Bromus inermis*), and orchardgrass (*Dactylis glomerata*). Native grass species on the site include slender wheatgrass (*Agropyron trachycaulum*), mountain brome (*Bromus carinatus*), onion grass (*Melica bulbosa*), subalpine needlegrass (*Stipa columbiana*), and Letterman needlegrass (*S. lettermani*). Forb species are also diverse and abundant. Perennial forb species dominate the forb composition (Table - Herbaceous Trends).

Soil: The National Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a clay loam with a moderately acidic soil reaction (pH 6.0) (Table - Soil Analysis Data). Bare ground cover is high, with a moderate amount of vegetation and litter providing protective ground cover (Table - Basic Cover). It was noted that there was a large number of rodent burrows on the site. The soil erosion condition was classified as stable in 2012.

Trend Assessments

Browse:

- **1997 to 2003 - stable (0):** Browse is a minor component on this site.
- **2003 to 2012 - stable (0):** Browse is a minor component on this site.

Grass:

- **1997 to 2003 - slightly down (-1):** The perennial grass sum of nested frequency decreased 13%, and cover decreased from 20% to 17%.
- **2003 to 2012 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover decreased slightly to 16%.

Forb:

- **1997 to 2003 - stable (0):** The perennial forb sum of nested frequency decreased 10%, but cover increased from 13% to 17%.
- **2003 to 2012 - stable (0):** There was little change in the sum of nested frequency of perennial forb species, but cover decreased slightly to 14%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 17

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
G	Agropyron intermedium	$_{b}$201	$_{a}$169	$_{b}$127	8.41	6.84	5.65
G	Agropyron trachycaulum	$_{a}$7	$_{b}$35	$_{b}$42	.04	1.02	.68
G	Bromus carinatus	$_{b}$173	$_{a}$135	$_{b}$178	5.08	2.86	3.74
G	Bromus inermis	63	39	57	2.18	1.75	1.60
G	Dactylis glomerata	$_{b}$72	$_{a}$5	$_{a}$-	.87	.01	-
G	Melica bulbosa	2	3	-	.01	.03	-
G	Poa pratensis	-	6	4	-	.03	.38
G	Stipa columbiana	$_{a}$1	$_{b}$104	$_{a}$3	.00	4.00	.03
G	Stipa lettermani	$_{b}$125	$_{a}$66	$_{b}$131	3.05	.78	3.76
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		644	562	542	19.66	17.34	15.86
Total for Grasses		644	562	542	19.66	17.34	15.86
F	Achillea millefolium	$_{a}$1	$_{b}$13	$_{ab}$11	.03	.10	.10
F	Agoseris glauca	$_{b}$23	$_{a}$3	$_{ab}$12	.18	.04	.33
F	Arabis sp.	16	24	15	.08	.12	.08
F	Artemisia dracunculus	2	2	12	.03	.68	.57
F	Aster chilensis	$_{a}$6	$_{b}$102	$_{c}$129	.01	1.54	1.73
F	Collomia linearis (a)	$_{c}$225	$_{a}$84	$_{a}$81	2.25	.26	.27
F	Delphinium occidentale	30	20	35	3.72	3.48	4.02
F	Epilobium paniculatum (a)	$_{b}$25	$_{a}$-	$_{a}$-	.16	-	-
F	Erigeron eatonii	4	1	16	.00	.03	.02
F	Geranium sp.	5	5	8	.39	.47	.39
F	Helianthella uniflora	-	-	2	-	-	.06
F	Lupinus argenteus	$_{a}$47	$_{ab}$49	$_{b}$63	1.99	3.11	3.07
F	Machaeranthera canescens	$_{c}$150	$_{b}$107	$_{a}$70	2.51	2.13	.58
F	Machaeranthera grindelioides	-	-	4	-	-	.03
F	Madia glomerata (a)	$_{a}$79	$_{a}$72	$_{b}$134	2.21	1.25	1.96
F	Mertensia sp.	18	10	16	.38	.27	.55
F	Orthocarpus tolmiei (a)	5	3	14	.18	.03	.10
F	Penstemon sp.	-	4	1	-	.01	.00
F	Polygonum douglasii (a)	$_{b}$184	$_{a}$108	$_{a}$118	1.00	1.25	.52
F	Ranunculus sp.	13	-	-	.19	-	-
F	Senecio sp.	-	4	-	-	.06	-
F	Stellaria jamesiana	$_{b}$121	$_{a}$38	$_{a}$58	1.03	.15	.48
F	Taraxacum officinale	12	19	8	.08	.26	.04
F	Tragopogon dubius (a)	2	6	2	.03	.09	.00
F	Vicia americana	50	46	60	.61	.74	.70
F	Viguiera multiflora	$_{b}$121	$_{b}$117	$_{a}$74	1.40	3.44	.78
F	Viola sp.	8	-	-	.09	-	-
Total for Annual Forbs		520	273	349	5.86	2.89	2.87

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
Total for Perennial Forbs		627	564	594	12.75	16.69	13.59
Total for Forbs		1147	837	943	18.61	19.58	16.46

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

BROWSE TRENDS--
Management unit 21B, Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
B	Chrysothamnus viscidiflorus lanceolatus	0	0	0	-	-	.03
Total for Browse		0	0	0	0	0	0.03

BASIC COVER--
Management unit 21B, Study no: 17

Cover Type	Average Cover %		
	'97	'03	'12
Vegetation	50.48	35.20	35.51
Rock	3.24	3.06	2.24
Pavement	.43	.27	.16
Litter	29.64	23.47	37.52
Cryptogams	1.00	0	.63
Bare Ground	29.97	45.79	42.59

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 17, Pioneer Peak

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
23.9	6.0	42.7	26.7	30.6	3.3	18.4	188.8	0.2

PELLET GROUP DATA--
Management unit 21B, Study no: 17

Type	Quadrat Frequency			Days use per acre (ha)		
	'97	'03	'12	'97	'03	'12
Elk	5	1	3	22 (54)	2 (5)	19 (48)
Deer	-	-	-	1 (2)	-	1 (2)
Cattle	9	6	3	33 (82)	19 (47)	23 (56)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 17

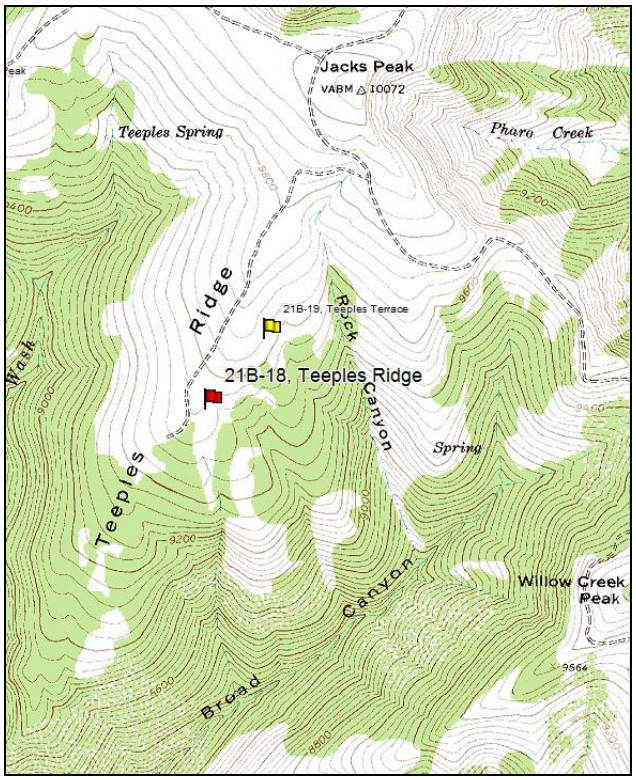
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Rhus trilobata									
97	**0**	0	0	-	-	0	0	0	6/9
03	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Symphoricarpos oreophilus									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	19/49
12	**0**	0	0	-	-	0	0	0	-/-

TEEPLES RIDGE - TREND STUDY NO. 21B-18-12

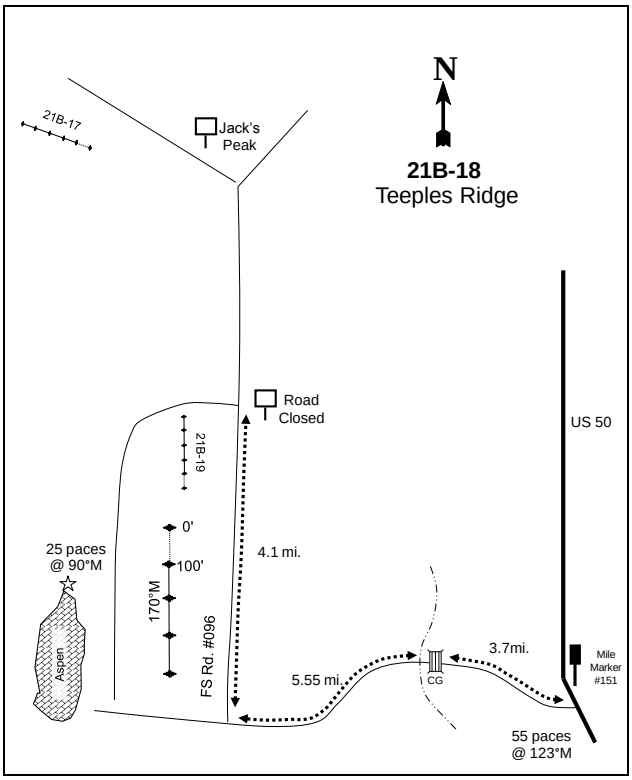
Vegetation Type: Dry Meadow
Range Type: Crucial Deer Summer, Crucial Elk Summer
NRCS Ecological Site Description: High Mountain Loam (Mountain Big Sagebrush), R047XA516UT
Land Ownership: USFS
Elevation: 9,500 ft (2,895 m)
Aspect: Southeast
Slope: 8-15%
Transect bearing: 170° magnetic
Belt placement: line 1 (11 &95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: none

Directions:
From Highway 50 at mile marker 151, drive west 3.7 miles to a cattlegaurd. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road # 096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Walk down the old road on the left (which is basically a trail now) for about 0.75 miles to the edge of an aspen clone and a clearing on the left. The study is in the clearing. From the north end of the aspen clone walk 25 paces at 90° M to the 200-foot stake. The 0-foot stake is 200 feet north.

Map Name: Mt. Catherine



Diagrammatic Sketch:



Township: 21S Range: 3W Section: 13

GPS: NAD 83, UTM 12S 4315093 E 400637 N

TEEPLES RIDGE - TREND STUDY NO. 21B-18

Site Information

Site Description: The study is located on the east side of the Pahvant Plateau just south of Jack's Peak. The area is administered by the U.S. Forest Service (USFS) as part of the Chalk Creek North Fork allotment. The site samples a dry meadow bordered by aspen (*Populus tremuloides*). Aspen stands near the site were mostly mature, high-lined trees with little or no apparent reproduction. Deer pellet groups have been sampled in low abundance since 1997. Elk pellet groups were sampled in high abundance in 1997, low abundance in 2003, and moderate abundance in 2012. Cattle sign has been sampled in moderate to high abundance since 1997 (Table - Pellet Group Data). Cattle were on the site when it was read in 1997.

Browse: Browse species are very rare on the site. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is sampled in low numbers (Table - Browse Characteristics). Larger stands of mountain big sagebrush are present to the north of the site, and aspen clones surround the site to the east and west.

Herbaceous Understory: The grass component is abundant, but composition is relatively poor. Two seeded species, intermediate wheatgrass (*Agropyron intermedium*) and smooth brome (*Bromus inermis*), provide nearly all of the grass cover. Other grass species are relatively rare on the site. The forb component is diverse and abundant, but many of the species are considered to be increaser species under heavy grazing pressure (Table - Herbaceous Trends).

Soil: The National Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a clay loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover is moderately high, but vegetation and litter provide a high amount of protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as slight since 2003.

Trend Assessments

Browse:
- **1997 to 2003 - stable (0):** Browse species are limited on this site.
- **2003 to 2012 - stable (0):** Browse species are limited on this site.

Grass:
- **1997 to 2003 - up (+2):** Perennial grass sum of nested frequency increased 23%, and cover increased from 17% to 21%.
- **2003 to 2012 - stable (0):** The sum of nested frequency of perennial grasses remained similar, though cover increased to 29%.

Forb:
- **1997 to 2003 - down (-2):** The sum of nested frequency of perennial forb species decreased 26%, and cover decreased from 13% to 12%.
- **2003 to 2012 - down (-2):** The sum of nested frequency of perennial forb species decreased 21%, and cover decreased to 8%.

Trend Summary

HERBACEOUS TRENDS--

Management unit 21B, Study no: 18

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
G	Agropyron intermedium	$_{a}$166	$_{b}$199	$_{b}$223	4.40	7.61	12.32
G	Agropyron trachycaulum	2	-	3	.00	-	.03
G	Bromus carinatus	$_{a}$1	$_{b}$16	$_{a}$1	.01	.07	.00
G	Bromus inermis	$_{a}$235	$_{b}$277	$_{b}$254	11.68	12.75	14.56
G	Dactylis glomerata	20	6	20	.27	.18	.87
G	Melica bulbosa	-	4	-	-	.06	-
G	Poa pratensis	$_{a}$2	$_{ab}$8	$_{b}$14	.00	.03	.58
G	Stipa columbiana	-	8	-	-	.07	-
G	Stipa lettermani	11	18	18	.13	.27	.87
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		437	536	533	16.52	21.06	29.26
Total for Grasses		437	536	533	16.52	21.06	29.26
F	Achillea millefolium	37	29	34	1.10	.50	1.09
F	Agoseris glauca	$_{c}$56	$_{b}$18	$_{a}$-	.49	.13	-
F	Arabis sp.	$_{b}$12	$_{ab}$5	$_{a}$-	.05	.01	-
F	Artemisia dracunculus	4	-	-	.05	-	-
F	Aster chilensis	$_{a}$2	$_{a}$8	$_{b}$116	.00	.07	1.12
F	Astragalus sp.	-	3	-	-	.00	-
F	Astragalus utahensis	-	-	2	-	-	.00
F	Cirsium sp.	1	2	6	.03	.00	.04
F	Collomia linearis (a)	$_{c}$52	$_{a}$-	$_{b}$17	.14	-	.10
F	Cymopterus sp.	4	-	-	.01	-	-
F	Delphinium occidentale	$_{b}$67	$_{a}$42	$_{ab}$48	5.99	4.09	2.54
F	Epilobium paniculatum (a)	8	-	-	.06	-	-
F	Erigeron eatonii	$_{a}$-	$_{ab}$7	$_{b}$15	-	.06	.05
F	Erigeron flagellaris	$_{a}$-	$_{ab}$15	$_{b}$18	-	.33	.13
F	Galium sp.	$_{a}$-	$_{a}$-	$_{b}$21	-	-	.24
F	Lupinus sp.	-	-	3	-	-	.03
F	Machaeranthera canescens	$_{b}$166	$_{c}$245	$_{a}$33	2.81	5.03	.33
F	Mertensia sp.	$_{b}$64	$_{ab}$60	$_{a}$33	.80	1.19	.63
F	Penstemon sp.	-	-	2	-	-	.03
F	Polygonum douglasii (a)	$_{b}$139	$_{a}$80	$_{b}$164	.56	.45	.70
F	Rumex crispus	3	-	-	.18	-	-
F	Stellaria jamesiana	$_{b}$177	$_{a}$17	$_{a}$7	1.00	.06	.02
F	Taraxacum officinale	25	10	10	.17	.39	.10
F	Vicia americana	$_{c}$32	$_{a}$-	$_{b}$9	.15	-	.02
F	Viguiera multiflora	30	40	40	.41	.45	1.06
Total for Annual Forbs		199	80	181	0.76	0.45	0.80
Total for Perennial Forbs		680	501	397	13.27	12.35	7.48
Total for Forbs		879	581	578	14.03	12.81	8.28

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

BROWSE TRENDS--
Management unit 21B, Study no: 18

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
B	Artemisia tridentata vaseyana	5	6	2	.03	.18	.01
Total for Browse		5	6	2	0.03	0.18	0.00

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 18

Species	Percent Cover	
	'03	'12
Artemisia tridentata vaseyana	-	.05

BASIC COVER--
Management unit 21B, Study no: 18

Cover Type	Average Cover %		
	'97	'03	'12
Vegetation	34.34	33.40	41.13
Rock	.08	.55	.17
Pavement	.69	.04	.16
Litter	31.69	34.98	37.62
Bare Ground	38.18	39.83	25.97

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 18, Teeples Ridge

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
16.9	6.4	32.7	28.7	38.6	3.8	18.2	252.8	0.6

PELLET GROUP DATA--
Management unit 21B, Study no: 18

Type	Quadrat Frequency		
	'97	'03	'12
Elk	9	10	13
Deer	2	2	1
Cattle	11	16	5

Days use per acre (ha)		
'97	'03	'12
61 (151)	18 (45)	23 (58)
2 (5)	1 (3)	5 (12)
50 (124)	23 (57)	34 (84)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 18

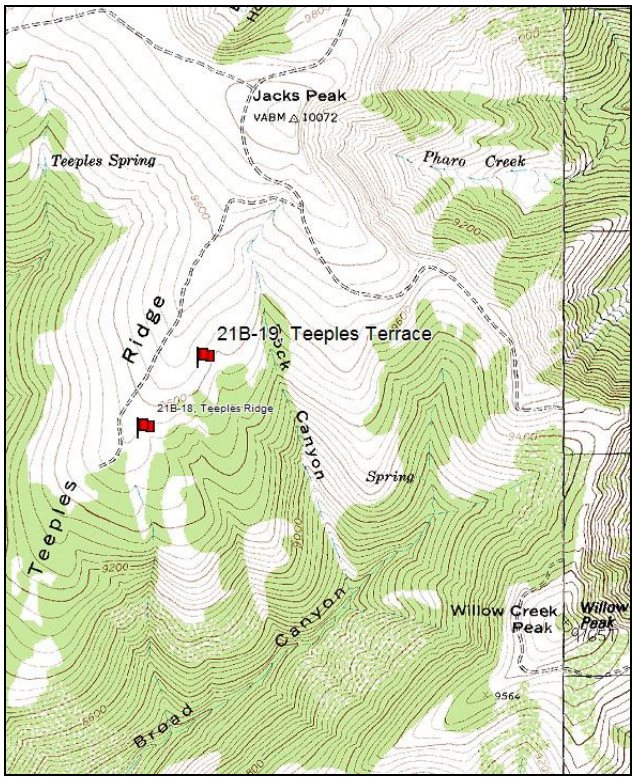
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana									
97	**100**	60	40	0	-	0	0	0	10/9
03	**120**	17	83	0	-	0	0	0	14/13
12	**40**	0	50	50	40	0	0	100	18/23
Chrysothamnus viscidiflorus lanceolatus									
97	**0**	0	0	-	-	0	0	0	9/7
03	**0**	0	0	-	-	0	0	0	8/13
12	**0**	0	0	-	-	0	0	0	9/12

TEEPLES TERRACE - TREND STUDY NO. 21B-19-12

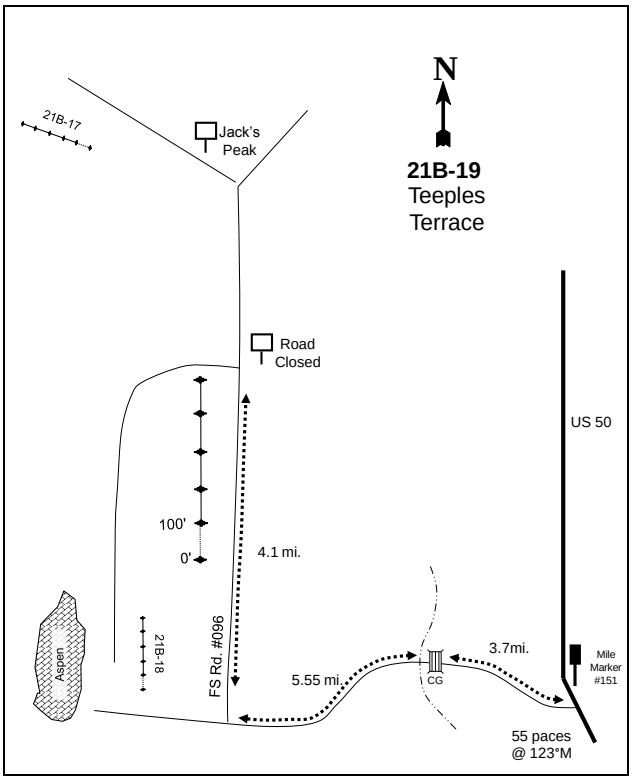
Vegetation Type: Dry Meadow
Range Type: Crucial Deer Summer, Crucial Elk Summer
NRCS Ecological Site Description: High Mountain Loam (Mountain Big Sagebrush), R047XA516UT
Land Ownership: USFS
Elevation: 9,600 ft (2,926 m)
Aspect: Southeast
Slope: 15-30%
Transect bearing: 10° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft)

Directions:
From Highway 50 at mile marker 151, drive west 3.7 miles to a cattlegaurd. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road # 096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Walk down the closed road about 2/3 mile to a cluster of *Ribes*. Walk down eight terraces to a witness post. The 0-foot stake is just north of the witness post. The baseline runs along the terrace.

Map Name: Mt. Catherine



Diagrammatic Sketch:



Township: 21S Range: 3W Section: 13

GPS: NAD 83, UTM 12S 4315407 E 400908 N

TEEPLES TERRACE - TREND STUDY NO. 21B-19

Site Information

Site Description: The study is located on the east side of the Pahvant Plateau just south of Jack's Peak. The area is administered by the U.S. Forest Service (USFS) as part of the Chalk Creek North Fork allotment. The study samples one of the watershed protection terraces on the east side of Teeples Ridge. These terraces are approximately 8 to 10 feet wide, and follow the contour of the slope. Wildlife and cattle often use the terraces as trails to travel through the area. Deer pellet groups have been sampled in minimal abundance since 1997. Elk pellet Groups were sampled in high abundance in 1997, low abundance in 2003, and moderate abundance in 2012. Cattle sign was sampled in moderately high abundance in 1997 and 2003, but low abundance in 2012 (Table - Pellet Group Data). Cattle were in the area of the study site during all of the sample years since 1997.

Browse: Browse species are very limited on the site. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), and mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) occur in very low numbers on the site. There are also some aspen (*Populus tremuloides*) clones in the area (Table - Browse Characteristics). These trees are all mature, with limited recruitment occurring.

Herbaceous Understory: The grass component is abundant, but composition is relatively poor. Two seeded species, smooth brome (*Bromus inermis*) and intermediate wheatgrass (*Agropyron intermedium*), provide nearly all of the grass cover. The native species subalpine needlegrass (*Stipa columbiana*) and Letterman needlegrass (*S. lettermani*) are the most common native species. The forb component is diverse and abundant, but many of the species are considered to be increaser species under heavy grazing pressure (Table - Herbaceous Trends).

Soil: The National Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy clay loam with a strongly acidic soil reaction (pH 5.0) (Table - Soil Analysis Data). Bare ground cover is high, but with a high amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable since 2003.

Trend Assessments

Browse:

- **1997 to 2003 - stable (0):** Browse species are limited on the site.
- **2003 to 2012 - stable (0):** Browse species are limited on the site.

Grass:

- **1997 to 2003 - up (+2):** The sum of nested frequency of perennial grasses increased 24%, and cover increased from 21% to 26%.
- **2003 to 2012 - up (+2):** The sum of nested frequency of perennial grasses increased 39%, and cover increased to 32%.

Forb:

- **1997 to 2003 - slightly up (+1):** The sum of nested frequency of perennial forbs increased 19%, but cover remained similar at 15%.
- **2003 to 2012 - up (+2):** The sum of nested frequency of perennial forbs increased 22%, and cover increased to 16%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 21B, Study no: 19

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
G	Agropyron intermedium	a20	a7	b129	.51	.16	4.87
G	Bromus carinatus	b55	a9	a47	2.73	.10	.65
G	Bromus inermis	a292	b390	a332	15.16	21.76	16.60
G	Carex sp.	3	-	6	.03	-	.06
G	Dactylis glomerata	a9	b28	ab18	.18	.58	.22
G	Poa pratensis	a14	b47	a17	.59	1.35	.43
G	Poa secunda	-	-	2	-	-	.03
G	Stipa columbiana	a-	b83	b97	-	1.79	3.07
G	Stipa lettermani	b87	a32	c178	1.74	.37	6.04
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		480	596	826	20.95	26.13	32.00
Total for Grasses		480	596	826	20.95	26.13	32.00
F	Achillea millefolium	a62	b107	a51	1.27	2.13	.48
F	Agoseris glauca	32	43	17	.26	.29	.25
F	Androsace septentrionalis (a)	-	4	-	-	.00	-
F	Arabis sp.	a7	a17	b37	.02	.05	.29
F	Artemisia dracunculus	1	-	7	.00	-	.30
F	Aster chilensis	a-	a7	b95	-	.03	1.13
F	Cirsium sp.	-	-	-	-	-	.00
F	Collomia linearis (a)	b108	a7	a5	.63	.01	.01
F	Epilobium paniculatum (a)	b17	a-	a1	.13	-	.00
F	Erigeron eatonii	a7	b26	ab20	.02	.28	.17
F	Erigeron flagellaris	a5	a4	b40	.06	.01	.22
F	Galium sp.	a-	a-	b14	-	-	.18
F	Gayophytum ramosissimum(a)	b15	a-	ab4	.08	-	.04
F	Helianthella uniflora	-	5	10	-	.03	.23
F	Lupinus argenteus	a94	a95	b189	5.46	5.55	10.75
F	Machaeranthera canescens	53	72	82	.70	.95	.87
F	Microsteris gracilis (a)	3	-	2	.00	-	.00
F	Orthocarpus tolmiei (a)	a-	ab3	b15	-	.03	.39
F	Penstemon sp.	1	-	2	.00	-	.00
F	Polygonum douglasii (a)	b127	a52	c204	.96	.35	.83
F	Potentilla sp.	-	2	7	-	.03	.07
F	Ranunculus sp.	3	-	-	.15	-	-
F	Rumex crispus	c60	b18	a-	3.60	.91	-
F	Stellaria jamesiana	ab44	a28	b71	.27	.13	.68
F	Taraxacum officinale	b112	c156	a39	2.58	4.53	.25
F	Tragopogon dubius (a)	-	3	-	-	.04	-
F	Vicia americana	a20	a13	b45	.14	.16	.33
F	Viguiera multiflora	3	6	3	.03	.04	.00

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
Total for Annual Forbs		270	69	231	1.81	0.43	1.28
Total for Perennial Forbs		504	599	729	14.60	15.16	16.27
Total for Forbs		774	668	960	16.42	15.60	17.55

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

BROWSE TRENDS--
Management unit 21B, Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
B	Artemisia tridentata vaseyana	2	2	13	.03	.00	1.18
B	Chrysothamnus viscidiflorus lanceolatus	2	0	1	-	-	.03
B	Symphoricarpos oreophilus	0	1	1	-	.03	-
Total for Browse		4	3	15	0.03	0.03	1.21

CANOPY COVER, LINE INTERCEPT--
Management unit 21B, Study no: 19

Species	Percent Cover	
	'03	'12
Artemisia tridentata vaseyana	-	1.68

BASIC COVER--
Management unit 21B, Study no: 19

Cover Type	Average Cover %		
	'97	'03	'12
Vegetation	38.49	39.74	50.38
Rock	2.25	4.46	7.09
Pavement	.47	.48	1.62
Litter	14.26	22.27	35.94
Cryptogams	3.31	0	.03
Bare Ground	45.15	43.47	36.28

SOIL ANALYSIS DATA --

Management unit 21B, Study no: 19, Teeples Terrace

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
20.7	5.0	48.0	26.7	25.3	2.5	52.1	227.2	0.2

PELLET GROUP DATA--
Management unit 21B, Study no: 19

Type	Quadrat Frequency			Days use per acre (ha)		
	'97	'03	'12	'97	'03	'12
Rabbit	-	1	-	-	-	-
Elk	4	6	8	61 (151)	8 (19)	28 (69)
Deer	1	1	3	2 (5)	-	1 (3)
Cattle	7	18	3	32 (79)	23 (56)	7 (18)

BROWSE CHARACTERISTICS--
Management unit 21B, Study no: 19

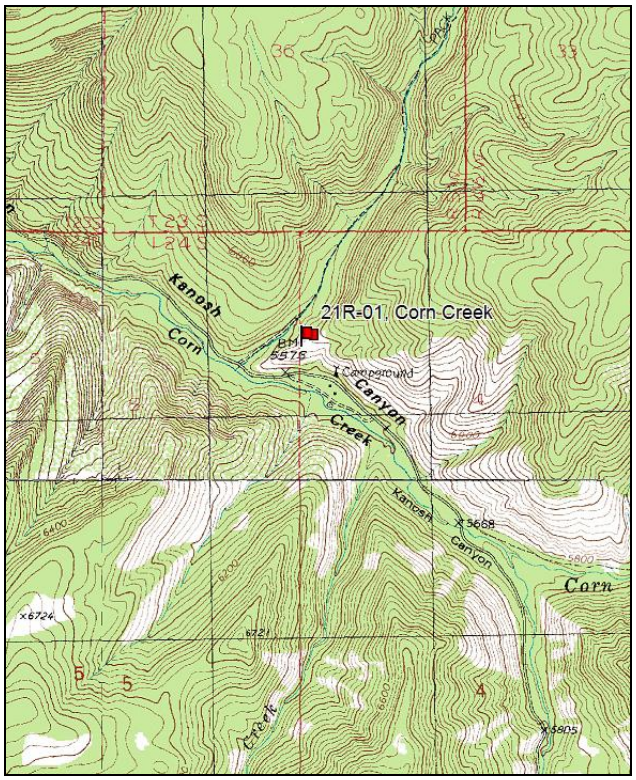
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana									
97	**40**	50	0	50	-	0	0	0	17/38
03	**40**	50	50	0	-	0	0	0	14/13
12	**380**	16	84	0	1640	0	0	0	17/48
Chrysothamnus viscidiflorus lanceolatus									
97	**40**	0	100	-	-	0	0	0	8/15
03	**0**	0	0	-	-	0	0	0	10/17
12	**40**	0	100	-	-	0	0	0	13/18
Symphoricarpos oreophilus									
97	**0**	0	0	-	-	0	0	0	-/-
03	**20**	100	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	100	0	18/44

CORN CREEK - TREND STUDY NO. 21R-1-12

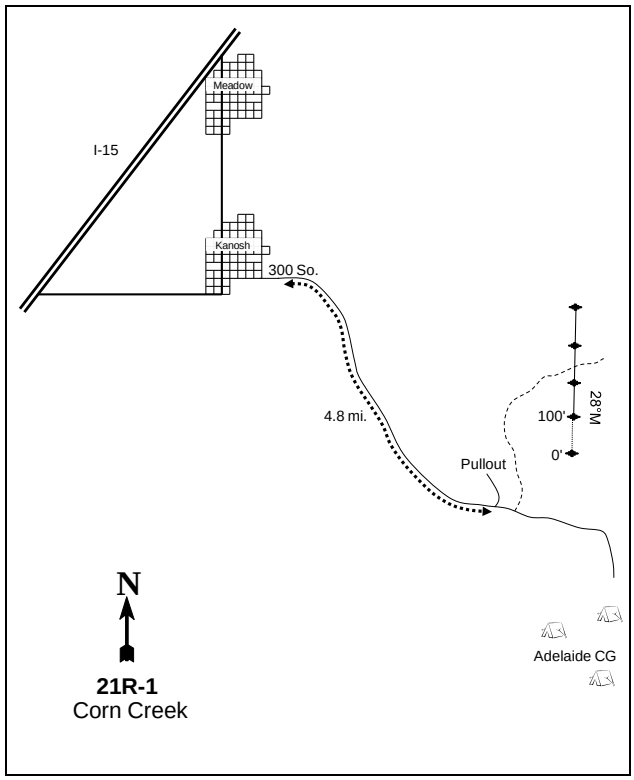
Vegetation Type: Perennial Grass
Range Type: Substantial Deer Summer, Crucial Elk Transitional
NRCS Ecological Site Description: Mountain Shallow Loam (Mountain Big Sagebrush), R047XA446UT
Land Ownership: USFS
Elevation: 5,800 ft (1,767 m)
Aspect: South
Slope: 5-15%
Transect bearing: 28° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 2ft. and belt 5 on 1ft.

Directions:
From Kanosh, go west on 300 South for 4.8 miles to a pullout (trail head) area on the left side of the road. From the pullout, walk up the road 100 ft to Leavitt's trail on the left side of the road (If you reach Adelaide campground you have gone too far). Follow this trail for about a 1/4 mile or until the ridge opens up on top. The 0' stake is 30 ft to the right of the trail once the ridge opens up.

Map Name: Sunset Peak



Diagrammatic Sketch:



Township: 24S Range: 5W Section: 4

GPS: NAD 83, UTM 12S 4290267 E 381422 N

CORN CREEK - TREND STUDY NO. 21R-1

Site Information

Site Description: The study is located on a ridgeline that runs northeast from Kanosh Canyon, approximately a quarter mile from corn creek. The area is administered by the U.S. Forest Service (USFS) as part of the Kanosh allotment. The area was burned in 1996 as part of the Adelaide wildfire, which burned 15,706 acres, and was subsequently reseeded. Deer pellet groups were sampled in low abundance since 1997. Elk pellet groups was sampled in high abundance in 1997, moderate abundance in 2003, and low abundance in 2012. Cattle sign has been sampled in low abundance since 1997 (Table - Pellet Group Data).

Browse: Browse is not particularly abundant on the site. A small patch of chokecherry (*Prunus virginiana*) is the primary browse on the lower end of the transect. Gambel oak (*Quercus gambelii*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) occur in low density on the higher end of the transect. A large number of other browse species are also sampled in very low density throughout the site (Table - Browse Characteristics).

Herbaceous Understory: Grass species are abundant, but composition is poor. The weedy perennial grass species bulbous bluegrass (*Poa bulbosa*) is the dominant grass species, and has increased on the site. Other common perennial grass species include crested wheatgrass (*Agropyron cristatum*), bluebunch wheatgrass (*A. spicatum*), slender wheatgrass (*A. trachycaulum*), and Sandberg bluegrass (*Poa secunda*). Cheatgrass (*Bromus tectorum*) is common, and provides moderate cover on the site. The forb component is diverse and abundant on the site. Hairy goldaster (*Heterotheca villosa*) is the dominant perennial forb species. Annual forb species are prevalent, and have dominated the forb component at times (Table - Herbaceous Trends).

Soil: National Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover was moderate in 1997 and 2003, but was low in 2012. Vegetation and litter provide a high amount of protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003, but was slight in 2012.

Trend Assessments

Browse:

- **1997 to 2003 - slightly up (+1):** Chokecherry density increased from 1,740 plants/acre to 3,300 plants/acre, and cover increased from 1% to 4%. Other browse species remained rare.
- **2003 to 2012 - stable (0):** Chokecherry density decreased to 1,620 plants/acre, but cover remained similar at 4%. Gambel oak density increased to 280 plants/acre, and cover increased to 3%.

Grass:

- **1997 to 2003 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 22%, but cover remained similar at 8%. Cheatgrass decreased significantly in nested frequency, and cover decreased from 4% to 1%. Bulbous bluegrass nested frequency remained similar, but cover increased from 10% to 19%.
- **2003 to 2012 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, deceased 11%, but cover remained similar at 8%. Cheatgrass increased significantly in nested frequency, and cover increased to 3%. Bulbous bluegrass increased significantly in nested frequency, and cover increased to 35%.

Forb:

- **1997 to 2003 - down (-2):** The sum of nested frequency of perennial forbs decreased 37%, and cover decreased from 8% to 7%.

- **2003 to 2012 - up (+2):** The sum of nested frequency of perennial forbs increased 82%, and cover increased to 15%.

Trend Summary

HERBACEOUS TRENDS--
Management unit 21R, Study no: 1

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
G	Agropyron cristatum	b73	a38	ab57	2.95	1.67	2.33
G	Agropyron intermedium	-	2	12	-	.01	.36
G	Agropyron spicatum	a29	a45	b110	.96	1.79	2.17
G	Agropyron trachycaulum	c135	b80	a8	2.18	1.46	.56
G	Bromus japonicus (a)	a-	a1	b16	-	.00	.80
G	Bromus tectorum (a)	b206	a94	b229	3.67	1.06	2.82
G	Festuca myuros (a)	-	-	11	-	-	.04
G	Koeleria cristata	20	8	14	.36	.04	.24
G	Poa bulbosa	a360	a388	b420	10.19	19.23	34.82
G	Poa fendleriana	-	2	5	-	.03	.38
G	Poa secunda	b117	b122	a54	1.84	2.65	1.47
G	Sporobolus cryptandrus	8	-	3	.01	.01	.03
Total for Annual Grasses		206	95	256	3.67	1.06	3.66
Total for Perennial Grasses		742	685	683	18.50	26.91	42.40
Total for Grasses		948	780	939	22.18	27.97	46.07
F	Agoseris glauca	a2	b33	a7	.01	.45	.02
F	Allium sp.	b101	a-	a-	1.33	-	-
F	Alyssum alyssoides (a)	a-	a-	b16	-	-	.09
F	Antennaria rosea	-	2	3	-	.30	.03
F	Artemisia ludoviciana	a13	b30	b31	.18	1.22	1.79
F	Astragalus sp.	-	6	-	-	.01	-
F	Balsamorhiza sagittata	b9	a-	ab9	.69	.15	.79
F	Camelina microcarpa (a)	9	-	-	.39	-	-
F	Carduus nutans (a)	1	-	-	.00	-	-
F	Cirsium sp.	a13	a13	b26	.93	1.52	1.31
F	Collinsia parviflora (a)	b28	a-	a2	.28	-	.00
F	Collomia linearis (a)	1	-	-	.00	-	-
F	Comandra pallida	b31	a9	b28	.29	.09	.76
F	Crepis acuminata	19	20	11	.26	.48	.19
F	Epilobium paniculatum (a)	b19	a-	ab8	.11	-	.07
F	Erigeron sp.	b25	a-	c86	.85	-	2.25
F	Eriogonum cernuum (a)	11	-	-	.07	-	-
F	Eriogonum racemosum	-	4	3	.03	.02	.00
F	Eriogonum umbellatum	8	7	8	.09	.21	.21
F	Erodium cicutarium (a)	a3	c265	b39	.03	12.89	1.02
F	Galium sp.	-	-	3	-	-	.03
F	Heterotheca villosa	a32	a51	b97	1.78	2.36	6.39
F	Holosteum umbellatum (a)	a-	a-	b25	-	-	.08

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
F	Lactuca serriola (a)	$_{a}$5	$_{a}$-	$_{b}$25	.04	-	.19
F	Lathyrus brachycalyx	$_{b}$42	$_{a}$2	$_{b}$37	.48	.03	.82
F	Linum lewisii	$_{a}$3	$_{a}$-	$_{b}$22	.03	-	.31
F	Lygodesmia sp.	-	-	3	-	-	.03
F	Phlox longifolia	$_{b}$39	$_{b}$34	$_{a}$15	1.00	.17	.14
F	Polygonum douglasii (a)	$_{b}$28	$_{a}$-	$_{a}$3	.25	-	.01
F	Sanguisorba minor	-	2	5	-	.03	.03
F	Taraxacum officinale	7	3	-	.16	.00	-
F	Tragopogon dubius (a)	$_{b}$45	$_{a}$4	$_{c}$92	.32	.03	1.12
F	Zigadenus paniculatus	-	-	-	-	-	.00
Total for Annual Forbs		150	269	210	1.50	12.92	2.61
Total for Perennial Forbs		344	216	394	8.18	7.06	15.15
Total for Forbs		494	485	604	9.68	19.99	17.76

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

BROWSE TRENDS--
Management unit 21R, Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'12	'97	'03	'12
B	Artemisia tridentata vaseyana	1	0	1	.38	-	.85
B	Chrysothamnus nauseosus	0	0	0	.01	-	-
B	Eriogonum heracleoides	7	0	18	.50	-	.38
B	Gutierrezia sarothrae	15	10	21	.16	.06	.77
B	Prunus virginiana	13	15	18	1.00	4.43	3.63
B	Quercus gambelii	2	0	3	.76	-	2.54
Total for Browse		38	25	61	2.81	4.49	8.18

CANOPY COVER, LINE INTERCEPT--
Management unit 21R, Study no: 1

Species	Percent Cover	
	'03	'12
Artemisia tridentata vaseyana	-	.61
Eriogonum heracleoides	-	.16
Gutierrezia sarothrae	-	.85
Prunus virginiana	3.96	4.56
Quercus gambelii	-	2.70

BASIC COVER--
Management unit 21R, Study no: 1

Cover Type	Average Cover %		
	'97	'03	'12
Vegetation	32.26	50.62	74.56
Rock	10.16	7.10	9.31
Pavement	1.64	.43	1.01
Litter	35.57	39.31	40.66
Cryptogams	5.63	.14	.15
Bare Ground	14.20	17.35	4.99

SOIL ANALYSIS DATA --

Management unit 21R, Study no: 1, Corn Creek

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.6	6.4	54.0	29.2	16.8	3.1	11.0	185.6	0.7

PELLET GROUP DATA--
Management unit 21R, Study no: 1

Type	Quadrat Frequency		
	'97	'03	'12
Rabbit	-	-	3
Elk	16	24	3
Deer	2	6	5
Cattle	4	2	1
Sheep	-	-	-

Days use per acre (ha)		
'97	'03	'12
-	-	-
54 (134)	33 (83)	11 (28)
3 (7)	1 (2)	1 (3)
15 (38)	-	-
-	-	1 (3)

BROWSE CHARACTERISTICS--
Management unit 21R, 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 utahensis									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	128/112
12	**0**	0	0	-	-	0	0	0	75/85
Artemisia tridentata vaseyana									
97	**20**	0	100	-	-	100	0	0	21/41
03	**0**	0	0	-	-	0	0	0	30/57
12	**20**	0	100	-	20	0	100	0	24/38
Cercocarpus montanus									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	87/72
12	**0**	0	0	-	-	0	0	0	38/49

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Cowania mexicana stansburiana									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	138/128
12	**0**	0	0	-	-	0	0	0	169/156
Eriogonum heracleoides									
97	**220**	0	100	-	-	0	0	0	9/11
03	**0**	0	0	-	-	0	0	0	-/-
12	**760**	11	89	-	-	0	0	0	5/7
Gutierrezia sarothrae									
97	**720**	25	75	-	-	0	0	0	8/10
03	**200**	0	100	-	-	0	0	0	10/13
12	**1280**	53	47	-	1680	0	0	9	9/13
Kochia prostrata									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	10/14
Mahonia repens									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	4/6
12	**0**	0	0	-	-	0	0	0	5/5
Opuntia sp.									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/13
Prunus virginiana									
97	**1740**	92	8	0	-	7	8	0	-/-
03	**3300**	19	78	3	-	0	0	2	18/16
12	**1620**	42	57	1	-	15	0	20	33/24
Quercus gambelii									
97	**180**	67	33	-	80	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	104/100
12	**280**	21	79	-	-	0	0	0	69/74
Rhus trilobata									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	52/89
12	**0**	0	0	-	-	0	0	0	44/142
Rosa woodsii									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	10/13
12	**0**	0	0	-	-	0	0	0	12/9

SUMMARY
WILDLIFE MANAGEMENT UNIT 21 - FILLMORE

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which inlude **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. Fifteen interagency range trend studies were sampled in Unit 21 during the summer of 2012.

Four studies [Pioneer Peak (21B-17), Teeples Ridge (21B-18), Teeples Terrace (21B-19), and Corn Creek (21R-1)] are categorized as deer summer range sites. These studies are more important elk range. All of the studies are considered to be elk summer range except the Corn Creek study, which is considered to be elk transitional range. Six studies ['M' Hill (21B-6), Smith's Ridge (21B-8), Dog Valley (21B-11), Dameron Canyon (21B-12), Meadow Creek (21B-14), and Fillmore Cemetery East (21B-15)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush communities that support other important browse species. All of these studies are also considered to be elk winter range. Five studies [Baker Canyon (21A-23), Bennett Field (21B-7), Wide Canyon BLM (21B-9), Wide Canyon DWR (21B-10), and Walker Creek (21B-13)] are categorized as low potential sites for deer winter range, and sample big sagebrush and cliffrose communities. 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 South Central division (Division 4).

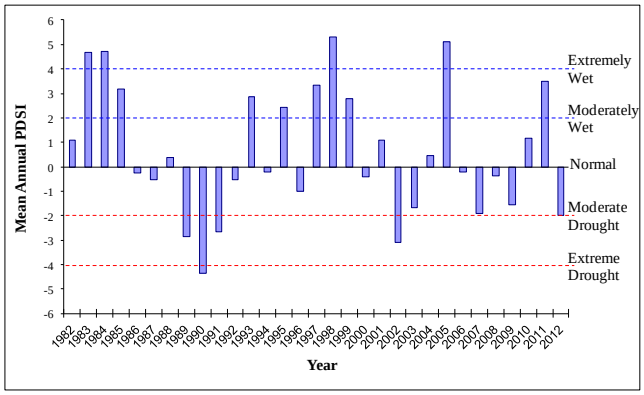


Figure 1. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the South Central division (Division 4). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

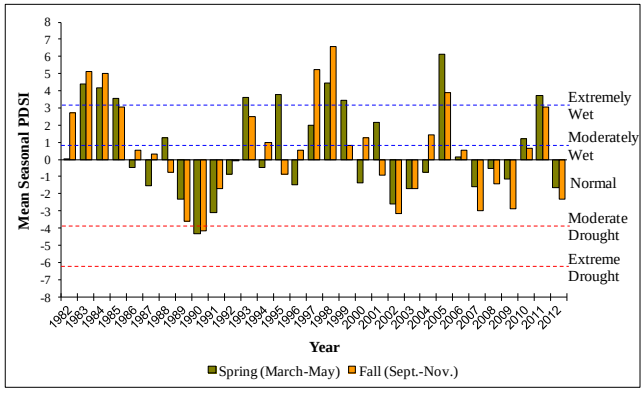


Figure 2. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the South Central division (Division 4). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

The South Central division had a historic annual mean precipitation of 12.52 inches from 1895 to 2012. The mean annual PDSI of the South Central division displays a cycle of several wet years followed by several drought years over the course of study years (Figure 1 and Figure 2) (Time Series Data 2013).

The 1961-1990 mean annual precipitation was 12-14 in. on the Baker Canyon, Bennett Field, Dog Valley, and Walker Creek studies; 14-16 in. on the 'M' Hill, Wide Canyon BLM, Wide Canyon DWR, and Dameron Canyon studies; 16-18 in. on the Smith's Ridge, Meadow Creek, Fillmore Cemetery East, and Corn Creek studies; and 32-36 in. on the Pioneer Peak, Teeples Ridge, and Teeple Terrace studies (PRISM Climate Group 2011).

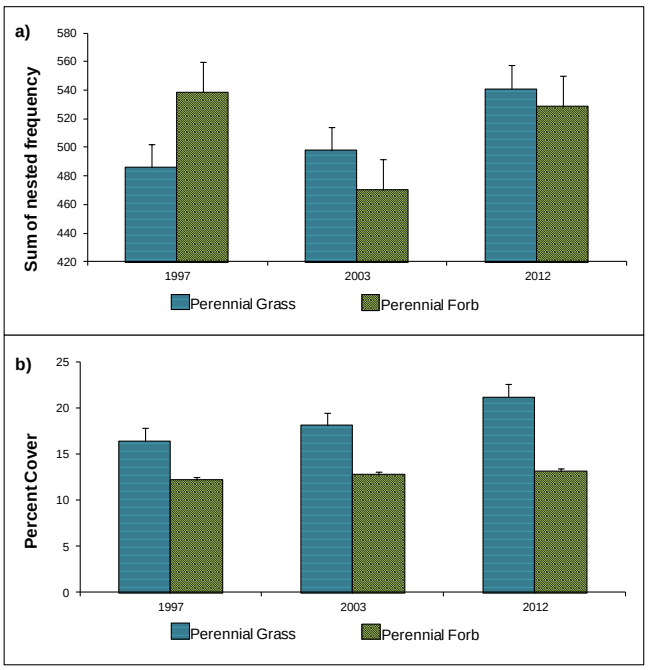


Figure 3. a) Deer summer range sites mean perennial grass and perennial forb sum of nested frequency by year for WMU 21, Fillmore. **b)** Deer summer range sites mean perennial grass and perennial forb cover by year for WMU 21.

Deer Summer Range

Browse: Browse species are not considered to be a crucial part of this high elevation range, and are not prevalent on these studies.

Herbaceous Understory: The summer range median cumulative grass trend for the unit has remained relatively stable since 1997 (Figure 9a). Perennial grass species are abundant, but are often dominated by introduced species. The introduced seeded species smooth brome (*Bromus inermis*) and intermediate wheatgrass (*Agropyron intermedium*) are the dominant grass species on the high elevation studies of Pioneer Peak, Teeples Ridge, and Teeples Terrace. The weedy species bulbous bluegrass (*Poa bulbosa*) is the dominant grass species on the Corn Creek study. Because bulbous bluegrass was sampled on only one summer range study, it was not included in this summary. For more information on the grass component on the Corn Creek study refer to the study discussion section. The mean sum of nested frequency and cover of perennial grasses, excluding bulbous bluegrass, has increased significantly from 1997 to 2012 (Figure 3a and Figure 3b).

The summer range median cumulative forb trend for the unit decreased in 2003, but increased again in 2012 (Figure 9a). Perennial forbs have been diverse and abundant within the sampled communities. The mean sum of nested frequency of perennial forbs decreased significantly in 2003, and increased significantly again in 2012 (Figure 3a). Cover of perennial forb species has remained similar throughout the study years (Figure 3b).

Occupancy: Pellet group transect data indicates that elk predominately occupy these summer range studies, but cattle also are prevalent. The mean abundance of elk pellet groups decreased in 2003, and has remained lower in subsequent sample years. The mean abundance of cattle sign decreased slightly in 2003. Cattle sign is particularly abundant on the Pioneer Peak, Teeples Ridge, and Teeples Terrace studies. Mean abundance of deer pellet groups has been low on the studies over the sample years (Figure 10a).

Discussion: The high prevalence of introduced seeded and weedy grass species on these sites is likely limiting more desirable herbaceous species on the study sites. Heavy utilization by cattle and elk may also be contributing to the dominance of these grazing tolerant seeded species.

Mid-Level Potential Deer Range

Browse: The mid-level potential site cumulative median browse trend has decreased over the duration of the study years. There was a slight decrease in the median browse trend in 1991, and a large decrease in 2008 (Figure 9b). Mountain big sagebrush is a dominant browse species on all of the mid-level potential studies except the Dog Valley study. The mean density and cover of mountain big sagebrush decreased significantly in 2008, and remained at reduced levels in 2012 (Figure 5a and Figure 5b). Most of the decrease in mountain big sagebrush is due to a wildfire on the Dameron Canyon study, which removed all of the sagebrush from that site. A one-way harrow treatment in 2008 on the Fillmore Cemetery East study also decreased cover of sagebrush on that site.

Antelope bitterbrush (*Purshia tridentata*) is common on all of the mid-level potential studies except the Dog Valley study. The mean density of bitterbrush has remained similar over the course of the study (Figure 5a). However, the mean cover of bitterbrush has decreased significantly over the study years (Figure 5b). Decadence of bitterbrush has increased significantly throughout the sample years (Figure 5c).

Herbaceous Understory: The mid-level potential median cumulative grass trend has remained similar over the course of the sample years (Figure 9b). Annual grass species including cheatgrass (*Bromus tectorum*) dominate the grass component on many of the sites. Mean sum of nested frequency and cover of annual grasses decreased significantly in 2003, but increased significantly again in 2012 (Figure 4a and

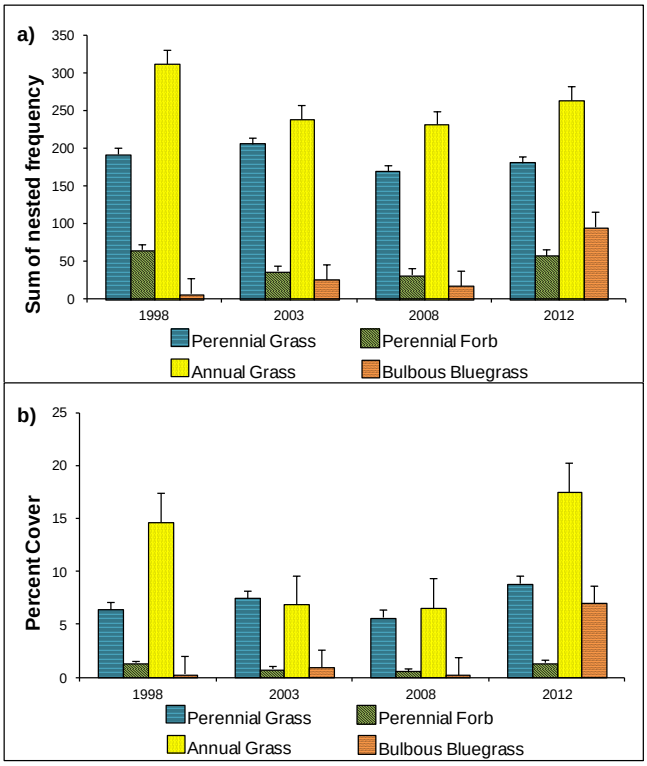


Figure 4. a) Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass sum of nested frequency by year for WMU 21, Fillmore. **b)** Mid-level potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 21.

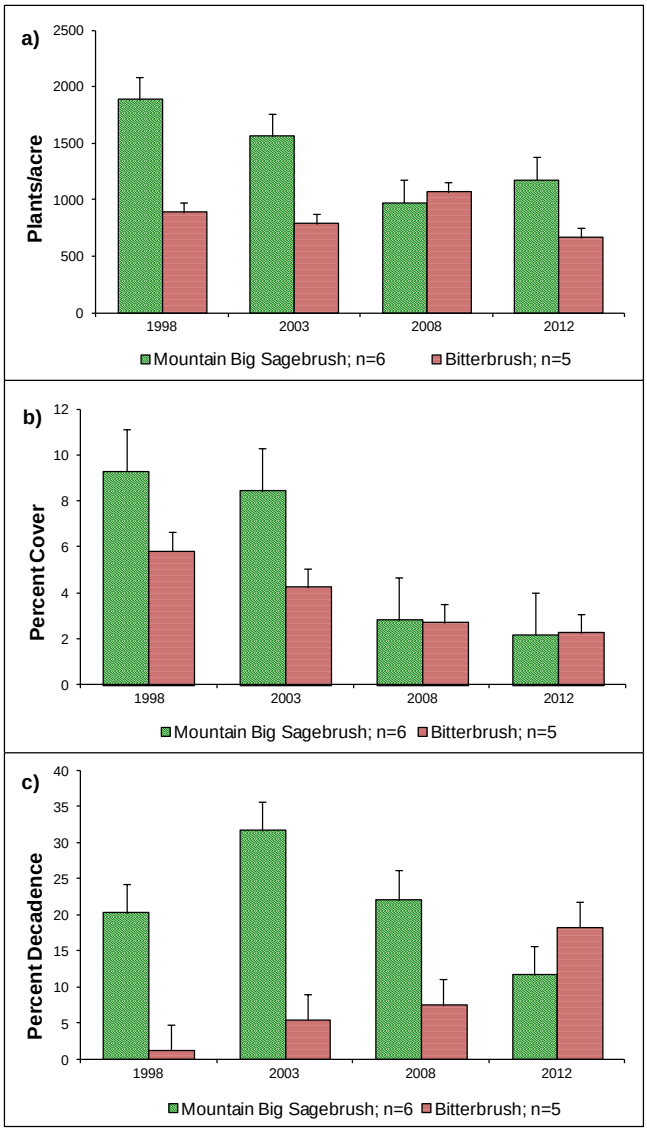


Figure 5. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) by year for WMU 21, Fillmore. **b)** Mid-level potential sites mean cover of mountain big sagebrush and antelope bitterbrush by year for WMU 21. **c)** Mid-level potential mean decadence of mountain big sagebrush and antelope bitterbrush by year for WMU 21.

Figure 4b). The weedy perennial species bulbous bluegrass is also common on many of the mid-level potential study sites, and appears to be increasing throughout the area. There was a significant increase in the mean nested frequency and cover of bulbous bluegrass in 2012 (Figure 4a and Figure 4b). The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, has remained relatively stable throughout the study years (Figure 4a). The mean cover of perennial grass species was significantly higher in 2012 than in 1998 and 2008 (Figure 4b).

The mid-level potential median cumulative forb trend has remained stable since the outset of the study (Figure 9b). Perennial forb species are rare on most of the studies. The mean sum of nested frequency and cover of perennial forb species has remained low since 1998 (Figure 4a and Figure 4b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these mid-level potential study areas. The mean abundance of deer pellet groups was high on most studies from 1998 to 2008, but was substantially lower in 2012. The decrease in pellet abundance is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk and livestock sign has been generally low since 1998 (Figure 10b).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI decreased from poor to very poor in 2008, and has remained very poor in subsequent sample years. Most of the decrease in score is due to decreases in preferred browse cover (Table 1 and Figure 8).

Discussion: The abundance of weedy annual species and bulbous bluegrass is a particular concern on these mid-level potential sites. These weedy species can form dense mats of cover that compete with other more desirable herbaceous species and with seedlings and young shrubs which limits establishment of new plants into the population. 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
98	19.8	8.5	8.0	12.8	-8.5	2.4	0.0	**43.0**	Poor
03	15.9	6.4	5.4	15.1	-5.2	1.6	-0.3	**39.0**	Poor
08	8.4	5.6	5.5	11.3	-4.9	1.3	-0.3	**26.8**	Very Poor
12	8.6	7.0	5.8	16.3	-8.4	2.8	-0.3	**31.7**	Very Poor

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=6) by year for WMU 21, Fillmore. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Low Potential Deer Range

Browse: The low potential site cumulative median browse trend has steadily decreased over the duration of the study years (Figure 9c). Wyoming big sagebrush is a dominant browse species on the Baker Canyon, Wide Canyon BLM, and Wide Canyon DWR studies. Basin big sagebrush is a dominant browse species on the Bennett Field and Walker Canyon studies. The two subspecies were combined for the purposes of this summary. The mean density of big sagebrush decreased significantly in 2003, and remained at reduced levels throughout subsequent sample years (Figure 7a). The mean cover of big sagebrush decreased significantly in 2008, and remained at reduced levels in 2012 (Figure 7b). Decadence of big sagebrush steadily increased from 1998 to 2008, but decreased significantly in 2012 (Figure 7c).

Stansbury cliffrose is common on all of the low potential studies except the Baker Canyon study. Most of cliffrose communities are comprised of large, mature plants that may have limited availability for use by animals due to their height. The mean density of cliffrose has remained relatively stable on these low potential

studies (Figure 7a). However, the mean cover decreased significantly in 2008, and remained at reduced levels in 2012 (Figure 7b). The mean decadence of cliffrose followed a similar trend as sagebrush, with a steady increase from 1998 to 2008 then a significant decrease in 2012 (Figure 7c).

Herbaceous Understory: The low potential median cumulative grass trend has steadily increased over the course of the sample years (Figure 9c). Despite the increase in trends of grasses, the grass component on most of the low potential studies is in poor condition. Annual grass species including cheatgrass (*Bromus tectorum*) dominate the grass component on the Bennett Field, Wide Canyon BLM, and Walker Creek studies, and is prevalent on the other studies. Mean sum of nested frequency of annual grasses decreased significantly in 2003, but increased significantly again in 2008 (Figure 6a). The mean cover of annual grasses decreased significantly in 2003, but increased significantly in 2012 (Figure 6b). The weedy perennial species bulbous bluegrass is also common on many of the low potential study sites, and appears to be increasing throughout the area. There was a significant increase in the mean nested frequency and cover of bulbous bluegrass in 2012 (Figure 6a and Figure 6b). The mean sum of nested frequency of perennial grasses, excluding bulbous bluegrass, has remained relatively stable throughout the study years (Figure 6a). The mean cover of perennial grass species was significantly higher in 2012 than in the other sample years (Figure 6b).

The low potential median cumulative forb trend has remained stable since the outset of the study (Figure 9c). Perennial forb species are rare on most of the studies. The mean sum of nested frequency and cover of perennial forb species has remained low since 1998 (Figure 6a and Figure 6b).

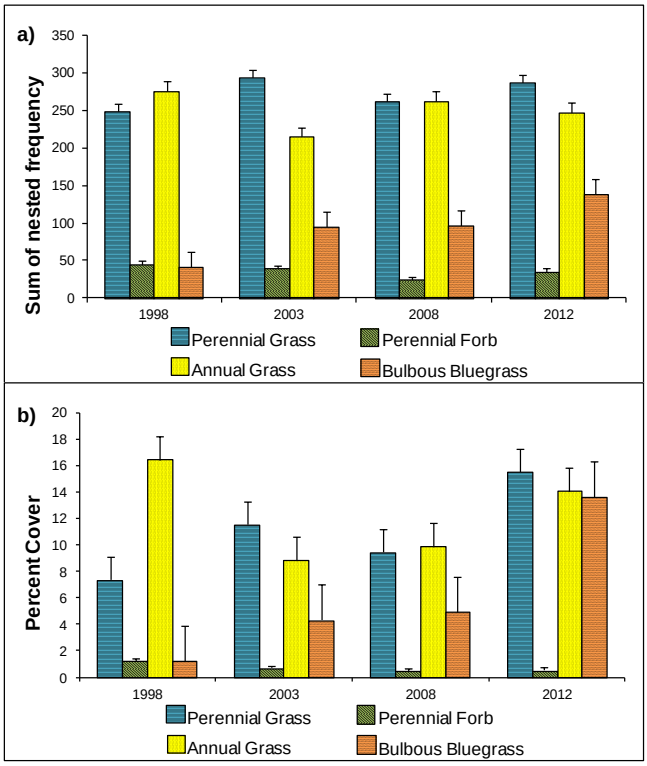


Figure 6. a) Low potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass sum of nested frequency by year for WMU 21, Fillmore. **b)** Low potential sites mean perennial grass (-POBU), perennial forb, annual grass, and bulbous bluegrass cover by year for WMU 21.

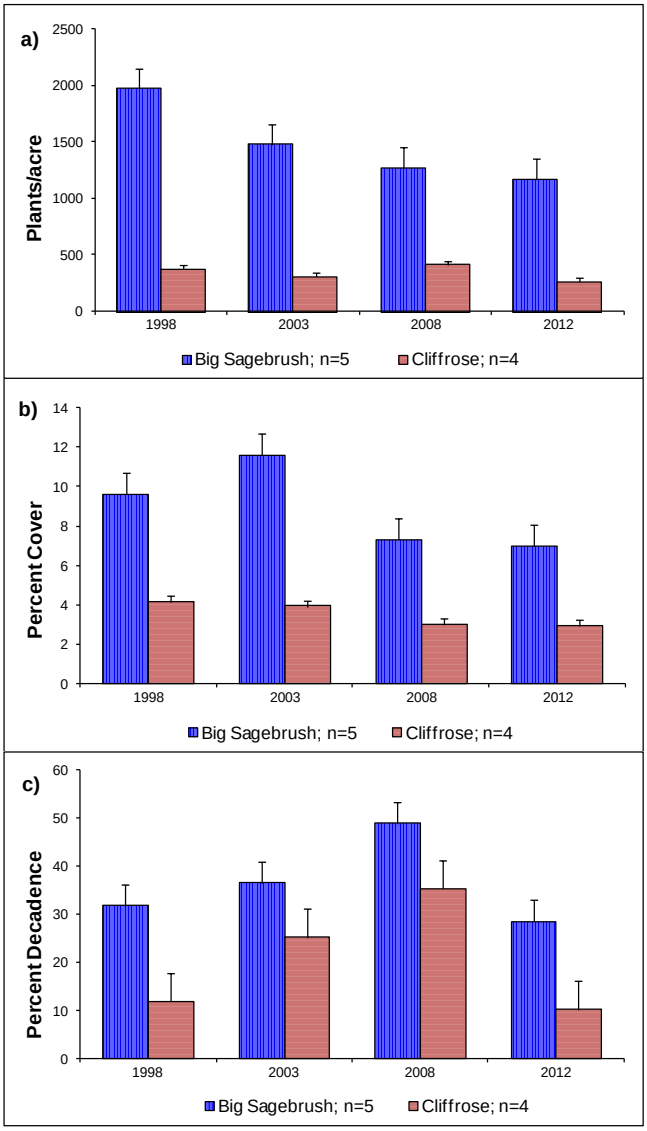


Figure 7. a) Low potential sites mean density of big sagebrush (*Artemisia tridentata spp.*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) by year for WMU 21, Fillmore. **b)** Low potential sites mean cover of big sagebrush and Stansbury cliffrose by year for WMU 21. **c)** Low potential sites mean decadence of big sagebrush and Stansbury cliffrose by year for WMU 21.

Occupancy: Pellet group transect data indicates that deer predominantly occupy these low potential study areas. The mean abundance of deer pellet groups was high on most studies from 1998 to 2008, but was substantially lower in 2012. The decrease in pellet abundance is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk and livestock sign has been very low since 1998 (Figure 10c).

Deer Desirable Components Index (DCI): The low potential deer DCI has remained fair to fair-good throughout the sample years. There has been a general decrease in the preferred browse cover score and an increase in the perennial grass score (Table 2 and Figure 8).

Discussion: The abundance of weedy annual species and bulbous bluegrass is a particular concern on these low potential sites. These weedy species can form dense mats of cover that compete with other more desirable herbaceous species and with seedlings and young shrubs which limits establishment of new plants into the population. 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
98	17.1	5.2	3.0	14.4	-11.3	2.5	0.0	**31.0**	Fair
03	20.4	6.3	2.7	22.4	-6.7	1.4	0.0	**46.6**	Fair-Good
08	13.5	2.8	3.5	17.5	-7.4	1.0	0.0	**30.8**	Fair
12	12.7	5.6	3.2	27.4	-10.1	1.1	0.0	**40.0**	Fair

Table 2. Low potential scale mean deer DCI scores and rankings (n=5) by year for WMU 21, Fillmore. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

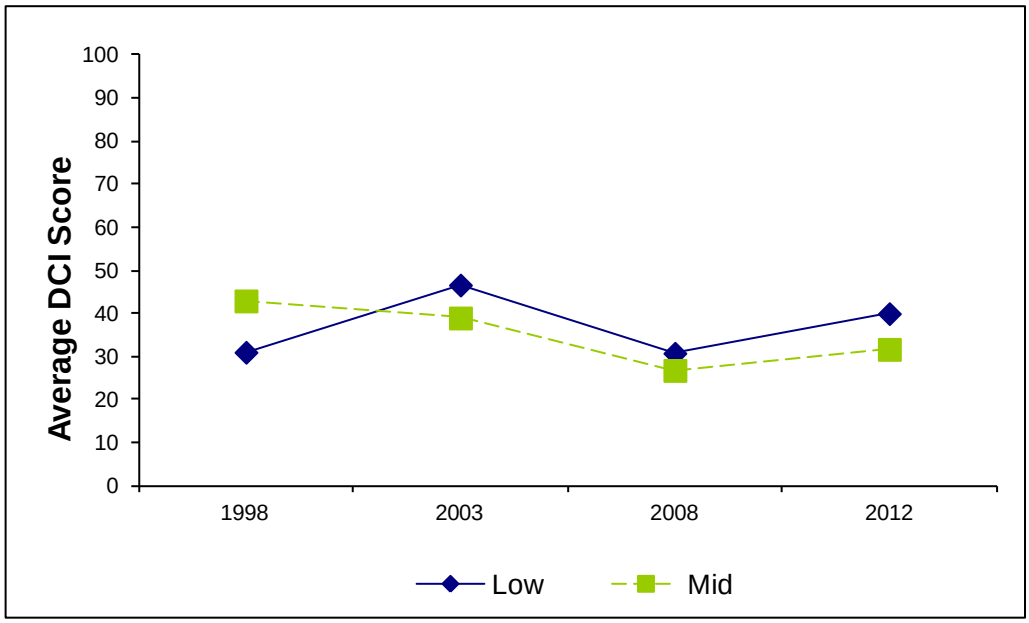


Figure 8. Mean mid-level (n=6) and low (n=5) potential scale deer DCI scores by year for WMU 21, Fillmore. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

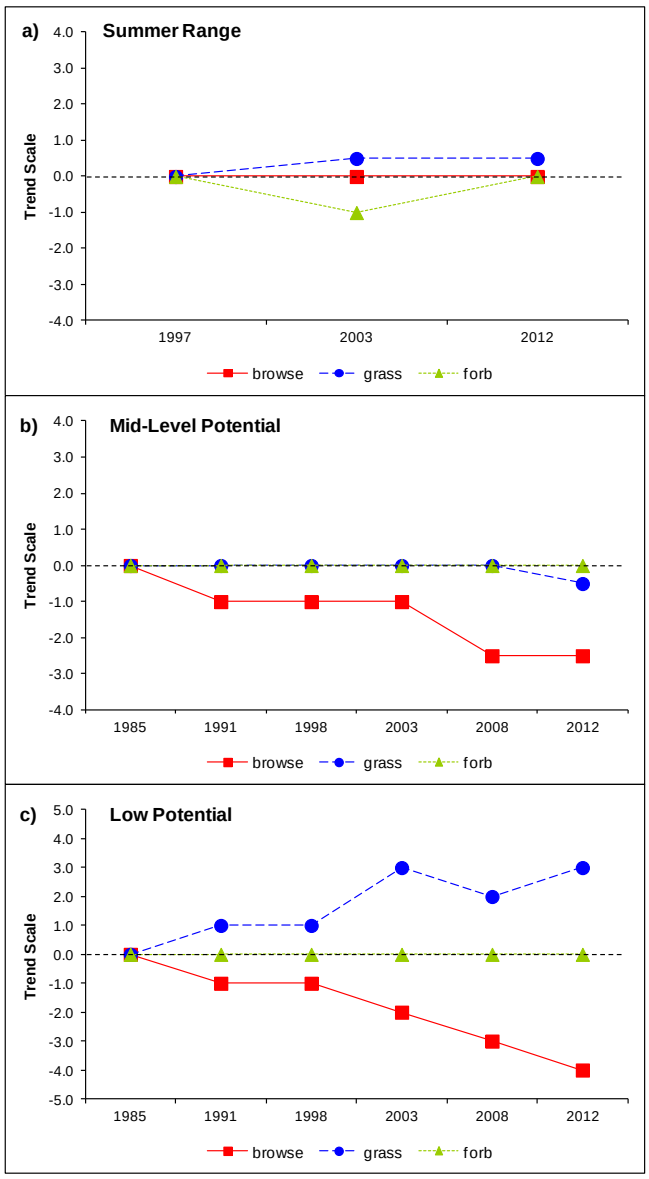


Figure 9. a) Deer summer range sites cumulative median browse, grass and forb trends by year for WMU 21, Fillmore. **b)** Mid-level potential sites cumulative median browse, grass, and forb trends by year for WMU 21. **c)** Low potential sites cumulative median browse, grass, and forb trends by year for WMU 21.

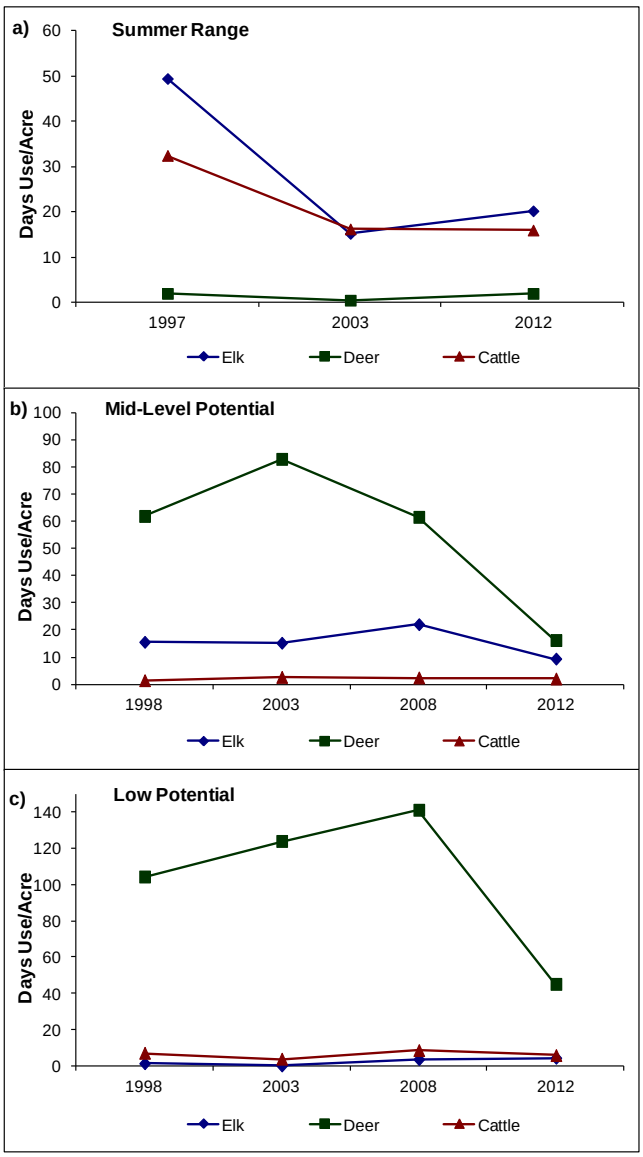
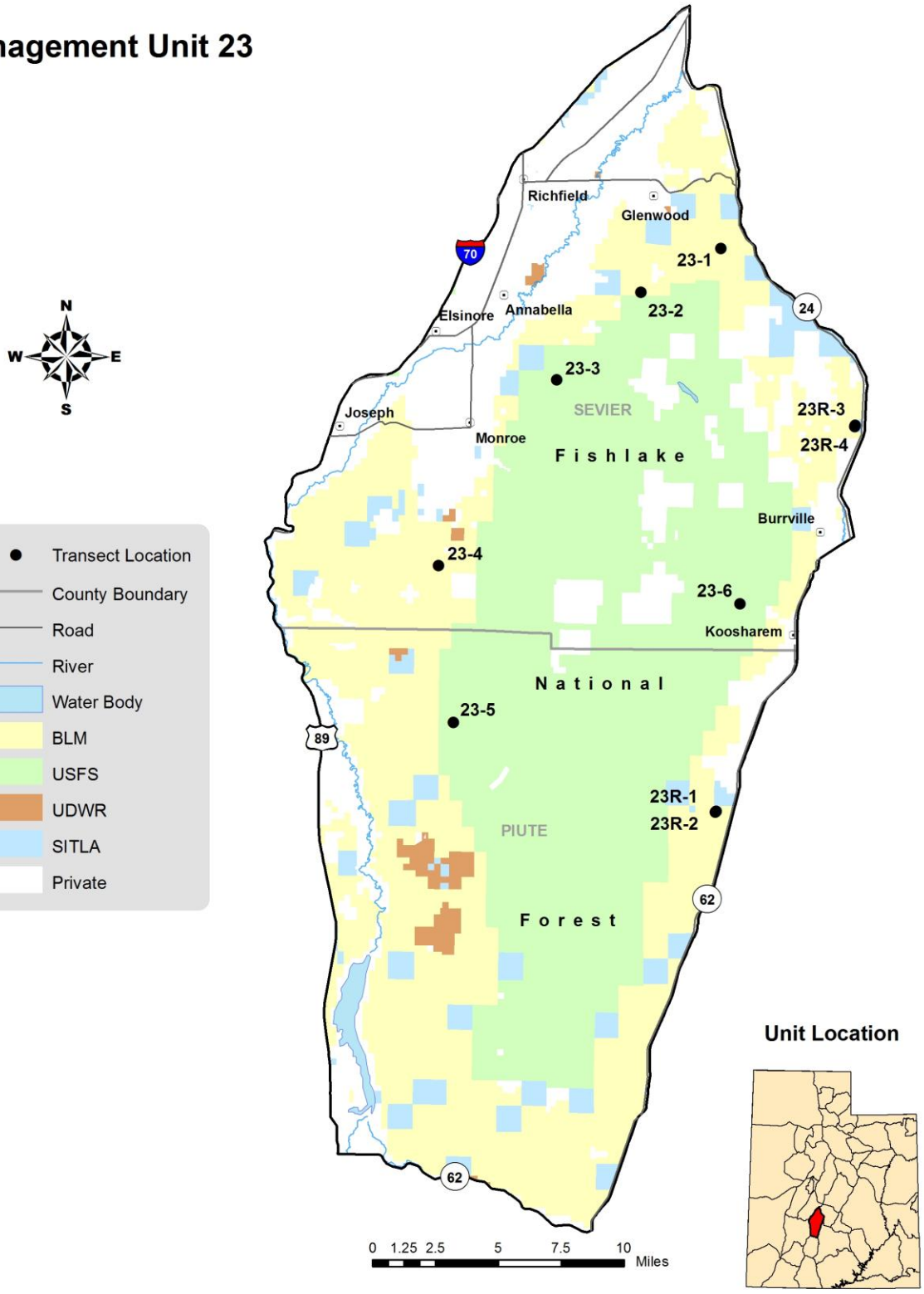


Figure 10. a) Deer summer range sites mean animals days use/acre (n=4) by year for WMU 21, Fillmore. **b)** Mid-level potential sites mean animal days use/acre (n=6) by year for WMU 21. **c)** Low potential sites mean animal days use/acre (n=5) by year for WMU 21.

Management Unit 23



WILDLIFE MANAGEMENT UNIT 23 - MONROE

Boundary Description

Piute and Sevier counties - Boundary begins at I-70 and US 89 at Sevier; south on US-89 to SR-62; east and north on SR-62 to SR-24; north on SR-24 to I-70; south on I-70 to US-89 and beginning point.

Management Unit Description

Unit 23, located in central Utah, completely encompasses Monroe Mountain for which it is named. This mountain is oriented north and south with drainages to the east, south and west. All of the water from the mountain eventually enters the Sevier River, either directly from the west side of the mountain or via tributaries (Otter Creek and the east fork of the Sevier River) on the east and south sides. The top of the mountain is relatively flat and has a good mixture of spruce-fir forests, aspen stands, sagebrush flats, and meadows. Numerous springs, small lakes, and reservoirs provide reliable water sources for both livestock and wildlife. Signal Peak and Monroe Peak are the elevational high points at approximately 11,225 feet. The municipalities located within the unit boundaries are Richfield, Sigurd, Elsinore, Joseph, Sevier, Marysvale, Junction, Kingston, Angle, Greenwich, and Koosharem.

Winter range is still considered the limiting factor for the elk and deer herds in the unit. The upper limits of the normal range extend to 8,000 feet on the southern end of the mountain and 7,800 feet on the northern end. During severe winters, the upper limit drops to about 7,800 feet on the southern end and 6,800 feet on the northern end. Deer wintering on the north end are particularly susceptible to winter loss during harsh winters when the winter range is severely restricted by deep snows. Winter concentration areas for deer are between Glenwood and Poverty Flat on the west side, and between Burrville and Greenwich on the east side. The elk herd splits each winter, with one part wintering near Greenwich and the other part wintering near Marysvale. Crop depredation problems occur each year in the fields near Greenwich and Monroe. Revegetation of adjacent pinyon-juniper areas is an ongoing task to provide an alternate forage source for these problem animals. In addition, a 2-mile (3.2-km) stretch of experimental high-tension electric fence was built across the top of a field south of Monroe. This fence has helped eliminate depredation problems on that particular field when it is maintained properly.

Huff and Blotter (1964) did the initial winter range survey. They reported acreages and percent cover of preferred deer browse for four general winter range vegetative types. Pinyon and juniper made up 62% of the winter range, with 13% of this composed of browse preferred by deer. The sagebrush, mixed, and mountain brush types cover 27%, 7%, and 4% of the winter range, respectively. With regard to these last three vegetative types, preferred browse comprised 14%, 18%, and 39% of these vegetative types, respectively. The pinyon and juniper type, which provides good protective thermal cover but is a less productive source of preferred browse, appears to be slowly encroaching into other vegetative types. Estimated total acreage for normal winter range is 146,000 acres.

The summer range is in fairly good condition, despite a history of overgrazing by livestock. More restrictive grazing plans may have helped in an upward trend in vegetative composition and vigor in recent years. The gentle topography and abundance of water with an interspersion of forage and cover provide quality fawning, calving, and summering areas for both deer and elk. The summer range has an extensive network of roads, with new roads having been proposed for timber sales. These roads and the associated activities can cause stress on the wildlife and affect their land use patterns. Some road closures would be beneficial to the unit's big game populations in the future. Many summer homes have been built, and more will likely be built in the future on the parcels of private land scattered throughout the summer range. The mountain is used for camping and fishing during the summer, and hunting in the fall.

Range Trend Studies

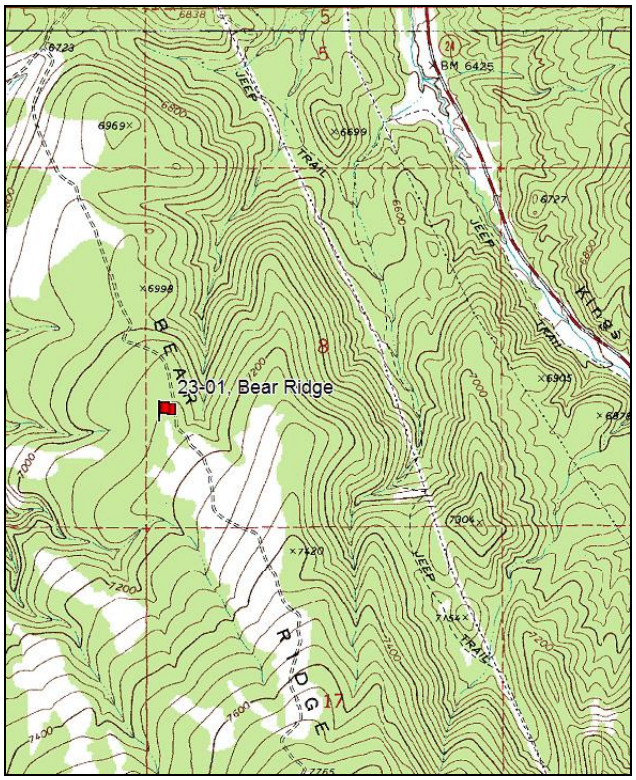
Six permanent range trend monitoring studies were chosen by an interagency committee of US Forest Service, BLM, and DWR personnel. These studies include: Bear Ridge (23-1), Saul Meadow (23-2), Thompson Basin (23-3), Poverty Flat (23-4), Smith Canyon (23-5), and Koosharem Canyon (23-6). They were established and sampled in 1985, and resampled in 1991, 1998, 2003, 2008, and 2012. Additionally, two studies, Greenwich Disking (23R-1) and Greenwich Native (23R-2), were established in 1997 to monitor a sagebrush disking treatment. Two studies, Plateau Harrow (23R-3) and Plateau Native (23R-4), were also established in 1999 to monitor a sagebrush harrow treatment near Koosharem Reservoir.

BEAR RIDGE - TREND STUDY NO. 23-1-12

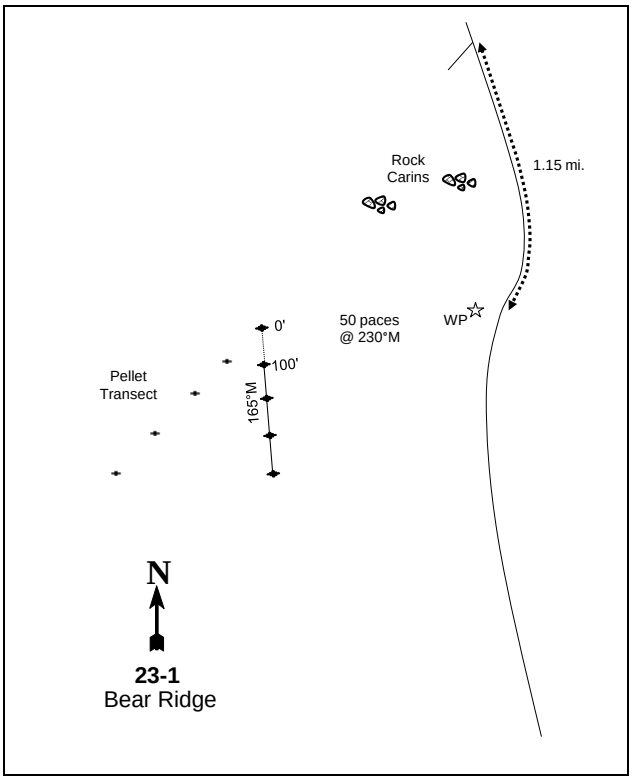
Vegetation Type: Perennial Grass
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Upland Shallow Loam (Black Sagebrush), R028AY325UT
Land Ownership: BLM
Elevation: 7,120 ft (2,170 m)
Aspect: Southwest
Slope: 9%
Transect bearing: 165° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 1ft, belt 2 on 7 ft.

Directions:
From Richfield, go east on Highway 119 to the junction of U-24. One hundred yards before the intersection of Hwy 119 and U-24, turn south on a dirt road. Follow this road for 1.5 miles to a hairpin turn, keep right. Go 0.55 miles to a fork, bear left and go 1.15 miles more to a witness post on the west side of the road. Walk 50 paces at 230 degrees magnetic to the 0-foot baseline stake. The trend study stakes are rebar 2-1/2 feet tall, the 0-foot stake is marked by browse tag #7038.

Map Name: Water Creek Canyon



Diagrammatic Sketch:



Township: 24S Range: 1W Section: 8

GPS: NAD 83, UTM 12S 418271 E 4287692 N

Site Information

Site Description: The study is located approximately three miles southeast of Glenwood, near the top of Bear Ridge within a treated pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland. The study is on land administrated by the Bureau of Land Management (BLM) and is within the North Cove Mountain allotment. The study site was treated by the North Cove Vegetation Treatment (WRI Project #1880) in the fall of 2010. Approximately 3,218 acres of pinyon and juniper woodland were two-way Ely chained and a seed mix of grass and forb species was aerially applied after the first pass of the chain (Table - Seed Mix). The objectives of the project are to decrease pinyon and juniper cover and improve herbaceous understory vegetation (WRI Database 2013). Pellet group data from the Utah Division of Wildlife (UDWR) Bell Rock transect indicated relatively stable trend 1980 trough 1991 with deer pellet groups being sampled in low abundance (Jense et al. 1985 and Jense et al. 1991). Deer pellet groups sampled on the study site were sampled in high abundance in 1998 and 2003, and were sampled in moderate abundance in 2008 and 2012. Elk pellet groups have been sampled in low abundance on the site since 1998. Cattle pellet groups were sampled in low abundance in 2008 (Table - Pellet Group Data).

Browse: The key browse species sampled are antelope bitterbrush (*Purshia tridentata*), black sagebrush (*Artemisia nova*), and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). Other less common preferred browse species sampled on the site are Saskatoon serviceberry (*Amelanchier alnifolia*), curlleaf mountain mahogany (*Cercocarpus ledifolius*), dwarf low rabbitbrush (*Chrysothamnus depressus*), and slenderbush eriogonum (*Eriogonum microthecum*). Antelope bitterbrush is a scattered population of mostly mature plants with low decadence and good vigor within the population, though poor vigor and decadence has been high in previous sampled periods. The size of bitterbrush plants decreased following the treatment in 2010. Recruitment of young bitterbrush plant has fluctuated over the sample years, but was good following the treatment. Black sagebrush and mountain big sagebrush are relatively small, scattered population of young to mature plants with good vigor and low decadence within the population. Prior to the treatment, both sagebrush species had high amounts of decadence and poor vigor within the population. Recruitment of young black sagebrush plants was poor prior to treatment, but following the treatment recruitment was good. Mountain big sagebrush recruitment of young plants to the population has been fairly good over the sample years (Table - Browse Characteristics).

Herbaceous Understory: Grasses are abundant and fairly diverse on the site. Bluebunch wheatgrass (*Agropyron spicatum*) is the dominant grass species on the site and has provided the majority of grass cover on the site over the sample years. Following the treatment, several seeded grass species were sampled including pubescent wheatgrass (*Agropyron intermedium*), bluebunch wheatgrass, Great Basin Wildrye (*Elymus cinereus*), Russian wildrye (*E. junceus*), sheep fescue (*Festuca ovina*), mutton bluegrass (*Poa fendleriana*), and Sandberg bluegrass (*P. secunda*), though bluebunch wheatgrass, mutton bluegrass, and Sandberg bluegrass were sampled on the site prior to treatment. The invasive annual grass species (*Bromus tectorum*) has been sampled on the site in low abundance. Forbs are not overly abundant, but are fairly diverse. Prior to the treatment forbs were rare on the site. The dominant forb species on the site was blue flax (*Linum perenne*) following the treatment, which was seeded on the site. Seeded forb species sampled on the site were annual sunflower (*Helianthus annuus*), blue flax, alfalfa (*Medicago sativa*), yellow sweetclover (*Melilotus officinale*), Palmer penstemon (*Penstemon palmeri*), and small burnet (*Sanguisorba minor*) (Table - Herbaceous Trends).

Soil: The soil is classified as part of the Borvant association, which is found on mountains and ridges. The parent material consists of alluvium, colluviums and/or slope alluvium derived from igneous rock. The soils within this classification are characterized as shallow, well drained, and with a moderately high permeable restrictively layer (Soil Survey Staff 2011). The soil texture is a loam with a neutral soil reaction (pH 7.3) (Table - Soil Analysis Data). Bare ground cover is moderate on the site, though there is a high amount of litter

and a moderate amount of vegetation, pavement, and rock providing protective ground cover (Table - Basic Cover). The soil erosion condition has been classified as stable in all sample years since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Black sagebrush density remained stable at 2,265 plants/acre, but decadence remained very high, increasing from 53% of the population to 77%. Young recruitment of black sagebrush decreased from 9% of the population to 3%, and plants displaying poor vigor remained relatively stable at 21% of the population. Mountain big sagebrush density decreased from 1,400 plants/acre to 1,065 plants/acre, and decadence increased slightly from 57% of the population to 63%. Young recruitment of mountain big sagebrush also increased from 14% of the population to 31%, and plants displaying poor vigor increased from 14% of the population to 38%. Bitterbrush density decreased from 533 plants/acre to 466 plants/acre, and decadence increased from 0% of the population to 29%. Young recruitment of bitterbrush remained high, but decreased from 38% of the population to 29%. Bitterbrush vigor remained excellent.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Black sagebrush decadence decreased from 77% of the population to 34%, and young recruitment slightly increased from 3% of the population to 6%. Plants displaying poor vigor decreased from 21% of the population to 9%. Mountain big sagebrush decadence remained very high at 67% of the population, and young recruitment decreased from 31% of the population to 9%. Plants displaying poor vigor remained relatively stable at 40%. Bitterbrush decadence decreased from 29% of the population to 8%, but young recruitment decreased from 29% of the population to 5%. Vigor remained good on most plants.
- **1998 to 2003 - down (-2):** Black sagebrush density decreased 12%, and decadence increased from 34% of the population to 53%. Young recruitment remained low at 2% of the population, and plants displaying poor vigor increased from 9% of the population to 18%. Mountain big sagebrush density decreased 24%, and decadence remained very high at 69% of the population. Young recruitment increased slightly from 9% of the population to 14%. Plants exhibiting poor vigor remained stable at 40% of the population. Bitterbrush density decreased 45%, and decadence increased from 8% of the population to 24%. Young recruitment remained stable at 5% of the population, and plant vigor remained good.
- **2003 to 2008 - down (-2):** Black sagebrush density decreased 35%, and decadence remained high at 49% of the population. No young plants were sampled. Plants displaying poor vigor increased from 18% of the population to 30%. Mountain big sagebrush density decreased 38%, and decadence increased from 69% of the population to 100%. No young plants were sampled. Plants displaying poor vigor increased from 40% of the population to 81%. Bitterbrush density remained stable at 420 plants/acre. Decadence also remained stable at 24% of the population, and no young plants were sampled. Bitterbrush plants displaying poor vigor increased to 57% of the population.
- **2008 to 2012 - stable (0):** Black sagebrush density remained similar at 680 plants/acre, and decadence decreased to 6% of the population. Young recruitment increased to 29% of the population, and plants displaying poor vigor decreased to 3% of the population. Mountain big sagebrush density decreased 73% to 340 plants/acre, and decadence decreased to 6% of the population. Young recruitment increased to 29% of the population. Plants displaying poor vigor decreased to 3% the population. Bitterbrush density increased 19% to 580 plants/acre. Decadence decreased to 0% of the population, and recruitment of young plants increased to 17% of the population. Vigor decreased to 0% of the population exhibiting poor vigor.

Grass:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 18%, and mutton bluegrass increased significantly in nested frequency.

- **1991 to 1998 - stable (0):** The sum of nested frequency for perennial grasses increased 10%, and Sandberg bluegrass increased significantly in nested frequency.
- **1998 to 2003 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 21%. Mutton bluegrass and cheatgrass decreased significantly in nested frequency.
- **2003 to 2008 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 12%.
- **2008 to 2012 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 11%. Seven seeded grass species were sampled on the site, though bluebunch wheatgrass, mutton bluegrass, Sandberg bluegrass were sampled on the site prior to the treatment.

Forb:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequency for perennial forbs increased, but perennial forb species remain relatively rare on the site.
- **1991 to 1998 - stable (0):** The sum of nested frequency for perennial forbs decreased slightly.
- **1998 to 2003 - stable (0):** Forbs remained rare on the site.
- **2003 to 2008 - stable (0):** Forbs remained rare on the site
- **2008 to 2012 - up (+2):** The sum of nested frequency of perennial forbs increased substantially on the site, and cover increased from less than 1% to 4%. Five seeded forb species were sampled on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 23, 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
98	10.8	4.8	3.3	21.9	-0.3	1.7	0.0	**42.1**	Poor
03	10.4	3.6	2.5	14.1	0.0	0.7	0.0	**31.3**	Very Poor
08	6.0	0.0	0.0	13.5	-0.1	0.9	0.0	**20.3**	Very Poor
12	3.8	0.0	0.0	19.6	-0.1	7.5	0.0	**30.9**	Very Poor

SEED MIX--
Management unit 23, Study no: 1

Project Name: North Cove Vegetation Treatment WRI Database #: 1880			
Application: Aerial		Acres:	1500
Seed type		lbs in mix	lbs/acre
G	Bluebunch Wheatgrass 'Anatone	1500	1.00
G	Great Basin Wildrye 'Trailhead'	2250	1.50
G	Muttongrass	300	0.20
G	Pubescent Wheatgrass 'Luna'	1500	1.00
G	Russian Wildrye 'Bozoisky'	3000	2.00
G	Sandberg Bluegrass	750	0.50
G	Sheep Fescue 'Covar'	750	0.50
F	Alfalfa 'Ranger'	1500	1.00
F	Annual Sunflower	1500	1.00
F	Blue Flax 'Appar'	1500	1.00
F	Palmer Penstemon	740	0.49
F	Small Burnet 'Delar'	6000	4.00
F	Yellow Sweetclover	1500	1.00
Total Pounds:		22790	15.19
PLS Pounds:			13.88

Trend Summary

HERBACEOUS TRENDS--

Management unit 23, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron intermedium	a-	a-	a-	a-	a-	b47	-	-	-	1.72
G	Agropyron spicatum	b227	b227	ab183	a160	ab181	a163	7.78	5.59	5.96	6.36
G	Bromus tectorum (a)	-	-	b42	a15	ab22	ab24	.43	.03	.09	.10
G	Elymus cinereus	a-	a-	a-	a-	a-	b12	-	-	-	.28
G	Elymus junceus	a-	a-	a-	a-	a-	b5	-	-	-	.05
G	Festuca ovina	a-	a-	a-	a-	a-	b25	-	-	-	.09
G	Oryzopsis hymenoides	4	12	12	5	-	6	.17	.04	-	.19
G	Poa fendleriana	a6	bc36	c49	ab24	ab8	a7	.98	.46	.08	.18
G	Poa secunda	a3	a18	b94	b80	b112	b66	2.00	.94	.67	.92
G	Sitanion hystrix	c25	bc20	ab6	a2	a2	a4	.01	.01	.00	.01
Total for Annual Grasses		0	0	42	15	22	24	0.43	0.03	0.09	0.10
Total for Perennial Grasses		265	313	344	271	303	335	10.95	7.05	6.73	9.82
Total for Grasses		265	313	386	286	325	359	11.39	7.08	6.82	9.92
F	Agoseris glauca	a-	b10	ab1	a-	a-	ab7	.00	-	-	.06
F	Arabis sp.	a-	b18	a1	a1	a4	a3	.00	.00	.04	.00
F	Astragalus convallarius	2	4	6	6	9	4	.15	.10	.13	.01
F	Calochortus nuttallii	4	8	-	-	-	-	-	-	-	-
F	Chaenactis douglasii	-	-	1	-	-	3	.03	-	-	.04
F	Collinsia parviflora (a)	-	-	3	-	-	-	.00	-	-	-
F	Comandra pallida	-	-	3	-	-	-	.03	-	-	-
F	Crepis acuminata	-	6	7	-	-	-	.06	-	-	-
F	Eriogonum racemosum	-	-	4	-	1	3	.03	-	.00	.00
F	Eriogonum umbellatum	a-	a1	ab9	a5	ab7	b17	.16	.07	.19	.37
F	Gayophytum ramosissimum(a)	-	-	-	-	-	4	-	-	-	.01
F	Helianthus annuus (a)	-	-	a-	a-	a-	b34	-	-	-	.34
F	Lactuca serriola (a)	-	-	-	-	-	9	-	-	-	.07
F	Linum perenne	a-	a-	a-	a-	a-	b75	-	-	-	2.29
F	Lithospermum incisum	-	-	-	-	-	-	-	-	-	.03
F	Lomatium sp.	-	-	1	-	-	-	.00	-	-	-
F	Medicago sativa	-	-	-	-	-	-	-	-	-	.00
F	Melilotus officinalis	-	-	-	-	-	1	-	-	-	.00
F	Penstemon palmeri	a-	a-	a-	a-	a-	b21	-	-	-	.31
F	Phlox austromontana	-	6	4	6	7	7	.16	.15	.04	.09
F	Phlox longifolia	a8	b27	ab16	a6	ab19	a5	.20	.02	.05	.01
F	Physaria chambersii	1	4	-	-	-	-	-	-	-	-
F	Sanguisorba minor	a-	a-	a-	a-	a-	b35	-	-	-	.52
F	Unknown forb-perennial	3	1	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	3	0	0	47	0.00	0	0	0.42
Total for Perennial Forbs		18	85	53	24	47	181	0.83	0.35	0.46	3.77
Total for Forbs		18	85	56	24	47	228	0.84	0.35	0.46	4.19

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

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

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia nova	35	26	25	22	2.24	2.41	1.37	1.06
B	Artemisia tridentata vaseyana	40	26	22	14	2.54	.76	.09	.21
B	Chrysothamnus depressus	1	0	0	1	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	0	0	.15	-	-	-
B	Gutierrezia sarothrae	2	0	0	0	-	-	-	-
B	Juniperus osteosperma	4	5	7	4	5.51	9.29	3.16	.38
B	Opuntia sp.	1	2	2	2	.15	-	.00	.03
B	Pinus edulis	4	6	8	3	5.99	8.81	4.83	.03
B	Purshia tridentata	18	15	15	19	3.20	4.31	2.75	1.46
Total for Browse		106	80	79	65	19.79	25.60	12.22	3.18

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

Species	Percent Cover		
	'03	'08	'12
Artemisia nova	1.85	2.20	.91
Artemisia tridentata vaseyana	.55	.26	.26
Juniperus osteosperma	23.31	21.35	.46
Pinus edulis	8.94	10.43	.15
Purshia tridentata	3.86	5.15	4.40

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

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.1	0.7	2.7
Purshia tridentata	4.0	4.6	3.1

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

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	213	197	165	86
Pinus edulis	115	119	120	43

Average diameter (in)			
'98	'03	'08	'12
8.8	7.0	11.2	4.9
4.8	5.3	8.2	1.2

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

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	2.00	5.75	30.04	32.50	21.17	19.09
Rock	6.00	5.25	11.18	13.20	10.03	7.28
Pavement	30.50	24.25	26.32	19.74	29.97	8.27
Litter	46.50	46.50	42.49	37.44	44.00	45.15
Cryptogams	5.00	3.00	.93	3.45	2.77	.47
Bare Ground	10.00	15.25	21.42	13.10	12.42	32.68

SOIL ANALYSIS DATA --

Management unit 23, Study no: 1, Bear Ridge

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

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

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	25	32	64	5
Elk	4	-	1	1
Deer	36	20	20	4
Cattle	-	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
7 (17)	1 (3)	1 (3)	4 (10)
51 (125)	54 (134)	34 (83)	21 (53)
-	-	1 (2)	-

BROWSE CHARACTERISTICS--
Management unit 23, 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									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	21/23
Artemisia nova									
85	**2264**	9	38	53	133	50	47	24	13/21
91	**2265**	3	21	77	66	32	24	21	9/16
98	**1300**	6	60	34	-	49	0	9	16/23
03	**1140**	2	46	53	-	9	0	18	15/25
08	**740**	0	51	49	-	8	19	30	14/22
12	**680**	29	65	6	-	12	3	3	10/18

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana									
85	**1397**	14	29	57	266	67	24	14	13/15
91	**1065**	31	6	63	333	19	6	38	12/13
98	**1100**	9	24	67	-	56	2	40	15/23
03	**840**	14	17	69	-	29	0	40	14/21
08	**520**	0	0	100	-	23	54	81	12/20
12	**340**	29	65	6	-	18	0	0	14/21
Cercocarpus ledifolius									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	9/17
Chrysothamnus depressus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	10/13
Chrysothamnus viscidiflorus viscidiflorus									
85	**398**	50	50	-	-	0	0	0	12/11
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	0	100	-	-	0	0	0	10/12
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Eriogonum microthecum									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	8/22
Gutierrezia sarothrae									
85	**0**	0	0	-	-	0	0	0	-/-
91	**66**	100	0	-	-	0	0	0	-/-
98	**40**	0	100	-	-	0	0	0	9/9
03	**0**	0	0	-	-	0	0	0	6/5
08	**0**	0	0	-	-	0	0	0	7/10
12	**0**	0	0	-	-	0	0	0	8/11

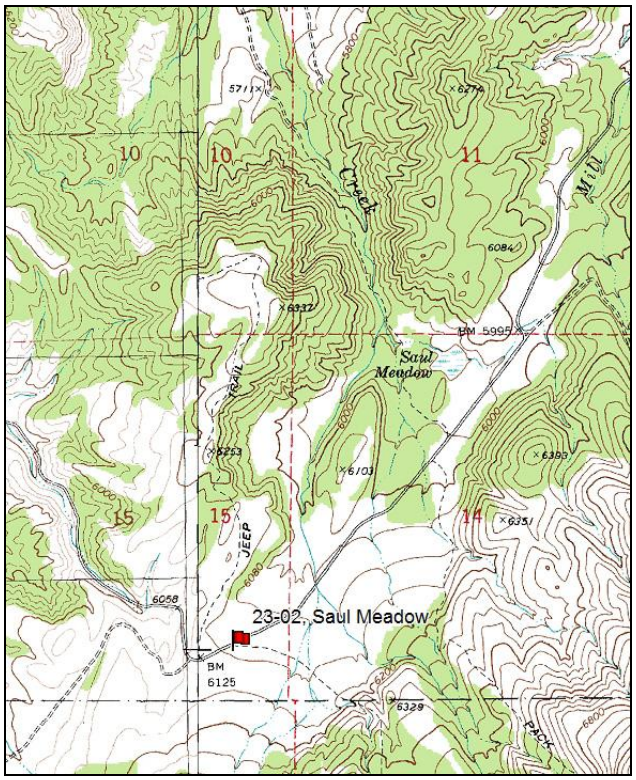
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Juniperus osteosperma									
85	**265**	25	75	-	66	0	0	0	69/64
91	**332**	40	60	-	66	20	40	20	152/98
98	**80**	50	50	-	40	0	0	0	-/-
03	**100**	60	40	-	-	0	0	0	-/-
08	**140**	43	57	-	-	0	14	14	-/-
12	**80**	75	25	-	20	0	0	0	-/-
Opuntia sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**60**	67	33	-	20	0	0	0	8/12
03	**40**	0	100	-	-	0	0	0	6/14
08	**60**	0	100	-	-	0	0	0	6/27
12	**40**	0	100	-	-	0	0	0	5/10
Pinus edulis									
85	**133**	0	100	-	-	0	0	0	69/64
91	**133**	0	100	-	-	0	0	0	133/104
98	**80**	0	100	-	20	0	0	0	-/-
03	**120**	33	67	-	20	0	0	0	-/-
08	**160**	38	63	-	40	0	0	0	-/-
12	**60**	67	33	-	-	0	0	33	-/-
Purshia tridentata									
85	**532**	37	63	0	133	63	0	0	24/42
91	**465**	29	43	29	-	43	43	0	19/35
98	**760**	5	87	8	40	37	0	5	22/41
03	**420**	5	71	24	-	43	48	0	27/59
08	**420**	0	76	24	-	24	76	57	26/53
12	**580**	17	83	0	20	62	14	0	17/33
Tetradymia canescens									
85	**66**	0	100	-	-	100	0	0	7/4
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

SAUL MEADOW - TREND STUDY NO. 23-2-12

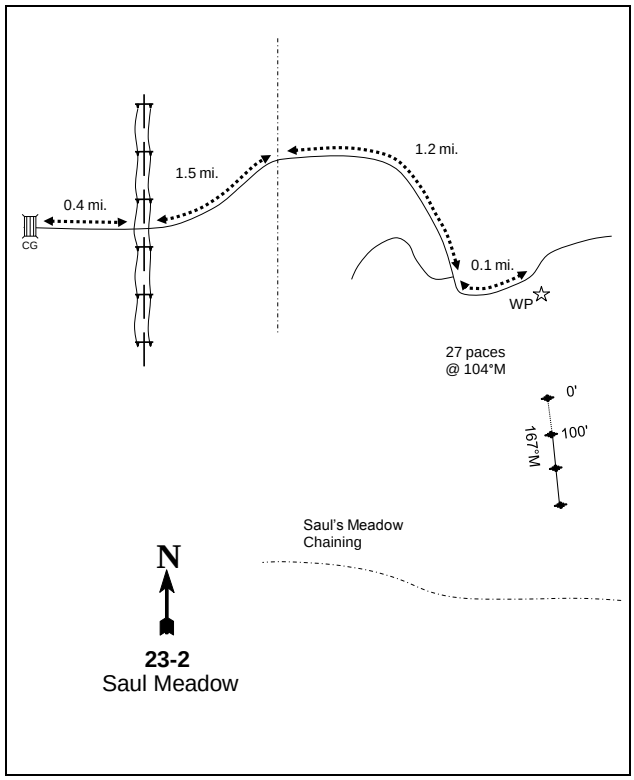
Vegetation Type: Wyoming Big Sagebrush
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Semidesert Gravelly Loam (Wyoming Big Sagebrush) South, R028AY214UT
Land Ownership: BLM
Elevation: 6,130 ft (1,868 m)
Aspect: Northeast
Slope: 6%
Transect bearing: 167° magnetic
Belt placement: line 1 (11 & 71ft), line 2 (34 & 95ft), line 3 (59ft)

Directions:
Starting from the Annabella cemetery go northeast 0.1 miles to a cattleguard. Bear left and go 0.4 miles crossing under a powerline. Continue 1.5 miles to the BLM boundary sign, then 1.2 miles more to a fork in the road. Continue straight 0.1 miles on the main road to a green and yellow fencepost on the right. The rebar marking the 0-foot end of the frequency baseline is 27 paces at 104 degrees magnetic from the green and yellow fencepost, which marks the start of a pellet transect.

Map Name: Water Creek Canyon



Diagrammatic Sketch:



Township: 24S Range: 2W Section: 15

GPS: NAD 83, UTM 12S 413150 E 4284872 N

SAUL MEADOW - TREND STUDY NO. 23-2

Site Information

Site Description: The study is located approximately three miles east of Annabella within a Wyoming big Sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) flat. The study is located on land administrated by the Bureau of Land Management (BLM) and is in the Salls Meadow allotment. The area was treated by lop and scatter between 1998 and 2003 to remove pinyon pine (*Pinus edulis*) and Utah Juniper (*Juniperus osteosperma*) trees. Deer pellet groups were sampled in moderate abundance from 1985 to 1991 on the Utah Division of Wildlife Resources (UDWR) Maple Creek pellet group transect study near the study site (Jense et al. 1985; Jense et al. 1991). Deer pellet groups were sampled on the study site in high abundance in 1998, 2003, and 2007; but were sampled in moderate abundance in 2012. Elk pellet groups were sampled in low abundance on the site in 1998, 2003, and 2008; and were sampled in high abundance in 2012. Cattle sign has been sampled on the site in low abundance since 1998. Rabbit pellet group quadrat frequency has been relatively high since 1998 (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). Sagebrush is a moderately dense and moderately to heavily used population, with relatively low decadence and good vigor within the population. The recruitment of young sagebrush plants to the population has fluctuated over the sample years, and over the last couple sample periods recruitment has been poor (Table - Browse Characteristics). Pinyon pine and juniper trees were removed from the study site following the 1998 sample year. There are thick patches of pinyon and juniper trees surrounding the study area.

Herbaceous Understory: Grasses are moderately abundant, but are not diverse. Crested wheatgrass (*Agropyron cristatum*) is the dominant perennial grass species on the site. The invasive annual grass species cheatgrass (*Bromus tectorum*) has been abundant on the site over the sampled years. Bottlebrush squirreltail (*Sitanion hystrix*) is the only native perennial grass species sampled on the site, but has not been very common the site over the sample years. Forbs are rare on the site. Annual species such as pale alyssum (*Alyssum alyssoides*), tumblemustard (*Sisymbrium altissimum*), and bur buttercup (*Ranunculus testiculatus*) dominate the forb component (Table - Herbaceous Trends).

Soil: The soil is classified as part of the Poverty Flat component, which is found on fan remnants on fan piedmonts. The parent material consists of alluvium, slope alluvium and colluviums derived from rhyolite and andesite. The soils within this classification are characterized as deep, well drained, and with a moderately high permeable restrictively layer (Soil Survey Staff 2011). The soil texture is a sandy loam with a neutral soil reaction (pH 6.6) (Table - Soil Analysis Data). Bare ground cover is moderate with a moderate amount of litter and a moderate amount of vegetation and pavement providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable since 2003.

Trend Assessments

Browse:

- **1985 to 1991 - stable (0):** Sagebrush density increased from 5,398 plants/acre to 6,399 plants/acre, but decadence increased from 12% of the population to 52%. Young recruitment decreased from 42% of the population to 18%, and plants exhibiting poor vigor increased from 5% of the population to 24%.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence remained high at 44% of the population, and young recruitment continued to decrease to 8%. Plants displaying poor vigor decreased to 14%.

- **1998 to 2003 - stable (0):** Sagebrush density remained similar at 3,060 plants/acre, and decadence decreased to 28%. Young recruitment increased to 31%, and plants displaying poor vigor stayed constant at approximately 13% of the population.
- **2003 to 2008 - slightly down (-1):** Sagebrush density decreased 11% to 2,740 plants/acre, and decadence increased to 36%. Young recruitment decreased to 9%. Plants displaying poor vigor increased to 26%. The density of dead plants sampled increased from 1,500 plants/acre to 1,760 plants/acre.
- **2008 to 2012 - stable (0):** Sagebrush density remained similar at to 2,620 plants/acre, and decadence decreased to 18%. Young recruitment decreased to 4%. Plants displaying poor vigor decreased to 14%.

Grass:
- **1985 to 1991 - up (+2):** The sum of nested frequency for perennial grasses increased 39%, and bottlebrush squirreltail increased significantly in nested frequency.
- **1991 to 1998 - stable (0):** The sum of nested frequency for perennial grasses changed little.
- **1998 to 2003 - stable (0):** The sum of nested frequency for perennial grasses changed little, but cheatgrass decreased significantly in nested frequency.
- **2003 to 2008 - stable (0):** There was little change in sum of nested frequency for perennial grasses. Cheatgrass increased significantly in nested frequency, but cover remained similar.
- **2008 to 2012 - up (+2):** The sum of nested frequency of perennial grasses increased 24%.

Forb:
- **1985 to 1991 - stable (0):** Forbs remained rare on the site.
- **1991 to 1998 - stable (0):** Forbs remained rare on the site.
- **1998 to 2003 - stable (0):** Forbs remained rare on the site.
- **2003 to 2008 - stable (0):** Forbs remained rare on the site.
- **2008 to 2012 - stable (0):** Forbs remained rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 23, 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
98	16.0	1.8	4.0	15.0	-8.8	0.0	0.0	**28.0**	Fair
03	18.6	6.6	15.0	14.4	-4.5	0.0	0.0	**50.1**	Good
08	10.8	4.4	4.4	16.1	-4.2	0.0	0.0	**31.4**	Fair
12	14.7	9.6	2.0	16.9	-7.7	0.0	0.0	**35.5**	Fair

Trend Summary

HERBACEOUS TRENDS--
Management unit 23, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	a97	ab114	ab132	ab135	ab125	b160	7.03	6.89	7.53	8.23
G	Bromus tectorum (a)	-	-	ab252	a228	bc289	c303	11.73	5.92	5.63	10.30
G	Sitanion hystrix	a4	b26	ab10	ab11	ab12	a10	.45	.31	.51	.24
G	Vulpia octoflora (a)	-	-	-	7	-	-	-	.01	-	-
Total for Annual Grasses		0	0	252	235	289	303	11.73	5.94	5.63	10.30

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
Total for Perennial Grasses		101	140	142	146	137	170	7.49	7.20	8.04	8.47
Total for Grasses		101	140	394	381	426	473	19.22	13.14	13.67	18.78
F	Alyssum alyssoides (a)	-	-	$_{a}$2	$_{a}$4	$_{b}$66	$_{c}$213	.00	.01	.16	.55
F	Draba sp. (a)	-	-	-	-	-	3	-	-	-	.00
F	Eriogonum cernuum (a)	6	5	-	-	-	-	-	-	-	-
F	Euphorbia sp.	-	-	2	-	-	-	.00	-	-	-
F	Gayophytum ramosissimum(a)	-	-	3	3	2	-	.00	.00	.00	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{b}$13	$_{ab}$7	$_{b}$13	-	.06	.01	.02
F	Sisymbrium altissimum (a)	$_{a}$-	$_{b}$19	$_{a}$-	$_{ab}$19	$_{a}$2	$_{ab}$13	-	.65	.03	.03
F	Stephanomeria pauciflora	3	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		6	24	5	39	77	242	0.00	0.72	0.21	0.61
Total for Perennial Forbs		3	0	2	0	0	0	0.00	0	0	0
Total for Forbs		9	24	7	39	77	242	0.01	0.72	0.21	0.61

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

BROWSE TRENDS--
Management unit 23, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata wyomingensis	78	75	73	74	12.83	14.86	8.49	11.75
B	Atriplex canescens	0	1	0	0	-	-	-	-
B	Atriplex confertifolia	0	0	0	0	-	-	.15	-
B	Gutierrezia sarothrae	2	0	0	0				
B	Juniperus osteosperma	3	0	0	0	2.00	-	-	-
B	Opuntia sp.	4	2	3	2	-	-	.00	-
Total for Browse		87	78	76	76	14.83	14.86	8.65	11.75

CANOPY COVER, LINE INTERCEPT--
Management unit 23, Study no: 2

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata wyomingensis	12.03	11.94	16.54
Opuntia sp.	.08	.11	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23, Study no: 2

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata wyomingensis	1.4	0.8	1.9

POINT-QUARTER TREE DATA--
Management unit 23, Study no: 2

Species	Trees per Acre			
	'98	*'03	'08	*'12
Juniperus osteosperma	19	-	21	-

Average diameter (in)			
'98	*'03	'08	*'12
5.4	-	2.2	-

*Point-Quarter Tree Density Data was not sampled

BASIC COVER--
Management unit 23, Study no: 2

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	5.00	3.75	31.53	27.32	22.91	33.45
Rock	5.00	2.00	4.00	4.58	3.13	3.98
Pavement	25.00	16.00	7.97	8.46	12.23	12.21
Litter	44.25	46.00	45.56	36.73	56.79	35.31
Cryptogams	0	1.50	1.85	1.64	.52	1.42
Bare Ground	20.75	30.75	21.92	34.51	21.77	28.46

SOIL ANALYSIS DATA --

Management unit 23, Study no: 2, Saul Meadow

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
16.9	6.6	62.0	19.4	18.6	1.2	8.6	115.2	0.5

PELLET GROUP DATA--
Management unit 23, Study no: 2

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	57	68	80	51
Elk	11	3	11	22
Deer	52	36	47	20
Cattle	1	2	1	1

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
18 (44)	10 (25)	15 (38)	40 (98)
94 (232)	59 (145)	85 (210)	32 (78)
4 (10)	1 (4)	-	16 (40)

BROWSE CHARACTERISTICS--
Management unit 23, Study no: 2

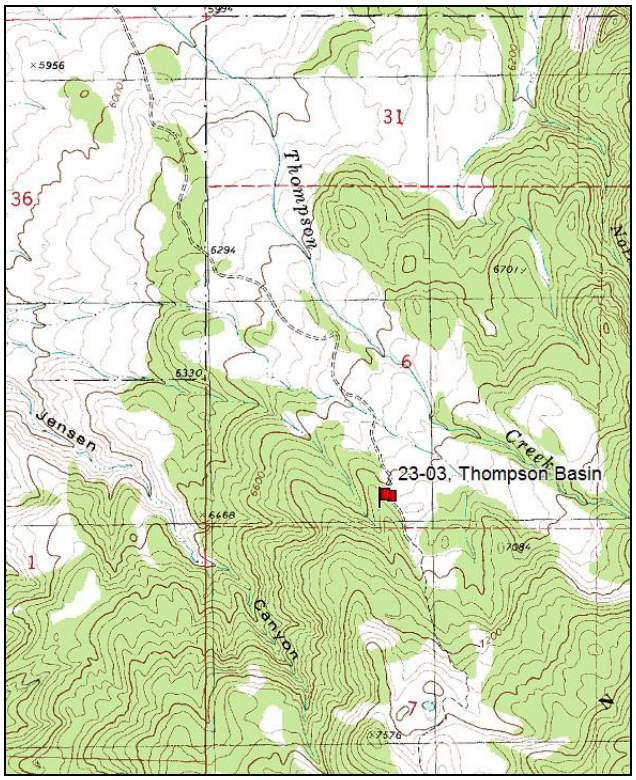
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis									
85	**5398**	42	46	12	599	36	22	5	18/23
91	**6399**	18	30	52	199	25	1	24	26/30
98	**2840**	8	47	44	40	45	4	14	24/31
03	**3060**	31	41	28	40	12	1	13	24/32
08	**2740**	9	54	36	-	19	46	26	23/32
12	**2620**	4	78	18	-	24	48	14	25/34
Atriplex canescens									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**40**	0	100	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Gutierrezia sarothrae									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	0	100	-	-	0	0	0	6/8
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	18/26
12	**0**	0	0	-	-	0	0	0	-/-
Juniperus osteosperma									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**60**	0	100	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Opuntia sp.									
85	**1598**	21	63	17	-	0	0	8	4/9
91	**1331**	30	65	5	66	15	0	0	5/6
98	**80**	0	75	25	-	0	0	25	4/6
03	**40**	0	100	0	-	0	0	0	6/16
08	**60**	0	67	33	-	0	0	33	5/20
12	**40**	0	100	0	-	0	0	0	5/11

THOMPSON BASIN - TREND STUDY NO. 23-3-12

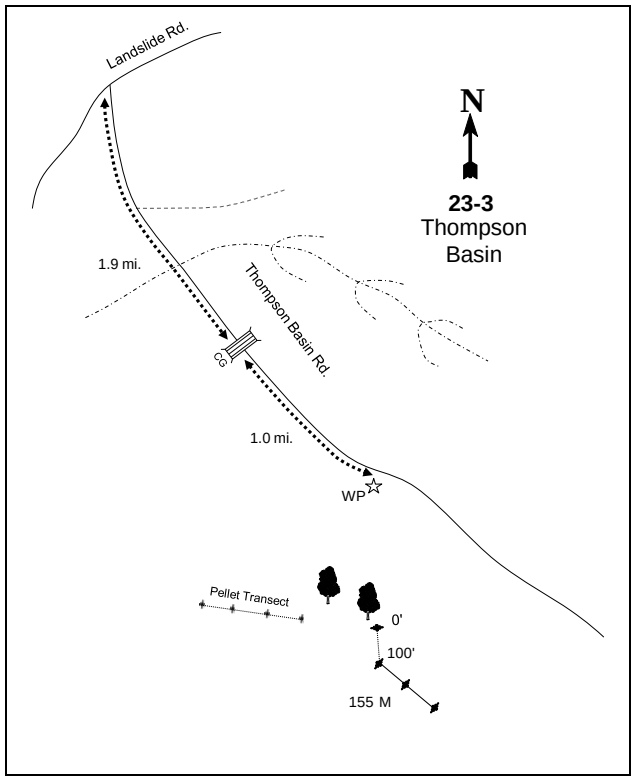
Vegetation Type: Pinyon Juniper
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Upland Stony Loam (Mountain Big Sagebrush), R047XB336UT
Land Ownership: USFS
Elevation: 6,880 ft (2,097 m)
Aspect: Northeast
Slope: 48%
Transect bearing: 155° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft). No rebar.

Directions:
From the Monroe City cemetery, go 3.05 miles north and east to a gravel road on the right. Turn here and go 1.0 miles to the Thompson Basin Road. Turn right and proceed 1.9 miles to a cattleguard. Continue 1.0 mile up the road and stop. There is a witness post on the right side of the road. Fifty feet up the hill, there should be a juniper with the center trunk cut out. The 0-foot baseline stake is on the other side of this tree, approximately 60 feet from the road. The 0-foot stake is a 3/4" rebar tagged #7041.

Map Name: Monroe



Diagrammatic Sketch:



Township: 25S Range: 2W Section: 6

GPS: NAD 83, UTM 12S 407744 E 4279268 N

Site Information

Site Description: The study is located approximately three miles northwest of Monroe on a pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) hillside. An area below the transect was chained approximately 30 years ago by the U.S. Forest Service (USFS). A fire also burned near the area approximately 35 years ago. The study is on land administrated by the USFS and is within the Scrub Flat allotment. The Thompson Basin has been noted historically as a concentration area for deer during the winter. A Utah Division of Wildlife Resources pellet group transect, which intersects the trend study, sampled deer pellet groups in moderate abundance from 1980-1985, and sampled deer pellet groups in low abundance from 1985-1991 (Jense et al. 1985 and Jense et al. 1991). Deer pellet groups were sampled on the study in moderate abundance in 1998, 2003, and 2008; and low abundance in 2012. Elk pellet groups have been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant preferred browse species, although true mountain mahogany (*Cercocarpus montanus*) and Mormon tea (*Ephedra viridis*) are present in low densities. Sagebrush is a scattered, lightly used population with low decadence and good vigor within the population, though vigor and decadence has been high in prior years. The recruitment of young sagebrush has been relatively poor over the sample years (Table - Characteristics). Pinyon and juniper are the dominant browse species on the site and have provided the majority of the cover over the sampled years (Table - Browse Trends).

Herbaceous Understory: Grasses are moderately abundant and moderately diverse on the site. The dominant grass species on the site is bluebunch wheatgrass (*Agropyron spicatum*). Other common grass species sampled on the site are mutton bluegrass (*Poa fendleriana*) and Sandberg bluegrass (*P. secunda*). The invasive annual grass species cheatgrass (*Bromus tectorum*) has been sampled on the site in low abundance. Forbs are not very abundant or diverse on the site. Desert phlox (*Phlox austromontana*) is the dominant forb species on the site and has provided the majority of the forb cover since 1998 (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy clay loam with a neutral soil reaction (pH 6.6) (Table - Soil Analysis Data). Bare ground cover is moderate with a moderate amount of litter, vegetation and pavement, and high amount of rock providing protective ground cover (Table - Basic Cover). The erosion condition class was rated as stable in 2003 and 2012; and moderate in 2008. There are a few large, active gullies on the hillside and in the valley.

Trend Assessments

Browse:

- **1985 to 1991 - slightly down (-1):** Sagebrush density remained similar at 1,466 plants/acre, and decadence increased from 33% of the population to 55%. Young recruitment remained stable at 9% of the population. Plants exhibiting poor vigor increased from 0% of the population to 32%.
- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence remained high, although it decreased to 30% of the population. Young recruitment decreased slightly to 6% of the population. Plants displaying poor vigor decreased to 10% of the population.
- **1998 to 2003 - stable (0):** Sagebrush density remained similar to 1998 at 1,000 plants/acre. However, decadence increased to 42% of the population. Young recruitment also slightly increased to 10% of the population. Plants displaying poor vigor increased to 24% of the population.
- **2003 to 2008 - slightly down (-1):** Sagebrush density decreased 16% to 840 plants/acre, and decadence remained high at 40% of the population. Young recruitment increased slightly to 14% of the population. Plants displaying poor vigor continued to increase to 29% of the population.

- **2008 to 2012 - slightly up (+1):** Sagebrush density increased 19% to 1000 plants/acre, and decadence decreased to 12% of the population. Young recruitment decreased to 2% of the population. Plants displaying poor vigor decreased to 6% of the population.

Grass:

- **1985 to 1991 - up (+2):** The sum of nested frequency for perennial grasses increased substantially. Bluebunch wheatgrass, Sandberg bluegrass, mutton bluegrass, and bottlebrush squirreltail increased significantly in nested frequency.
- **1991 to 1998 - down (-2):** The sum of nested frequency for perennial grasses decreased 27%. Bluebunch wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail decreased significantly in nested frequency.
- **1998 to 2003 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 17%. Mutton bluegrass decreased significantly in nested frequency, and that for Sandberg bluegrass increased significantly.
- **2003 to 2008 - stable (0):** The sum of nested frequency for perennial grasses changed little. Mutton bluegrass increased significantly in nested frequency, while that for Sandberg bluegrass decreased significantly.
- **2008 to 2012 - up (+2):** The sum of nested frequency for perennial grasses increased 21%. Mutton bluegrass increased significantly in nested frequency.

Forb:

- **1985 to 1991 - up (+2):** The sum of nested frequency for perennial forbs greatly increased.
- **1991 to 1998 - down (-2):** The sum of nested frequency for perennial forbs decreased 52
- **1998 to 2003 - stable (0):** The sum of nested frequency for perennial forbs increased slightly.
- **2003 to 2008 - stable (0):** The sum of nested frequency for perennial forbs decreased by 14%.
- **2008 to 2012 - up (+2):** The sum of nested frequency for perennial forbs increased 35%.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 23, study no: 3

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
98	5.3	0.0	0.0	23.5	-0.1	2.6	0.0	**31.3**	Very Poor
03	6.0	0.0	0.0	10.6	-0.1	3.7	0.0	**20.1**	Very Poor
08	4.7	0.0	0.0	12.3	-0.2	2.4	0.0	**19.2**	Very Poor
12	4.0	0.0	0.0	14.1	-0.3	2.6	0.0	**20.4**	Very Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 23, Study no: 3

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	$_{a}$41	$_{c}$203	$_{b}$124	$_{b}$151	$_{b}$143	$_{b}$146	4.71	2.65	4.00	4.43
G	Bromus tectorum (a)	-	-	$_{a}$36	$_{ab}$44	$_{ab}$55	$_{b}$71	.19	.18	.33	.39
G	Oryzopsis hymenoides	-	-	-	2	-	-	-	.03	.01	.03
G	Poa fendleriana	$_{ab}$41	$_{cd}$128	$_{d}$162	$_{a}$7	$_{b}$70	$_{c}$126	6.05	.04	1.47	1.60
G	Poa secunda	$_{a}$17	$_{cd}$138	$_{b}$85	$_{d}$148	$_{b}$88	$_{bc}$106	1.00	2.59	.57	.91
G	Sitanion hystrix	$_{a}$4	$_{b}$43	$_{a}$1	$_{a}$1	$_{a}$14	$_{a}$3	.00	.00	.11	.06

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
Total for Annual Grasses		0	0	36	44	55	71	0.18	0.18	0.33	0.38
Total for Perennial Grasses		103	512	372	309	315	381	11.77	5.31	6.17	7.04
Total for Grasses		103	512	408	353	370	452	11.96	5.50	6.50	7.43
F	Antennaria rosea	1	3	-	-	1	-	-	-	.03	-
F	Arabis sp.	$_{a}$-	$_{b}$17	$_{ab}$8	$_{ab}$11	$_{ab}$8	$_{ab}$4	.02	.07	.02	.01
F	Castilleja chromosa	-	8	-	-	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{b}$51	$_{a}$-	$_{a}$2	-	.21	-	.00
F	Crepis acuminata	-	5	-	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{b}$92	$_{a}$12	$_{a}$2	-	.75	.03	.00
F	Draba sp. (a)	-	-	-	5	-	2	-	.02	-	.00
F	Erigeron eatonii	-	3	3	-	-	-	.00	-	-	-
F	Erigeron pumilus	3	6	-	-	-	-	-	-	-	-
F	Eriogonum racemosum	3	1	3	-	-	3	.03	-	-	.00
F	Gilia sp. (a)	-	-	-	1	-	-	-	.00	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{b}$14	$_{a}$-	$_{a}$-	-	.03	.00	-
F	Machaeranthera canescens	5	-	-	-	-	-	-	-	-	-
F	Phlox austromontana	$_{a}$12	$_{b}$52	$_{b}$56	$_{b}$63	$_{b}$50	$_{b}$67	1.24	1.70	1.09	1.19
F	Phlox longifolia	$_{a}$-	$_{c}$59	$_{a}$3	$_{ab}$15	$_{ab}$17	$_{b}$24	.01	.07	.04	.08
F	Streptanthus cordatus	-	-	1	1	1	6	.00	.00	.00	.01
Total for Annual Forbs		0	0	0	163	12	6	0	1.02	0.04	0.01
Total for Perennial Forbs		24	154	74	90	77	104	1.31	1.84	1.20	1.30
Total for Forbs		24	154	74	253	89	110	1.31	2.87	1.24	1.32

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

BROWSE TRENDS--
Management unit 23, Study no: 3

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	40	35	29	31	4.21	4.77	3.73	3.17
B	Chrysothamnus viscidiflorus stenophyllus	0	0	1	1	-	.00	-	-
B	Gutierrezia sarothrae	0	1	0	0	-	-	-	-
B	Juniperus osteosperma	10	10	12	10	8.44	12.06	4.61	16.06
B	Opuntia sp.	12	14	17	24	.06	.04	.45	.39
B	Pinus edulis	4	5	5	6	4.00	6.38	2.02	3.25
Total for Browse		66	65	64	72	16.72	23.27	10.82	22.89

CANOPY COVER, LINE INTERCEPT--
Management unit 23, Study no: 3

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	4.26	4.15	4.06
Juniperus osteosperma	25.36	19.20	21.16
Opuntia sp.	.03	.16	.21
Pinus edulis	8.44	8.16	7.94

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23, Study no: 3

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.5	0.7	1.1

POINT-QUARTER TREE DATA--
Management unit 23, Study no: 3

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	99	97	104	134
Pinus edulis	72	63	63	72

Average diameter (in)			
'98	'03	'08	'12
9.9	8.4	9.6	10.1
4.2	5.3	4.8	4.5

BASIC COVER--
Management unit 23, Study no: 3

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	2.75	6.00	33.60	29.34	18.60	31.98
Rock	29.00	24.25	21.23	28.35	22.82	24.96
Pavement	18.00	14.25	17.47	14.74	14.09	12.05
Litter	38.00	35.50	42.68	30.02	39.34	27.17
Cryptogams	1.50	.75	.14	.28	.20	.18
Bare Ground	10.75	19.25	8.38	17.11	22.46	28.12

SOIL ANALYSIS DATA --

Management unit 23, Study no: 3, Thompson Basin

Effective rooting depth (in)	pH	Sandy Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.7	6.6	54.0	19.4	26.6	2.0	10.5	166.4	0.8

PELLET GROUP DATA--
Management unit 23, Study no: 3

Type	Quadrat Frequency			
	'98	'03	'08	'12
Sheep	2	-	-	-
Rabbit	23	21	39	10
Elk	4	1	4	5
Deer	12	8	20	4
Cattle	-	-	-	-

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
-	-	-	-
11 (27)	9 (23)	15 (38)	7 (17)
21 (52)	26 (64)	20 (50)	9 (22)
-	-	1 (2)	-

BROWSE CHARACTERISTICS--
Management unit 23, 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)
Artemisia tridentata vaseyana									
85	**1599**	8	58	33	-	46	8	0	11/21
91	**1465**	9	36	55	-	50	18	32	14/22
98	**1000**	6	64	30	60	14	0	10	20/29
03	**1000**	10	48	42	-	12	6	24	20/28
08	**840**	14	45	40	-	14	12	29	21/33
12	**1000**	2	86	12	-	20	2	6	19/26
Cercocarpus montanus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	22/33
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	4/25
Chrysothamnus viscidiflorus stenophyllus									
85	**266**	0	50	50	-	25	0	0	11/14
91	**265**	0	75	25	-	25	0	25	11/14
98	**0**	0	0	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	8/10
08	**20**	100	0	0	-	0	0	0	13/20
12	**20**	0	100	0	-	0	0	0	12/20
Ephedra viridis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	12/22
03	**0**	0	0	-	-	0	0	0	11/9
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	16/34
Eriogonum microthecum									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	4/5

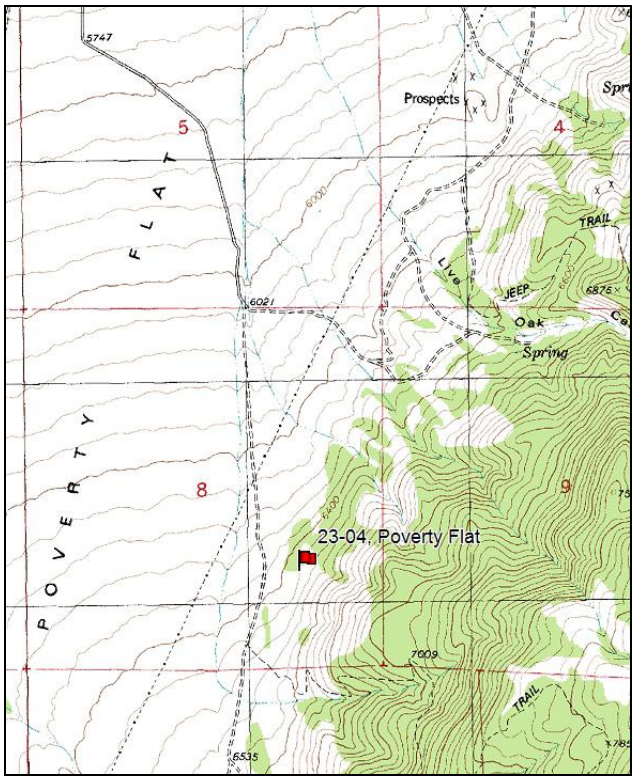
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	-/-
03	**40**	0	0	100	-	0	0	100	-/-
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	7/8
Juniperus osteosperma									
85	**66**	0	100	-	133	0	0	0	69/93
91	**199**	67	33	-	-	0	0	0	118/79
98	**200**	50	50	-	-	0	0	0	-/-
03	**200**	30	70	-	-	0	0	10	-/-
08	**240**	25	75	-	-	0	0	8	-/-
12	**200**	10	90	-	-	0	0	0	-/-
Opuntia sp.									
85	**133**	0	100	0	-	0	0	0	3/2
91	**199**	0	100	0	-	0	0	0	4/5
98	**320**	19	75	6	20	0	0	0	5/10
03	**360**	17	83	0	-	0	0	0	5/11
08	**420**	10	67	24	-	0	0	5	5/13
12	**680**	6	91	3	-	0	0	6	5/9
Pinus edulis									
85	**66**	100	0	-	-	0	0	0	-/-
91	**66**	100	0	-	-	0	0	0	-/-
98	**80**	25	75	-	20	0	0	0	-/-
03	**100**	40	60	-	-	0	0	0	-/-
08	**100**	40	60	-	40	0	0	0	-/-
12	**120**	33	67	-	-	0	0	0	-/-

POVERTY FLAT - TREND STUDY NO. 23-4-12

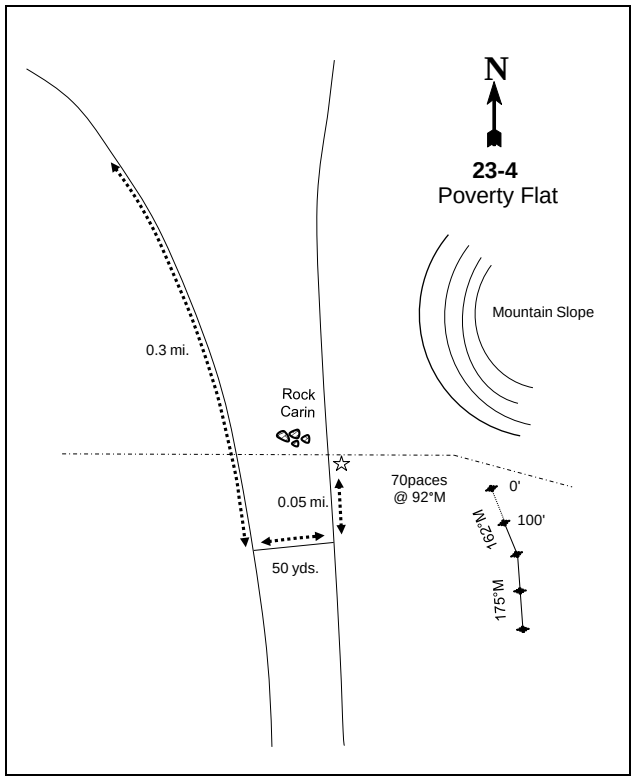
Vegetation Type: Perennial Grass
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Semidesert Gravelly Loam (Wyoming Big Sagebrush) South, R028AY214UT
Land Ownership: BLM
Elevation: 6,450 ft (1,966 m)
Aspect: West
Slope: 19%
Transect bearing: 162° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: Belt 2 on 2 ft, belt 5 on 1ft.

Directions:
From 600 South and Main in Monroe, turn southwest on Jones Road, a gravel road coming in at a 45 degree angle. Proceed 3.4 miles to a junction, stay left. Go up this road 1.7 miles to a fork. Stay right, go 0.5 miles and pass under a powerline. Continue 0.3 miles further to a fork, turn left. Go about 50 yards then turn left again. Go another 0.05 miles (about 150 yards) to a witness post on the east side of the road. Walk up slope to the 5th yellow stake. The frequency baseline begins 12 feet south of the 5th yellow stake east of the road (about 365 feet from road).

Map Name: Monroe



Diagrammatic Sketch:



Township: 26S Range: 3W Section: 8

GPS: NAD 83, UTM 12S 400165 E 4267348 N

POVERTY FLAT - TREND STUDY NO. 23-4

Site Information

Site Description: The study is located approximately five miles south of Monroe within a burned Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), pinyon pine (*Pinus edulis*), and Utah juniper (*Juniperus osteosperma*) hillside. A wildfire (Poverty or Flat fires) burned the area in 1997, eliminating most of the preferred browse on the site. The land is administrated by the Bureau of Land Management (BLM) and is part of a Monroe Co-op allotment. Sheep use is more concentrated on the flat, and the hillside where the transect is located is grazed by animals that trail to and from the summer pasture on the forest. No livestock sign was noted in 1998 or 2003. Cattle sign was sampled in low abundance in 2008 and 2012. Deer pellet groups were sampled in low abundance in 1998 and 2012; and in high abundance in 2003 and 2008. Elk pellet groups have been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Before the fire in 1997, the browse component consisted of a mixed stand of pinyon pine and Utah juniper with an understory of Wyoming big sagebrush. Most of pinyon and juniper trees were burned by the fire. Prior to the fire, the sagebrush was a moderately dense population, but the fire removed nearly all the sagebrush plants from the study site. Forage kochia (*Kochia prostrata*) and fourwing saltbush (*Atriplex canescens*) were likely seeded after the burn. Forage kochia has steadily increased in abundance on the site since the fire. Saltbush has remained in low density on the site since being seed on the site (Table - Browse Characteristics).

Herbaceous Understory: Grasses are fairly abundant and diverse on the site. The invasive annual grass species cheatgrass (*Bromus tectorum*) has dominated the site and provided the majority of grass cover since the fire. Crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*A. intermedium*) are common on the site and were likely seeded on the site following the fire. Bottlebrush squirreltail (*Sitanion hystrix*) was the dominant perennial grass species at the outset of the study, but has decreased in abundance on the site over the sample years. Forbs have been rare on the site over the sample years (Table - Herbaceous Trends).

Soil: The soil is classified as part of the Povertyflat-Annabella association, though a portion of the transect is likely part of the Red Butte component. The Povertyflat- Annabella association is found on fan remnants on fan piedmonts and inset fans. The parent material consists of alluvium, slope alluvium and colluviums derived from rhyolite and andesite. The soils within this classification are characterized as deep, well to excessively drained, and with a moderately high to high permeable restrictively layer (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, though there is a high amount of rock and a moderate amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2008, but was slight in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - stable (0):** Sagebrush density increased 43% from 5,398 plants/acre to 7,731 plants/acre; however, decadence increased from 20% of the population to 34%. Young recruitment decreased from 21% of the population to 15%. Plants exhibiting poor vigor were sampled for the first time and comprised 33% of the population.
- **1991 to 1998 - down (-2):** The fire eliminated almost all of the sagebrush population, and density was reduced to 40 plants/acre. Half of the sampled plants were young, and half were decadent.
- **1998 to 2003 - slightly up (+1):** Sagebrush density increased substantially to 400 plants/acre, however, decadence remained high at 30% of the population, and young recruitment was low at 5%. Twenty-five percent of the population displayed poor vigor. Forage kochia, fourwing saltbush, and blue elderberry (*Sambucus cerulea*) were sampled for the first time.

- **2003 to 2008 - stable (0):** Sagebrush was not sampled within the density strips, and fourwing saltbush and blue elderberry remained at low densities. Forage kochia density increased from 40 plants/acre to 1,200 plants/acre, and young recruitment was high at 28% of the population.
- **2008 to 2012 - slightly up (+1):** Sagebrush was not sampled within the density strips, and fourwing saltbush and blue elderberry remained at low densities. Forage kochia density increased to 3,160 plants/acre, and young recruitment increased to 44% of the population.

Grass:
- **1985 to 1991 - stable (0):** Perennial grass species remained rare on the site.
- **1991 to 1998 - stable (0):** Perennial grass species remained rare on the site.
- **1998 to 2003 - slightly down (-1):** The sum of nested frequency for perennial grasses increased slightly, and crested wheatgrass and intermediate wheatgrass were sampled for the first time. However, cheatgrass increased significantly in nested frequency, and quadrat frequency increased from 61% to 92%.
- **2003 to 2008 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 40%, and intermediate wheatgrass increased significantly in nested frequency. Cheatgrass decreased significantly in nested frequency, but quadrat frequency remained high at 85%.
- **2008 to 2012 - stable (0):** The sum of nested frequency of perennial grasses remained similar.

Forb:
- **1985 to 1991 - stable (0):** Forbs remained rare on the site.
- **1991 to 1998 - stable (0):** Forbs remained rare on the site.
- **1998 to 2003 - stable (0):** Forbs remained rare on the site.
- **2003 to 2008 - stable (0):** Forbs remained rare on the site.
- **2008 to 2012 - stable (0):** Forbs remained rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 23, 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
98	0.0	0.0	0.0	2.9	-6.8	2.1	0.0	**-1.8**	Very Poor
03	2.9	0.0	0.0	8.0	-19.0	0.0	0.0	**-8.1**	Very Poor
08	2.6	0.0	0.0	19.2	-10.7	0.0	0.0	**11.1**	Very Poor-Poor
12	5.6	0.0	0.0	18.2	-13.2	0.1	0.0	**10.6**	Very Poor-Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 23, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron cristatum	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$58	$_{bc}$65	$_{c}$76	-	2.25	4.31	5.78
G	Agropyron intermedium	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$4	$_{b}$27	$_{b}$51	-	.16	2.00	2.84
G	Bromus tectorum (a)	-	-	$_{a}$160	$_{c}$316	$_{b}$275	$_{b}$270	9.03	25.35	14.32	17.65
G	Elymus cinereus	-	-	-	-	-	-	-	-	.00	-
G	Oryzopsis hymenoides	4	-	1	4	5	4	.03	.22	.83	.07
G	Poa secunda	7	7	5	13	17	3	.18	.35	.25	.06
G	Sitanion hystrix	$_{c}$77	$_{bc}$48	$_{bc}$60	$_{ab}$37	$_{ab}$42	$_{a}$14	1.24	1.02	1.51	.11

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Sporobolus cryptandrus	a-	a-	a-	a-	a6	b19	-	-	.68	.23
Total for Annual Grasses		0	0	160	316	275	270	9.03	25.35	14.32	17.65
Total for Perennial Grasses		88	55	66	116	162	167	1.44	4.00	9.61	9.11
Total for Grasses		88	55	226	432	437	437	10.48	29.35	23.94	26.77
F	Alyssum alyssoides (a)	-	-	-	1	-	-	-	.00	-	-
F	Argemone munita	-	-	2	-	-	-	.15	-	-	-
F	Astragalus sp.	1	-	-	-	-	-	-	-	-	-
F	Calochortus nuttallii	-	-	1	-	-	-	.00	-	-	-
F	Castilleja sp.	-	-	1	-	-	-	.00	-	-	-
F	Crepis acuminata	-	-	-	-	-	2	-	-	-	.03
F	Descurainia pinnata (a)	-	-	ab4	b9	a-	ab7	.04	.07	-	.01
F	Erigeron pumilus	1	3	-	-	-	-	-	-	-	-
F	Euphorbia sp.	a-	a-	ab5	a-	a-	b14	.04	-	-	.02
F	Lactuca serriola (a)	a-	a-	a-	a7	a2	b46	-	.04	.03	.45
F	Lappula occidentalis (a)	-	-	4	-	-	-	.01	-	-	-
F	Leucelene ericoides	a-	a-	b15	a-	a-	a-	.33	-	-	-
F	Lupinus argenteus	-	-	3	-	-	-	.15	-	-	-
F	Nicotiana attenuata (a)	-	-	3	-	-	-	1.06	-	-	-
F	Sisymbrium altissimum (a)	-	a1	a-	c35	bc18	ab9	-	2.07	.39	.05
F	Tragopogon dubius (a)	-	-	-	-	-	2	-	-	-	.03
F	Unknown forb-perennial	-	-	-	-	-	-	.38	-	-	-
Total for Annual Forbs		0	1	11	52	20	64	1.11	2.19	0.42	0.55
Total for Perennial Forbs		2	3	27	0	0	16	1.07	0	0	0.05
Total for Forbs		2	4	38	52	20	80	2.18	2.19	0.42	0.61

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

BROWSE TRENDS--
Management unit 23, Study no: 4

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata wyomingensis	2	13	0	0	-	2.31	-	-
B	Atriplex canescens	0	1	1	1	-	-	.00	.85
B	Chrysothamnus nauseosus	0	0	1	0	-	-	-	-
B	Coryphantha sp.	0	0	2	1	-	-	-	-
B	Gutierrezia sarothrae	10	12	8	11	.16	.22	.15	.07
B	Juniperus osteosperma	0	1	0	0	.63	.38	-	-
B	Kochia prostrata	0	2	8	23	-	.03	1.57	1.99
B	Sambucus cerulea	0	1	1	5	-	-	.15	1.01
Total for Browse		12	30	21	41	0.79	2.95	1.88	3.93

CANOPY COVER, LINE INTERCEPT--
Management unit 23, Study no: 4

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata wyomingensis	1.48	-	-
Atriplex canescens	.53	.48	.86
Gutierrezia sarothrae	.85	.31	.68
Juniperus osteosperma	3.40	3.33	3.59
Kochia prostrata	.40	1.91	2.95
Sambucus cerulea	-	.35	1.50

POINT-QUARTER TREE DATA--
Management unit 23, Study no: 4

Species	Trees per Acre			
	'98	*'03	*'08	'12
Juniperus osteosperma	26	-	-	26
Pinus edulis	20	-	-	22

Average diameter (in)			
'98	*'03	*'08	'12
9	-	-	13.7
1.6	-	-	4.4

*Point-Quarter Tree Density Data not sampled

BASIC COVER--
Management unit 23, Study no: 4

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	3.25	2.75	14.86	33.31	27.56	34.04
Rock	28.75	25.25	48.72	33.97	44.57	44.27
Pavement	24.00	28.00	18.13	1.89	3.33	3.45
Litter	41.50	33.25	11.90	35.83	38.18	29.23
Cryptogams	.25	0	.06	.15	0	.00
Bare Ground	2.25	10.75	9.93	7.62	1.22	2.62

SOIL ANALYSIS DATA --

Management unit 23, Study no: 4, Poverty Flat

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.1	6.7	44.0	35.4	20.6	4.8	26.2	163.2	0.8

PELLET GROUP DATA--
Management unit 23, Study no: 4

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	-	8	38	-
Elk	1	1	9	5
Deer	3	21	27	11
Cattle	-	-	-	2

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
2 (5)	5 (12)	13 (33)	6 (15)
19 (47)	57 (141)	57 (141)	7 (17)
-	-	5 (13)	3 (7)

BROWSE CHARACTERISTICS--
Management unit 23, 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)
Artemisia tridentata wyomingensis									
85	**5398**	21	59	20	533	58	9	0	20/23
91	**7731**	15	52	34	733	38	41	33	15/17
98	**40**	50	0	50	-	0	0	0	-/-
03	**400**	5	65	30	-	10	0	25	19/23
08	**0**	0	0	0	-	0	0	0	15/30
12	**0**	0	0	0	-	0	0	0	13/20
Atriplex canescens									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	0	0	32/48
08	**20**	0	100	-	-	0	0	0	44/98
12	**20**	0	100	-	-	0	0	0	53/94
Chrysothamnus nauseosus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**20**	0	100	-	-	0	0	0	25/37
12	**0**	0	0	-	-	0	0	0	22/38
Coryphantha sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**40**	0	100	-	-	0	0	0	4/8
12	**20**	0	100	-	-	0	0	0	4/9
Echinocereus sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**66**	0	100	-	-	0	0	0	5/6
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	4/7
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

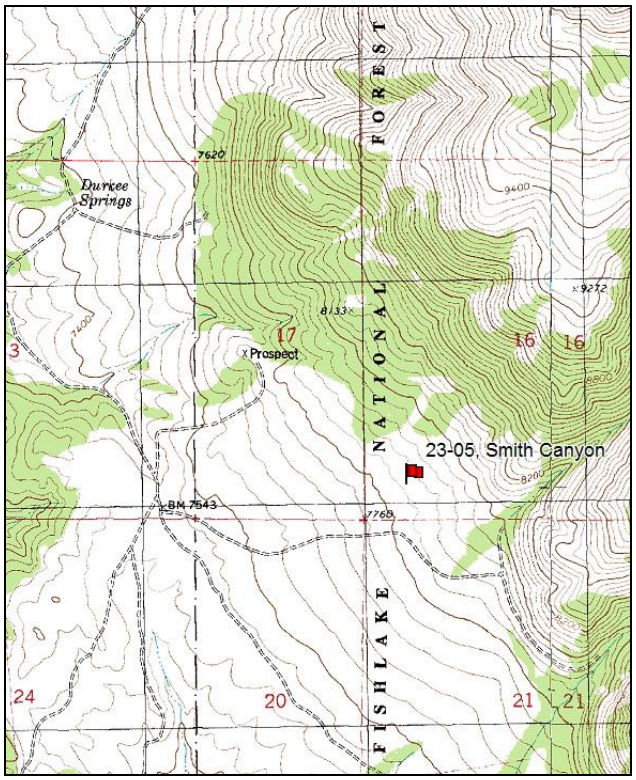
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**500**	36	64	0	20	0	0	0	10/13
03	**620**	0	81	19	-	29	16	16	12/15
08	**320**	0	100	0	-	6	0	0	6/10
12	**500**	16	84	0	-	0	0	0	8/15
Juniperus osteosperma									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	-/-
03	**40**	0	0	100	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Kochia prostrata									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**40**	0	100	-	-	50	0	0	18/29
08	**1200**	28	72	-	560	3	90	0	8/17
12	**3160**	44	56	-	80	5	0	0	8/16
Opuntia sp.									
85	**199**	0	100	-	-	0	0	0	6/10
91	**332**	40	60	-	-	0	0	0	6/13
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	6/14
08	**0**	0	0	-	-	0	0	0	5/14
12	**0**	0	0	-	-	0	0	0	6/19
Sambucus cerulea									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**0**	0	0	0	-	0	0	0	-/-
03	**20**	0	100	0	-	0	0	0	48/43
08	**20**	0	100	0	-	0	0	0	69/72
12	**120**	17	67	17	-	0	0	17	40/46
Tetradymia canescens									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	43/104

SMITH CANYON - TREND STUDY NO. 23-5-12

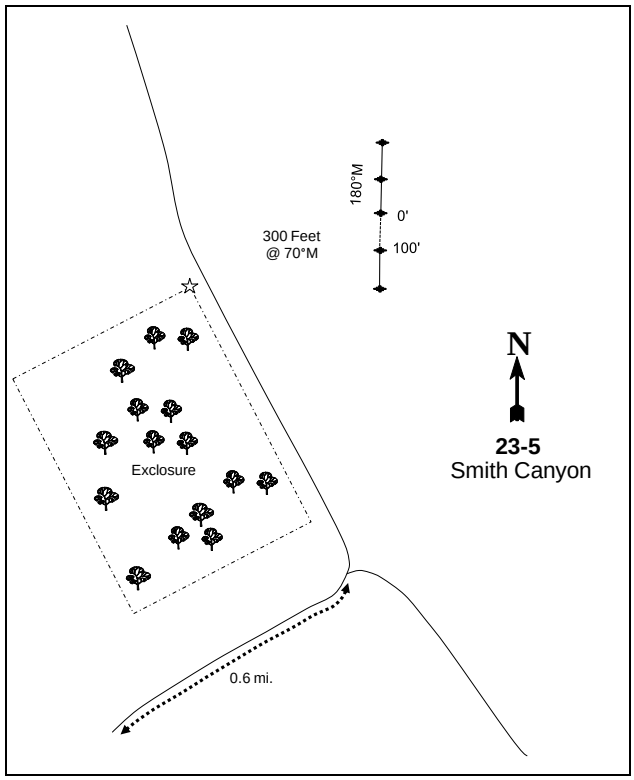
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: USFS
Elevation: 7,830 ft (2,387 m)
Aspect: Southwest
Slope: 5%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

Directions:
From the intersection of Main Street (SR89) and Center Street in Marysvale, turn east and proceed 0.7 miles, crossing a bridge. At a three-way split in the road, stay left and continue 1.9 miles. Keep right and go 0.8 miles. Keep right at the split, then go immediately right again. Proceed another 0.8 miles and make a left turn. Go 2.75 miles up this road to a "T" intersection. Turn right and go 1.0 miles to a cattleguard. Turn hard left here and drive 0.1 miles, then right 0.6 miles to an exclosure. Turn north (left) and go along the east side of a cattle exclosure. From the northeast corner of the exclosure, walk 300 feet at 70 degrees (in line with the north side fence) to the start of the baseline. The 0-foot end is marked by a fencepost with a browse tag #7043 attached.

Map Name: Marysvale



Diagrammatic Sketch:



Township: 27S Range: 2.5W Section: 16

GPS: NAD 83, UTM 12S 401130 E 4257287 N

SMITH CANYON - TREND STUDY NO. 23-5

Site Information

Site Description: The study is located approximately five miles west of Marysvale within a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) flat. The land is administrated by the U.S. Forest Service (USFS) and is in the Marysvale Peak Allotment. It was chained and seeded in the past, and it also burned in the Black Bird Mine WFU wildfire in 2006 which burned 1,464 acres in the area. Following the fire, the burned area was aerially seeded (Table - Seed Mix) in July of 2006 as part of the Monroe Mountain Burn Stabilization project (WRI Project# 598) (WRI Database 2013). Wildlife use the area in the winter, but tracks and sightings indicate use is common year-round. Pellet group data collected along the Division of Wildlife Resources Smith Canyon transect showed on average deer pellet groups sampled in high abundance, which was greater than any other transects on the unit (Jense et al. 1985; Jense et al. 1991). Deer pellet groups were sampled on the site in high abundance in 1998 and 2003; and were sampled in moderate abundance in 2008 and 2012. Elk pellet groups have been sampled in low abundance on the site since 1998. Cattle sign has been sampled in low abundance on the site since 1998, though abundance was more moderate in 2012 (Table - Pellet Group Data).

Browse: Prior to the fire, the browse component consisted of mainly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), with an overstory of scattered Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*), Gambel oak (*Quercus gambelii*), and curlleaf mountain mahogany (*Cercocarpus ledifolius*). The fire removed most of the browse component, but sagebrush has since increased substantially on the site. Sagebrush consists of a moderately dense, young population with low decadence and good vigor within the population. The recruitment of young sagebrush plants to the population has been good following the fire. A small population of mature bitterbrush plants has been sampled on the site following the fire, though the majority of the bitterbrush plants were removed by the fire (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is in poor condition. Grasses are dominated by the invasive annual grass species cheatgrass (*Bromus tectorum*), which has provided the majority of the grass cover on the site since 1998. Perennial grass species are rare on the site. Forbs are not very abundant or overly diverse on the site. Perennial forbs are not abundant. The dominant forb species is pale alyssum (*Alyssum alyssoides*). Silvery lupine (*Lupinus argenteus*), redroot eriogonum (*Eriogonum racemosum*), and longleaf phlox (*Phlox longifolia*) have been the most common perennial forbs. Annual stickseed (*Lappula occidentalis*) and tumblemustard (*Sisymbrium altissimum*) became abundant after the fire. Seeded species such as Lewis flax (*Linum lewisii*) and alfalfa (*Medicago sativa*) were present and vigorous in 2008, but were rarely sampled. (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a moderately acidic soil reaction (pH 5.9) (Table - Soil Analysis Data). Bare ground cover is low, though there is a high amount of litter, vegetation, and pavement providing protective ground cover (Table - Basic Cover). The erosion condition class was classified as stable in 2003, 2008, and 2012. In 2008, signs of severe erosion were noted just off of the study on the steeper slopes to the northeast.

Trend Assessments

Browse:

- **1985 to 1991 - slightly up (+1):** Sagebrush density increased from 6,066 plants/acre to 7,199 plants/acre, and decadence decreased slightly from 26% of the population to 22%. Young recruitment decreased from 11% of the population to 2%, and plants displaying poor vigor also slightly decreased from 15% of the population to 12%. Bitterbrush density increased from 1,066 plants/acre to 1,332

plants/acre. However, decadence increased from 0% of the population to 55%, and young recruitment decreased from 19% of the population to 5%. Vigor remained excellent.

- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence slightly decreased from 22% of the population to 18%, and young recruitment remained low at 4%. Plants exhibiting poor vigor decreased from 12% of the population to 5%. Bitterbrush decadence decreased from 55% of the population to 8%, and young recruitment increased from 5% of the population to 15%. Vigor remained good on all sampled plants.
- **1998 to 2003 - down (-2):** Sagebrush density decreased 12%, and decadence increased from 18% of the population to 41%. Young recruitment remained very low at 1% of the population, and plants displaying poor vigor remained relatively stable at 7% of the population. Bitterbrush density decreased 15%, and decadence increased from 8% of the population to 58%. No young plants were sampled, and vigor declined, with 35% of the population showing poor vigor.
- **2003 to 2008 - down (-2):** Due to the fire, sagebrush density decreased 68%. However, the age structure of the remaining population was favorable, with 33% young and 67% mature plants. Bitterbrush density was reduced 88%, and the remaining population was 17% young and 83% mature. No sagebrush or bitterbrush seedlings were sampled.
- **2008 to 2012 - up (+2):** Sagebrush density increased substantially to 17,240 plants/acre, and cover increased from 1% to 12%. Young recruitment increased substantially and consisted of the majority of the population at 90%. Sagebrush decadence and plants displaying poor vigor remained low within the population. Bitterbrush density remained similar at 120 plants/acre, and decadence and plants displaying poor vigor remained low within the population.

Grass:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 13%, and mutton bluegrass increased significantly in nested frequency.
- **1991 to 1998 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 18%. Mutton bluegrass and bottlebrush squirreltail decreased significantly in nested frequency.
- **1998 to 2003 - down (-2):** The sum of nested frequency for perennial grasses decreased 43%. Bluebunch wheatgrass decreased significantly in nested frequency, while cheatgrass increased significantly in nested frequency.
- **2003 to 2008 - down (-2):** The sum of nested frequency for perennial grasses decreased 74%. Bluebunch wheatgrass, bottlebrush squirreltail, and cheatgrass decreased significantly in nested frequency. However, cheatgrass quadrat frequency remained high at 99%.
- **2008 to 2012 - stable (0):** The sum of nested frequency for perennial grasses increased slightly. Cheatgrass increased significantly in nested frequency and cover increased from 18% to 31%.

Forb:

- **1985 to 1991 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 23%, and redroot eriogonum increased significantly in nested frequency.
- **1991 to 1998 - down (-2):** The sum of nested frequency for perennial forbs decreased 53%. Redroot eriogonum, longleaf phlox, and silvery lupine decreased significantly in nested frequency, while that for Utah deervetch (*Lotus utahensis*) increased significantly.
- **1998 to 2003 - down (-2):** The sum of nested frequency for perennial forbs decreased 47%. Utah deervetch decreased significantly in nested frequency, while annuals such as slender phlox (*Microsteris gracilis*) and blue-eyed Mary (*Collinsia parviflora*) increased significantly in nested frequency.
- **2003 to 2008 - stable (0):** The sum of nested frequency for perennial forbs changed little. Redroot eriogonum and pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency.
- **2008 to 2012 - stable (0):** The sum of nested frequency for perennial forbs changed little. Pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 23, 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
98	30.0	10.2	3.2	10.0	-7.9	5.1	0.0	**50.6**	Poor-Fair
03	30.0	8.5	0.4	3.0	-13.0	2.4	0.0	**31.4**	Very Poor
08	1.0	0.0	0.0	2.4	-13.6	10.0	0.0	**-0.3**	Very Poor
12	14.5	14.7	15.0	1.4	-20.0	1.5	0.0	**27.1**	Very Poor

Trend Summary

SEED MIX--
Management unit 23, Study no: 5

Project Name: Monroe Mountain Burn Stabilization WRI Database #: 598			
Application: Broadcast seed		Acres:	1400
Seed type		lbs in mix	lbs/acre
G	Big Bluegrass 'Sherman'	700	0.50
G	Canby Bluegrass 'Canbar'	694	0.50
G	Orchardgrass 'Paiute'	700	0.50
G	Pubescent Wheatgrass	1400	1.00
G	Sandberg Bluegrass 'Toole MT'	700	0.50
G	Slender Wheatgrass	1008	0.72
G	Thickspike Wheatgrass 'Bannock'	1400	1.00
G	Timothy 'Climax'	200	0.14
G	Timothy VNS	500	0.36
Total Pounds:		7302	5.22
PLS Pounds:			4.59

HERBACEOUS TRENDS--
Management unit 23, Study no: 5

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron spicatum	$_{c}$179	$_{c}$176	$_{c}$195	$_{b}$75	$_{a}$28	$_{ab}$38	4.20	.58	.92	.64
G	Bromus tectorum (a)	-	-	$_{a}$305	$_{b}$342	$_{a}$313	$_{c}$367	10.56	17.33	18.14	30.71
G	Hilaria jamesii	-	-	3	-	-	-	.15	-	-	-
G	Poa fendleriana	$_{ab}$58	$_{c}$78	$_{b}$28	$_{ab}$32	$_{a}$5	$_{ab}$6	.25	.33	.06	.04
G	Poa secunda	-	-	6	7	-	-	.01	.21	-	-
G	Sitanion hystrix	$_{cd}$47	$_{d}$64	$_{bc}$28	$_{b}$36	$_{ab}$6	$_{a}$1	.22	.35	.21	.03
G	Stipa comata	-	4	5	1	-	-	.18	.00	-	-
Total for Annual Grasses		0	0	305	342	313	367	10.56	17.33	18.14	30.71
Total for Perennial Grasses		284	322	265	151	39	45	5.02	1.48	1.19	0.72
Total for Grasses		284	322	570	493	352	412	15.59	18.82	19.34	31.43
F	Agoseris glauca	-	6	-	7	-	-	.00	.01	-	-
F	Alyssum alyssoides (a)	-	-	$_{a}$3	$_{ab}$11	$_{b}$37	$_{c}$161	.00	.07	.36	4.11
F	Arabis sp.	-	4	3	-	-	-	.00	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
F	Astragalus convallarius	17	6	9	10	1	12	.19	.16	.03	.09
F	Astragalus sp.	-	12	3	2	3	3	.01	.03	.00	.01
F	Balsamorhiza sagittata	-	5	2	-	-	1	.01	-	.00	.03
F	Calochortus nuttallii	$_{a}$-	$_{b}$9	$_{ab}$1	$_{a}$-	$_{ab}$5	$_{a}$-	.00	-	.02	-
F	Chaenactis douglasii	-	-	5	-	-	-	.01	-	-	-
F	Collinsia parviflora (a)	-	-	$_{a}$2	$_{b}$82	$_{b}$53	$_{a}$7	.00	.69	.10	.01
F	Comandra pallida	5	5	1	4	-	-	.03	.03	-	-
F	Crepis acuminata	$_{ab}$4	$_{b}$14	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
F	Cryptantha nana	3	-	-	-	-	1	-	-	-	.03
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$7	$_{b}$15	-	-	.33	.02
F	Erigeron eatonii	-	-	-	-	-	1	-	-	-	.00
F	Eriogonum racemosum	$_{ab}$20	$_{c}$59	$_{ab}$21	$_{a}$9	$_{bc}$41	$_{bc}$46	.29	.12	1.90	.53
F	Eriogonum umbellatum	$_{a}$-	$_{a}$-	$_{ab}$3	$_{b}$11	$_{a}$-	$_{ab}$2	.00	.08	-	.00
F	Gayophytum ramosissimum(a)	-	-	-	-	3	3	-	-	.01	.00
F	Lactuca serriola (a)	-	-	-	-	-	1	-	-	-	.00
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$65	$_{b}$41	-	-	1.08	.08
F	Linum lewisii	-	-	-	-	-	-	-	-	.03	-
F	Lithospermum ruderale	-	-	-	-	4	4	-	-	.33	.03
F	Lotus utahensis	$_{a}$-	$_{a}$1	$_{b}$16	$_{a}$1	$_{a}$-	$_{a}$-	.30	.00	.00	-
F	Lupinus argenteus	$_{b}$74	$_{b}$46	$_{a}$18	$_{a}$6	$_{a}$7	$_{a}$-	1.55	.76	2.76	.03
F	Microsteris gracilis (a)	-	-	$_{a}$11	$_{b}$170	$_{a}$-	$_{a}$-	.02	2.63	-	-
F	Phlox longifolia	$_{bc}$42	$_{bc}$50	$_{ab}$21	$_{a}$3	$_{a}$-	$_{a}$2	.11	.00	-	.00
F	Polygonum douglasii (a)	-	-	-	-	-	1	-	-	-	.00
F	Sisymbrium altissimum (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$14	$_{b}$19	-	-	1.92	.06
F	Sphaeralcea coccinea	-	3	-	-	-	-	-	-	-	-
F	Streptanthus cordatus	4	2	1	2	1	-	.00	.00	.01	-
F	Tragopogon dubius (a)	-	-	-	-	-	1	-	-	-	.00
F	Wyethia amplexicaulis	$_{b}$11	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
Total for Annual Forbs		0	0	16	263	179	249	0.02	3.40	3.83	4.31
Total for Perennial Forbs		180	222	104	55	62	72	2.53	1.22	5.11	0.77
Total for Forbs		180	222	120	318	241	321	2.56	4.62	8.94	5.08

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

BROWSE TRENDS--
Management unit 23, Study no: 5

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Artemisia tridentata vaseyana	88	88	28	80	24.61	24.54	.78	11.46
B	Chrysothamnus nauseosus albicaulis	1	0	1	2	-	-	-	.03
B	Chrysothamnus viscidiflorus viscidiflorus	2	0	0	0	-	-	-	-
B	Eriogonum microthecum	2	0	0	4	-	-	-	.00
B	Purshia tridentata	0	0	0	0	6.61	3.71	.00	.06
B	Symphoricarpos oreophilus	0	0	0	0	-	-	.03	-
Total for Browse		93	88	29	86	31.22	28.26	0.81	11.55

CANOPY COVER, LINE INTERCEPT--
Management unit 23, Study no: 5

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	28.85	1.01	14.83
Chrysothamnus nauseosus albicaulis	-	.10	.38
Purshia tridentata	5.46	.03	.60
Symphoricarpos oreophilus	.10	-	-

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23, Study no: 5

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.7	5.3	2.3
Purshia tridentata	3.2	-	2.3

BASIC COVER--
Management unit 23, Study no: 5

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	8.00	4.25	40.73	49.27	35.97	49.93
Rock	1.00	1.25	2.75	2.19	4.04	1.03
Pavement	18.50	8.75	12.96	16.32	36.84	18.13
Litter	68.25	73.25	54.14	45.69	29.92	39.82
Cryptogams	.75	1.25	.12	.03	0	.00
Bare Ground	3.50	11.25	13.71	10.39	7.83	5.15

SOIL ANALYSIS DATA --

Management unit 23, Study no: 5, Smith Canyon

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.9	5.9	54.0	29.4	16.6	3.5	21.9	281.6	0.4

PELLET GROUP DATA--
Management unit 23, Study no: 5

Type	Quadrat Frequency			
	'98	'03	'08	'12
Rabbit	26	3	16	1
Elk	-	-	4	3
Deer	34	27	25	12
Cattle	3	-	3	5

Days use per acre (ha)			
'98	'03	'08	'12
-	-	-	-
1 (2)	7 (17)	9 (22)	8 (20)
112 (277)	139 (344)	25 (61)	23 (58)
14 (35)	3 (7)	12 (30)	18 (45)

BROWSE CHARACTERISTICS--
Management unit 23, 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)
Amelanchier utahensis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	24/17
03	**0**	0	0	-	-	0	0	0	9/9
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	7/13
Artemisia tridentata vaseyana									
85	**6064**	11	63	26	66	54	11	15	24/27
91	**7198**	2	76	22	-	50	3	12	22/30
98	**3860**	4	79	18	-	46	7	5	32/44
03	**3400**	1	58	41	-	26	5	7	31/39
08	**1100**	33	67	0	-	0	0	0	13/15
12	**17240**	90	9	0	5260	.23	.23	.11	19/32
Chrysothamnus nauseosus albicaulis									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**20**	0	0	100	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**20**	0	100	0	-	0	0	0	14/20
12	**60**	33	67	0	-	0	0	0	17/24
Chrysothamnus viscidiflorus viscidiflorus									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	0	100	-	-	0	50	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	15/22
12	**0**	0	0	-	-	0	0	0	12/21

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Eriogonum microthecum									
85	**0**	0	0	-	-	0	0	0	-/-
91	**199**	67	33	-	-	0	33	0	1/2
98	**60**	67	33	-	-	0	33	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**100**	60	40	-	20	60	20	0	5/15
Opuntia sp.									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	5/11
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	5/11
Pinus edulis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**20**	100	0	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Purshia tridentata									
85	**1065**	19	81	0	66	69	31	0	20/27
91	**1332**	5	40	55	-	15	80	0	13/20
98	**1220**	15	77	8	-	26	67	0	20/37
03	**1040**	0	42	58	-	15	79	35	19/39
08	**120**	17	83	0	-	33	17	0	10/24
12	**120**	0	100	0	-	0	100	0	10/29
Quercus gambelii									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	28/26
12	**0**	0	0	-	-	0	0	0	-/-
Sclerocactus sp.									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**80**	0	25	75	-	0	75	0	-/-
03	**0**	0	0	0	-	0	0	0	-/-
08	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-

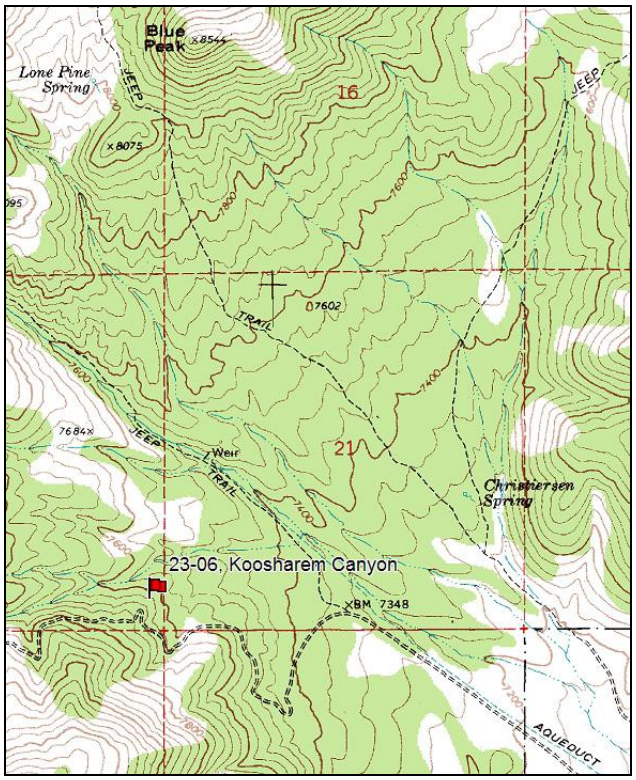
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus									
85	**0**	0	0	0	-	0	0	0	-/-
91	**66**	100	0	0	-	0	100	0	-/-
98	**20**	0	100	0	-	0	0	0	13/28
03	**60**	0	67	33	-	0	0	33	8/14
08	**20**	0	100	0	-	0	0	0	13/25
12	**20**	0	100	0	-	100	0	0	12/29
Tetradymia canescens									
85	**133**	100	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	0	0	11/13
08	**20**	0	100	-	-	0	0	0	13/16
12	**20**	0	100	-	-	0	100	0	8/30

KOOSHAREM CANYON - TREND STUDY NO. 23-6-12

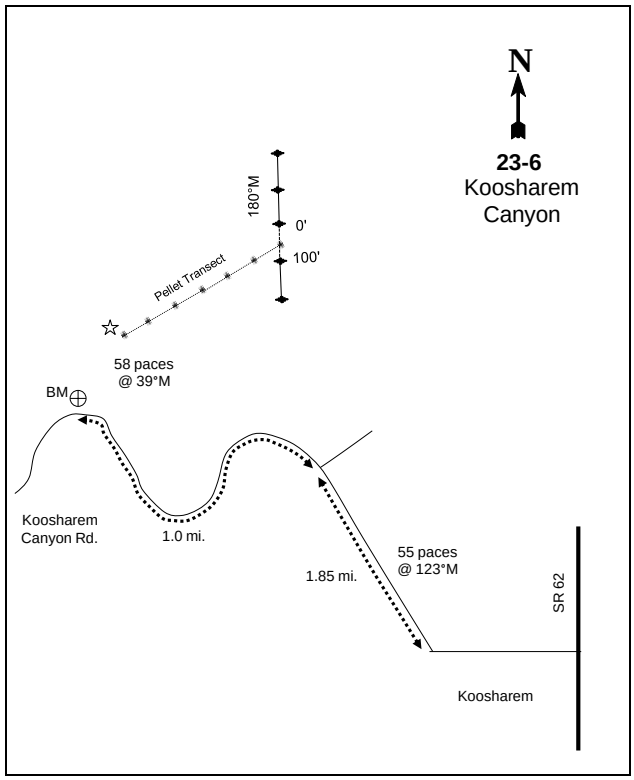
Vegetation Type: Mix Mountain Brush
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R028AY431UT
Land Ownership: USFS
Elevation: 7,200 ft (2,195 m)
Aspect: North
Slope: 26%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft)

Directions:
From the intersection next to the Koosharem LDS Ward Building go west 0.35 miles up the Koosharem Mountain Road. Bear right and go 0.05 miles to a fork. Take the left fork over a small bridge and proceed 1.85 miles to another fork. Turn left and go just over 1.0 mile to a hairpin turn that curves to the left. Stop at the apex of the curve. There is a benchmark here on the north side of the road. Take a bearing of 39 degrees and go 58 feet from the benchmark to find a short yellow rebar that marks a pellet group transect. From the first stake, the pellet group transect runs northeast (62-67 degrees) with stakes at intervals of about 50-60 feet. Count down 7 stakes, then go due north 50 feet to the baseline starting point. The 0-foot end of the baseline is marked by a steel rebar with browse tag #7042 attached. The baseline runs due south, crossing the pellet group transect.

Map Name: Koosharem



Diagrammatic Sketch:



Township: 26S Range: 1W Section: 20

GPS: NAD 83, UTM 12S 419491 E 4264909 N

KOOSHAREM CANYON - TREND STUDY NO. 23-6

Site Information

Site Description: The study is located approximately two miles northwest of Koosharem within a mixed pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) hillside. The land is administrated by the U.S. Forest Service (USFS) and is in the Koosharem allotment. Wildlife use appears to be year-round. Data collected on the nearby Division of Wildlife Resources (DWR) pellet group transect sampled a moderate amount of deer pellet groups from 1981-1991 (Jense et al. 1985 and Jense et al. 1991). Deer pellet groups have been sampled on the study in high abundance since 1998. Elk pellet groups were sampled in moderate abundance in 1998 and low abundance in 2003, 2008, and 2012. Cattle sign has been sampled in low abundance since 1998 (Table - Pellet Group Data).

Browse: Preferred browse is diverse and abundant. The majority of the preferred browse cover is comprised of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and true mountain mahogany (*Cercocarpus montanus*) (Table - Browse Trends). The mountain big sagebrush is a dense, moderately used population with high decadence and poor vigor within the population. The recruitment of young sagebrush plants to the population has been poor over the sample years. Mahogany is a scattered, heavily used population with low decadence and poor vigor within the population, though vigor has been fairly low in the early sample years. The recruitment of young mahogany plants to the population has been good over the sample year with the exception of 2003. Utah serviceberry (*Amelanchier utahensis*), antelope bitterbrush (*Purshia tridentata*), dwarf rabbitbrush (*Chrysothamnus depressus*), slenderbush eriogonum (*Eriogonum microthecum*), and Gambel oak (*Quercus gambelii*) are also present, although found in smaller densities. Antelope bitterbrush was first sampled in 1998 (Table - Browse Characteristics). Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees are also scattered across the area in low density (Table - Point-Quarter Tree Data).

Herbaceous Understory: Grasses are abundant and diverse on the site. Mutton bluegrass (*Poa fendleriana*) and sedge (*Carex* sp.) were the most abundant species, but other commonly sampled species included bottlebrush squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), and western wheatgrass (*Agropyron smithii*). Cheatgrass (*Bromus tectorum*) is rare on the site. Forbs are diverse, but provide little cover. Some of the more common species include longleaf phlox (*Phlox longifolia*), scarlet globemallow (*Sphaeralcea coccinea*), clover (*Trifolium sp.*), dusty penstemon (*Penstemon comarrhenus*), and sulphur eriogonum (*Eriogonum umbellatum*) (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 a slightly acidic soil reaction (pH 6.5) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of litter, vegetation, and rock providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable-slight in 2003, slight in 2008, and moderate in 2012.

Trend Assessments

Browse:

- **1985 to 1991 - down (-2):** Sagebrush density decreased from 7,599 plants/acre to 5,732 plants/acre . Decadence increased from 21% to 65%, and young recruitment decreased from 40% to 9%. Plants with poor vigor increased from 6% to 31%. True mountain mahogany density decreased from 1,066 plants/acre to 666 plants/acre. Decadence was at 0%, and young recruitment remained very high at 50% of the population. Vigor remained excellent. Serviceberry density decreased from 599 plants/acre to 332 plants/acre. Decadence increased from 0% to 20%, although young recruitment remained very high at 80%. Vigor remained good on all sampled plants.

- **1991 to 1998 - stable (0):** Differences in density may be related to the larger sample area used in 1998; therefore, trend was determined using other parameters. Sagebrush decadence decreased from 65% of the population to 26%, and young recruitment remained stable at 9%. Plants displaying poor vigor decreased from 31% of the population to 2%. True mountain mahogany decadence increased from 0% to 9%, and young recruitment decreased from 50% to 13%. The majority of the sampled plants remained vigorous. Serviceberry decadence decreased from 20% of the population to 0%. Young recruitment decreased, but remained favorable at 33% of the population. Plant vigor remained good.
- **1998 to 2003 - stable (0):** Sagebrush density increased 29%, however, decadence also increased from 26% of the population to 33%. Young recruitment decreased from 9% of the population to 3%, and vigor remained good on most plants. True mountain mahogany density increased 12%, and decadence remained relatively stable at 8% of the population. Young recruitment decreased from 13% of the population to 4%. Plants displaying poor vigor increased from 1% of the population to 8%. Serviceberry density decreased 42%, and decadence increased from 0% of the population to 29%. No young plants were sampled, and vigor declined, with 29% of the population showing poor vigor. Bitterbrush density remained relatively stable, and vigor remained excellent.
- **2003 to 2008 - stable (0):** Sagebrush density remained relatively similar at 4,440 plants/acre, but decadence increased from 33% of the population to 54%. Young recruitment increased from 3% of the population to 9%. Plants displaying poor vigor increased from 7% of the population to 48%. True mountain mahogany density increased 30%, but decadence also increased from 8% of the population to 28%. Young recruitment increased from 4% of the population to 22%, and plants exhibiting poor vigor slightly increased from 8% of the population to 10%. Serviceberry density decreased 71%, but all of the sampled plants were young and vigorous. Bitterbrush density remained similar at 200 plants/acre, but decadence increased from 0% of the population to 60%. Plants were classified with poor vigor for the first time, at 40% of the population.
- **2008 to 2012 - stable (0):** Sagebrush density remained relatively similar at 4,180 plants/acre, but decadence decreased to 24% of the population. Young recruitment increased remained poor at 5% of the population. Plants displaying poor vigor decreased to 20% of the population. True mountain mahogany density decreased 17%, but decadence also decreased to 8% of the population. Young recruitment remained good at11% of the population, and plants exhibiting poor vigor increased to 22% of the population. Bitterbrush density remained similar at 180 plants/acre, and decadence decreased to 11% of the population.

Grass:
- **1985 to 1991 - slightly up (+1):** The sum of nested frequency for perennial grasses increased 19%. Mutton bluegrass, bluebunch wheatgrass, and bottlebrush squirreltail increased significantly in nested frequency, while that for sedge decreased significantly.
- **1991 to 1998 - down (-2):** The sum of nested frequency for perennial grasses decreased 35%. Sedge, bottlebrush squirreltail, and western wheatgrass decreased significantly in nested frequency.
- **1998 to 2003 - down (-2):** The sum of nested frequency for perennial grasses decreased 24%, and sedge decreased significantly in nested frequency.
- **2003 to 2008 - up (+2):** The sum of nested frequency for perennial grasses increased 42%, and sedge increased significantly in nested frequency.
- **2008 to 2012 - stable (0):** The sum of nested frequency for perennial grasses remained similar.

Forb:
- **1985 to 1991 - up (+2):** The sum of nested frequency for perennial forbs increased 63%. Longleaf phlox, clover, and sulfur eriogonum increased significantly in nested frequency.
- **1991 to 1998 - down (-2):** The sum of nested frequency for perennial forbs decreased 82%. Longleaf phlox, clover, and sulfur eriogonum decreased significantly in nested frequency. Forb species are very rare on the site.
- **1998 to 2003 - stable (0):** Forb species remained rare on the site.

- **2003 to 2008 - stable (0):** Forb species remained rare on the site.
- **2008 to 2012 - stable (0):** Forb species remained rare on the site.

DEER DESIRABLE COMPONENTS INDEX - MID POTENTIAL SCALE --
Management unit 23, 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
98	30.0	9.1	6.7	25.2	0.0	0.5	0.0	**71.5**	Good
03	30.0	8.5	3.7	13.7	0.0	0.2	0.0	**56.1**	Fair
08	27.0	1.9	6.7	17.4	0.0	1.2	0.0	**54.1**	Fair
12	30.0	10.4	4.0	19.6	0.0	0.2	0.0	**64.2**	Fair-Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 23, Study no: 6

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
G	Agropyron smithii	a-	b24	a5	a5	ab22	ab19	.03	.01	.04	.11
G	Agropyron spicatum	a10	b49	ab32	a21	ab25	ab27	.83	.76	.93	.84
G	Bouteloua gracilis	-	-	2	-	-	2	.00	-	-	.03
G	Bromus tectorum (a)	-	-	-	1	-	-	-	.00	-	-
G	Carex sp.	d221	c179	b109	a54	a120	b118	2.02	1.37	1.96	1.41
G	Oryzopsis hymenoides	-	8	18	14	10	16	.70	.22	.78	.60
G	Poa fendleriana	a176	c183	bc138	abc138	bc146	ab106	8.00	3.93	4.04	4.82
G	Sitanion hystrix	a58	b110	a56	a32	a50	a49	.98	.33	.77	.80
G	Stipa lettermani	a-	a-	a-	a8	ab13	b26	-	.24	.16	1.19
Total for Annual Grasses		0	0	0	1	0	0	0	0.00	0	0
Total for Perennial Grasses		465	553	360	272	386	363	12.58	6.87	8.69	9.81
Total for Grasses		465	553	360	273	386	363	12.58	6.88	8.69	9.81
F	Agoseris glauca	-	6	-	-	-	-	-	-	-	-
F	Androsace septentrionalis (a)	-	-	b14	a-	a2	ab7	.06	-	.00	.05
F	Antennaria rosea	1	3	-	6	-	-	-	.03	-	-
F	Arabis sp.	a-	a-	ab3	a-	b10	a-	.00	-	.02	-
F	Astragalus convallarius	-	-	-	-	5	-	-	-	.06	-
F	Astragalus lentiginosus	6	7	5	-	-	-	.03	-	-	-
F	Calochortus nuttallii	a-	b17	a-	a-	ab7	a-	-	-	.02	-
F	Castilleja chromosa	a-	b16	a-	a-	a-	a-	-	-	-	-
F	Crepis acuminata	ab3	b13	a-	a-	a-	a-	-	-	-	-
F	Cryptantha humilis	4	5	1	-	-	-	.03	-	-	-
F	Descurainia pinnata (a)	-	-	2	3	1	-	.00	.01	.00	.00
F	Erigeron eatonii	5	3	-	-	-	-	-	-	-	-
F	Eriogonum racemosum	-	-	4	-	3	-	.03	-	.09	-
F	Eriogonum umbellatum	a5	b16	a3	a-	a2	a-	.03	-	.00	-
F	Lappula occidentalis (a)	-	-	a-	b10	a-	a-	-	.02	-	-
F	Lomatium sp.	a-	b12	a-	a-	a-	a-	-	-	-	-

Type	Species	Nested Frequency						Average Cover %			
		'85	'91	'98	'03	'08	'12	'98	'03	'08	'12
F	Machaeranthera canescens	5	-	-	-	2	3	-	-	.00	.03
F	Penstemon comarrhenus	6	2	-	5	-	1	-	.06	-	.03
F	Penstemon watsonii	a-	a-	ab8	a-	b10	a-	.04	-	.22	-
F	Phlox longifolia	b40	c69	a7	a4	a15	a6	.01	.01	.07	.01
F	Potentilla gracilis	-	-	1	-	1	4	.03	-	.01	.00
F	Sphaeralcea coccinea	b28	ab17	a5	a-	a1	a2	.04	-	.00	.01
F	Taraxacum officinale	1	-	-	-	-	-	-	-	-	-
F	Tragopogon dubius (a)	-	-	1	-	-	2	.00	-	-	.00
F	Trifolium sp.	b21	c37	a2	a3	ab10	a-	.00	.00	.07	-
F	Unknown forb-perennial	5	-	-	-	-	-	-	-	-	-
F	Wyethia amplexicaulis	5	-	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	2	-	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	17	13	3	9	0.07	0.03	0.00	0.05
Total for Perennial Forbs		137	223	39	18	66	16	0.26	0.11	0.59	0.08
Total for Forbs		137	223	56	31	69	25	0.34	0.14	0.60	0.14

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

BROWSE TRENDS--
Management unit 23, Study no: 6

Type	Species	Strip Frequency				Average Cover %			
		'98	'03	'08	'12	'98	'03	'08	'12
B	Amelanchier utahensis	10	6	2	6	.36	.15	-	.18
B	Artemisia tridentata vaseyana	91	92	87	87	17.00	15.68	12.92	14.11
B	Cercocarpus montanus	45	50	61	49	6.75	8.14	5.97	8.85
B	Chrysothamnus depressus	5	6	10	4	.33	.03	.03	.03
B	Chrysothamnus viscidiflorus viscidiflorus	6	3	8	9	.03	.18	.04	.41
B	Eriogonum microthecum	15	17	16	15	.42	.34	.40	.89
B	Juniperus osteosperma	3	5	5	6	.00	.76	.68	1.37
B	Opuntia sp.	21	24	26	26	.23	.57	1.36	2.58
B	Pediocactus simpsonii	2	1	2	0	.01	.00	.03	-
B	Pinus edulis	3	3	2	3	.18	.33	.96	.68
B	Purshia tridentata	8	8	8	7	.16	.30	.21	1.38
B	Quercus gambelii	11	11	10	10	1.54	2.71	1.04	1.75
B	Symphoricarpos oreophilus	31	32	35	37	1.77	1.74	2.54	2.25
Total for Browse		251	258	272	259	28.80	30.96	26.20	34.52

CANOPY COVER, LINE INTERCEPT--
Management unit 23, Study no: 6

Species	Percent Cover		
	'03	'08	'12
Amelanchier utahensis	.13	.10	.70
Artemisia tridentata vaseyana	12.36	16.29	16.18
Cercocarpus montanus	8.06	12.81	11.26
Chrysothamnus viscidiflorus viscidiflorus	.25	.76	.96
Eriogonum microthecum	.31	.26	1.04
Juniperus osteosperma	1.68	2.36	2.45
Opuntia sp.	.26	1.33	1.81
Pinus edulis	1.31	1.53	1.73
Purshia tridentata	1.06	1.14	.91
Quercus gambelii	2.79	2.54	2.81
Symphoricarpos oreophilus	1.20	2.66	2.66

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23, Study no: 6

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata vaseyana	1.3	1.0	0.7
Cercocarpus montanus	2.9	3.5	0.6
Purshia tridentata	2.4	2.1	2.3

POINT-QUARTER TREE DATA--
Management unit 23, Study no: 6

Species	Trees per Acre			
	'98	'03	'08	'12
Juniperus osteosperma	42	39	45	63
Pinus edulis	30	51	45	52

Average diameter (in)			
'98	'03	'08	'12
2.5	5.6	5.0	4.1
2.8	3.1	3.3	2.7

BASIC COVER--
Management unit 23, Study no: 6

Cover Type	Average Cover %					
	'85	'91	'98	'03	'08	'12
Vegetation	9.25	5.25	37.37	37.10	40.31	42.02
Rock	11.25	10.25	9.54	12.19	11.87	9.32
Pavement	13.00	7.75	14.62	7.19	6.94	5.90
Litter	49.00	47.25	47.14	43.18	39.32	53.63
Cryptogams	0	.25	.00	.15	.03	.06
Bare Ground	17.50	29.25	23.75	19.78	21.29	16.49

SOIL ANALYSIS DATA --

Management unit 23, Study no: 6, Koosharem Canyon

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
16.2	6.5	40.0	25.4	34.6	4.2	26.8	243.2	0.6

PELLET GROUP DATA--
Management unit 23, Study no: 6

Type	Quadrat Frequency				Days use per acre (ha)			
	'98	'03	'08	'12	'98	'03	'08	'12
Rabbit	50	34	76	11	-	-	-	-
Elk	10	-	11	1	31 (77)	2 (5)	13 (31)	7 (17)
Deer	45	42	71	33	63 (156)	113 (279)	163 (403)	64 (159)
Cattle	1	-	-	-	5 (12)	1 (2)	4 (9)	1 (2)

BROWSE CHARACTERISTICS--
Management unit 23, 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 utahensis									
85	**599**	89	11	0	266	33	0	0	13/9
91	**332**	80	0	20	-	0	60	0	-/-
98	**240**	33	67	0	-	25	0	0	25/21
03	**140**	0	71	29	-	14	71	29	22/16
08	**40**	100	0	0	-	0	0	0	14/15
12	**120**	33	50	17	-	33	50	17	24/19
Artemisia tridentata vaseyana									
85	**7598**	40	39	21	1066	37	2	6	39/33
91	**5732**	9	26	65	-	56	6	31	31/26
98	**3420**	9	64	26	60	33	6	2	29/31
03	**4400**	3	64	33	-	32	10	7	24/27
08	**4440**	9	38	54	60	28	5	49	22/32
12	**4180**	5	71	24	320	35	21	20	26/34
Cercocarpus montanus									
85	**1065**	63	37	0	66	44	0	0	34/19
91	**666**	50	50	0	-	30	60	0	49/21
98	**1380**	13	78	9	-	49	23	1	33/37
03	**1520**	4	88	8	-	18	72	8	33/35
08	**1980**	22	49	28	-	39	27	10	30/35
12	**1640**	11	83	6	40	35	45	22	32/37
Chrysothamnus depressus									
85	**1599**	42	58	0	-	0	0	0	5/5
91	**1398**	5	10	86	-	0	100	0	2/3
98	**160**	0	100	0	-	63	0	0	3/10
03	**260**	0	100	0	-	38	54	0	6/9
08	**400**	20	75	5	-	20	15	5	5/7
12	**160**	13	88	0	-	0	75	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)
Chrysothamnus viscidiflorus viscidiflorus									
85	**266**	50	50	0	133	0	0	0	10/7
91	**0**	0	0	0	-	0	0	0	-/-
98	**140**	0	86	14	-	0	0	14	15/14
03	**60**	0	33	67	-	0	0	33	14/10
08	**200**	10	50	40	-	10	10	10	13/16
12	**260**	8	85	8	-	8	0	15	11/14
Coryphantha vivipara arizonica									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	2/3
Eriogonum microthecum									
85	**66**	0	100	0	66	0	0	0	7/4
91	**0**	0	0	0	-	0	0	0	-/-
98	**780**	21	79	0	-	3	0	0	10/12
03	**860**	2	91	7	-	0	2	5	7/7
08	**1060**	15	81	4	-	23	0	0	7/8
12	**680**	9	91	0	20	9	6	15	7/11
Juniperus osteosperma									
85	**465**	57	29	14	199	14	0	0	69/157
91	**332**	40	60	0	66	20	0	0	71/43
98	**60**	33	67	0	20	0	0	0	-/-
03	**100**	40	60	0	-	0	0	0	-/-
08	**100**	60	40	0	-	0	0	0	-/-
12	**160**	63	38	0	20	0	0	0	-/-
Mahonia repens									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**60**	0	100	-	-	0	0	0	4/7
03	**0**	0	0	-	-	0	0	0	-/-
08	**20**	0	100	-	-	0	0	0	2/4
12	**0**	0	0	-	-	0	0	0	-/-
Opuntia sp.									
85	**932**	14	86	0	-	0	0	0	7/10
91	**666**	0	0	100	-	40	0	80	-/-
98	**620**	16	84	0	20	0	0	13	6/14
03	**940**	2	98	0	-	0	0	0	4/9
08	**740**	3	92	5	-	0	0	14	6/16
12	**1260**	2	98	0	20	5	0	21	6/14

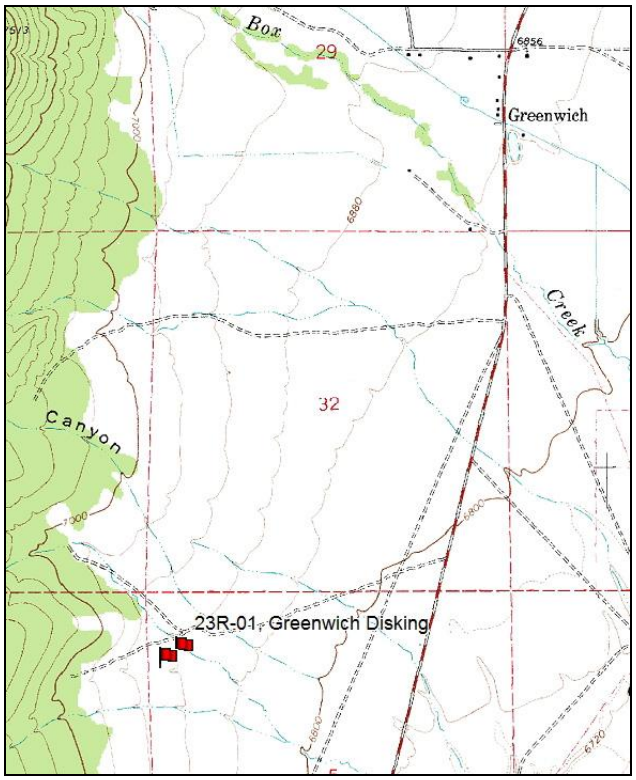
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	-	0	0	0	-/-
98	**40**	50	50	-	-	0	0	0	-/-
03	**20**	0	100	-	-	0	0	0	2/3
08	**40**	0	100	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Pinus edulis									
85	**0**	0	0	-	-	0	0	0	-/-
91	**0**	0	0	-	66	0	0	0	-/-
98	**60**	33	67	-	-	0	0	0	-/-
03	**60**	67	33	-	-	0	0	0	-/-
08	**40**	50	50	-	20	0	0	0	-/-
12	**60**	33	67	-	20	0	0	0	-/-
Purshia tridentata									
85	**0**	0	0	0	-	0	0	0	-/-
91	**0**	0	0	0	-	0	0	0	-/-
98	**180**	22	78	0	-	33	22	0	24/35
03	**200**	0	100	0	-	30	70	0	17/36
08	**200**	20	20	60	-	20	70	40	17/32
12	**180**	0	89	11	60	11	89	33	14/27
Quercus gambelii									
85	**732**	82	18	0	333	0	0	0	42/21
91	**665**	60	40	0	-	50	10	0	59/18
98	**960**	56	38	6	80	52	8	0	35/28
03	**940**	45	53	2	-	30	28	0	43/29
08	**1840**	17	63	20	-	47	16	9	43/33
12	**600**	20	77	3	-	13	57	27	36/32
Symphoricarpos oreophilus									
85	**1132**	53	47	0	199	0	0	0	14/10
91	**2465**	87	8	5	-	27	3	0	11/11
98	**1540**	38	61	1	20	17	0	0	12/19
03	**2240**	7	91	2	-	0	2	2	10/14
08	**2320**	23	50	27	360	22	.86	4	10/17
12	**2220**	16	83	1	20	20	3	7	9/12

GREENWICH DISKING - TREND STUDY NO. 23R-1-12

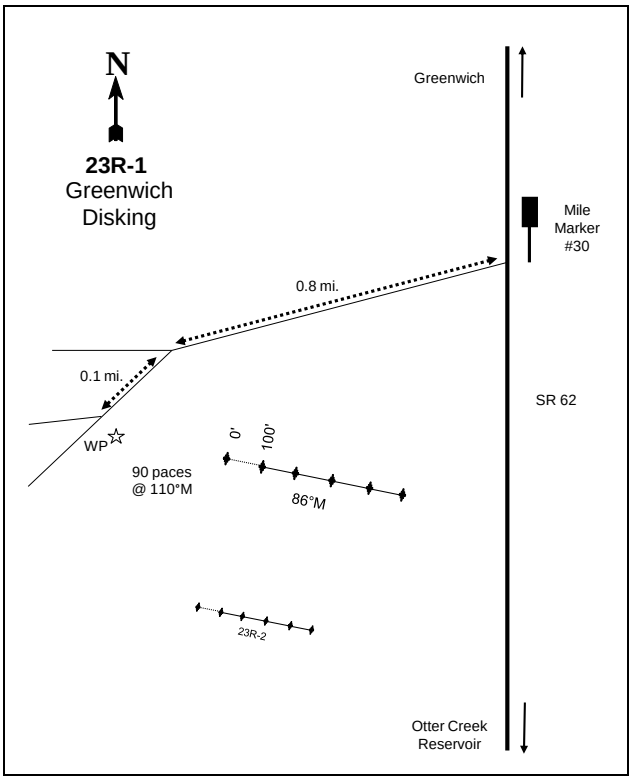
Vegetation Type: Wyoming Big Sagebrush
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Semidesert Loam (Wyoming Big Sagebrush), R047XB222UT
Land Ownership: BLM
Elevation: 6,870 ft (2,094 m)
Aspect: Southeast
Slope: 7%
Transect bearing: 86° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft)

Directions:
Start on Highway 62 between Greenwich and Otter Creek Reservoir. At mile marker 30 there is a road going west. Take this road for 0.8 miles to a fork. Stay right and go 0.1 mile to a witness post on the left (south) side of the road. Walk 90 paces at 110 degrees magnetic into the disking to the 0-foot stake. The study is marked with green, steel fenceposts approximately 12-18 inches in height.

Map Name: Greenwich



Diagrammatic Sketch:



Township: 28S Range: 1W Section: 5

GPS: NAD 83, UTM 12S 417968 E 4251602 N

GREENWICH DISKING - TREND STUDY NO. 23R-1

Site Description

Site Information: The study is located on big game winter range, two miles southwest of Greenwich and west of Highway 62, on land administered by the Bureau of Land Management (BLM). The study is located in the North Narrows allotment. The study was established in 1997 to monitor the effects of a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) disking and seeding treatment. The area was treated during the fall of 1996, prior to study establishment, to enhance herbaceous vegetation. Long narrow areas were disked (200 ft to 300 ft in width) and seeded leaving large areas of undisturbed sagebrush. After the first year, seeded perennial grasses, forbs, and shrubs were observed growing in the treated strips. The site was reread in 2003 and browse species were not growing within the strips and cutleaf nightshade (*Solanum triflorum*) was nearly the only herbaceous species encountered. The study site was reread in 2004 prior to an additional treatment project. Greenwich Native trend study 23R-2 was established as a control in 1997 and the vegetation composition had overly mature sagebrush with little understory vegetation. In November of 2004, a second project (Narrows Project) was undertaken to establish grass, forb, and browse species on the previous treated areas and untreated areas. The Greenwich Disking site was broadcasted seeded with grass, forb, and browse species, and then one-way harrowed in the previous strips left from the disking treatment in 1996. As part of the Narrows Project a portion of the Greenwich Native study site was two-way harrowed and seeded with grass, forb, and browse species. The seed was applied after the first pass of the harrow (Table - Seed Mix). A total of 3,600 acres were treated. Elk pellet groups have been sampled in low abundance since 1997. Deer pellet group were sampled in minimal abundance in 1997, 2004, and 2012. Cattle sign was sampled in low abundance in 2003, 2004, and 2012. Rabbit pellet group quadrat frequency has been high since 2003 (Table - Pellet Group Data). For the purposes of this study the 2004 data was omitted from the tables and trends.

SEED MIX--
Management unit 23R, Study no: 1

Project Name: Narrows Project								
Application: Broadcast Seeder		Acres:	3,600	Application: Broadcast Seeder		Acres:	1,100
Seed type		lbs in mix	lbs/acre	Seed type		lbs in mix	lbs/acre
G	*Basin Wildrye	1800	0.50	B	*Forage Kochia 'Immigrant'	1100	1.00
G	*Crested Wheatgrass	3600	1.00	B	Sagebrush, Wyoming	550	0.50
G	*Indian Ricegrass	2550	0.71	Total Pounds:		1650	1.50
G	*Pubescent Wheatgrass	7200	2.00				
G	*Russian Wildrye	3600	1.00				
G	*Sandberg Bluegrass	3600	1.00				
G	*Sheep Fescue	3600	1.00				
F	*Lewis Flax	3550	0.99				
F	*Small Burnet	7200	2.00				
F	*Yellow Sweetclover	3600	1.00				
F	Alfalfa 'Ladak+'	5400	1.50				
F	Annual Sunflower	150	0.04				
F	Cicer Milkvetch 'Lutana'	525	0.15				
F	Prickly Lettuce	48	0.01				
F	Sainfoin	5400	1.50				
F	Western Yarrow	250	0.07				
B	*Four-wing Saltbush	3600	1.00				
Total Pounds:		55673	15.46				

*Seed provided by the Bureau of Land Management (BLM).

Browse: The preferred browse species on the site is Wyoming big Sagebrush. The Wyoming sagebrush population was treated prior to the establishment of the study site, and the remaining sagebrush population was sampled at low density in 1997. The sagebrush density decreased further with few to no plants sampled in 2003 or 2004. However, sagebrush has increased in abundance since the reseeding and harrow project in 2004. The sagebrush population following the 2004 treatment has increased in abundance and is infilling from the edge of the treatment. Sagebrush decadence and plants displaying poor vigor has been low following the treatments. The recruitment of young sagebrush plants to the population has been good following the 1996 and 2004 treatments, but was low in the 2003 and 2004 sample years due to the low density of the population. Utilization of sagebrush plants has been mostly light over the sample years. Following the 1996 treatment, there was a flush of young fourwing saltbush (*Atriplex canescens*) plants sampled in 1997, though in subsequent sample year's fourwing saltbush has been rare on the site with little to no plants being sampled (Table - Browse Characteristics).

Herbaceous Understory: Grasses are moderately abundant and fairly diverse. There were no grass species sampled in 2003 or 2004. Grass species increased in diversity and abundance following the Narrows Project treatment in 2004. The dominant grass species sample on the site was the seeded species Russian wildrye (*Elymus junceus*). At the outset of the study, crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*A. intermedium*) were the dominant grass species on the site. Following the Narrows Project harrow treatment, seeded species sampled on the site included crested wheatgrass, intermediate wheatgrass, Great Basin wildrye (*Elymus cinereus*), sheep fescue (*Festuca ovina*), and Russian wildrye; however, all the seeded perennial species other than Russian wildrye were sampled at low frequency and cover. Crested wheatgrass and intermediate wheatgrass were also sampled on the site prior to the 2004 treatment. Perennial forb species were moderately abundant at the outset of the study due to the seeded species alfalfa (*Medicago sativa*), but other perennial forb species were rare. Alfalfa decreased substantially in abundance, and was not sampled in 2003, 2008, or 2012. Alfalfa was extremely rare in 2004. The seeded species Lewis flax (*Linum lewisii*) was sampled in 2008, following the treatment, and provided nearly all of the perennial forb cover on the site, but was not sampled in 2012. Annual forbs have dominated the forb component at times, but cover and frequency have fluctuated markedly over the sample years. The most common annual forb species sampled on the site include cutleaf nightshade, Russian thistle (*Salsola iberica*), and annual stickseed (*Lappula occidentalis*) (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a slightly acidic soil reaction (pH 6.4) (Table - Soil Analysis Data). Bare ground cover is high, though there is a moderate amount of litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2003 and 2008, but was stable in 2004 and 2012.

Trend Assessments

Browse

- **1997 to 2003 - down (-2)**: The density of Wyoming big sagebrush decreased from 740 plants/acre to 0 plants/acre. Fourwing saltbush decreased in density from 720 plants/acre to 0 plants/acre.
- **2003 to 2008 - up (+2)**: The density of Wyoming big sagebrush increased to 300 plants/acre, and cover increased to 1%. The recruitment of young sagebrush plants increased to 20% of the population.
- **2008 to 2012 - up (+2)**: The density of Wyoming big sagebrush increased twelve-fold to 3,740 plants/acre, and cover increased to 6%. The recruitment of young sagebrush plants increased to 72% of the population. Plants displaying poor vigor decreased from 20% to 3% of the population. Decadence remained low within the population at 1%.

Grass

- **1997 to 2003 - down (-2)**: Perennial grasses became very rare with no grasses sampled on the site.

- **2003 to 2008 - up (+2)**: The sum of nested frequency of perennial grasses increased substantially, and cover increased to 8%. The seeded species Russian wildrye provided 6% cover..
- **2008 to 2012 - stable (0)**: The sum of nested frequency of perennial grasses remained similar, and cover increased to 11%. The seeded species Russian wildrye increased to 8% cover.

Forb

- **1997 to 2003 - down (-2)**: Perennial forbs became very rare on the site with no perennial forbs sampled on the site in 2003.
- **2003 to 2008 - stable (0)**: The sum of nested frequency of perennial forbs increased slightly on the site, but forbs remained rare on the site. Lewis flax was the only perennial forb sampled 4% cover. The sum of nested frequency of annual forbs increased substantially, though cover decreased from 5% to 4%.
- **2008 to 2012 - stable (0)**: Perennial forbs remained rare on the site. The sum of nested frequency of annual forbs decreased 61%, and cover decreased to 1%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 23R, 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
97	0.9	0.0	0.0	9.4	0.0	10.0	0.0	**20.3**	Poor
03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	Very Poor
08	0.9	0.0	0.0	15.1	0.0	8.4	0.0	**24.5**	Poor-Fair
12	6.9	14.7	15.0	21.5	0.0	0.3	0.0	**58.5**	Good

Trend Summary

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

Type	Species	Nested Frequency				Average Cover %			
		'97	'03	'08	'12	'97	'03	'08	'12
G	Agropyron cristatum	c209	a-	b	b27	3.49	-	.09	.71
G	Agropyron intermedium	b83	a-	a5	a-	1.22	-	.07	-
G	Bromus tectorum (a)	2	-	-	-	.00	-	-	-
G	Elymus cinereus	-	-	2	12	-	-	.15	.33
G	Elymus junceus	a-	a-	b159	b143	-	-	6.32	7.63
G	Festuca ovina	a-	a-	c64	b26	-	-	.63	.72
G	Oryzopsis hymenoides	-	-	6	19	-	-	.09	.42
G	Poa secunda	a-	a-	b41	b64	-	-	.12	.93
G	Sitanion hystrix	-	-	12	8	-	-	.06	.01
Total for Annual Grasses		2	0	0	0	0.00	0	0	0
Total for Perennial Grasses		292	0	310	299	4.71	0	7.54	10.76
Total for Grasses		294	0	310	299	4.71	0	7.54	10.76
F	Astragalus sp.	2	-	-	1	.03	-	-	.15
F	Cleome sp. (a)	-	-	-	-	-	-	-	-
F	Cryptantha sp.	-	-	-	3	-	-	-	.03
F	Descurainia pinnata (a)	-	-	-	3	-	-	-	.01
F	Epilobium brachycarpum (a)	7	-	-	-	.07	-	-	-

Type	Species	Nested Frequency				Average Cover %			
		'97	'03	'08	'12	'97	'03	'08	'12
F	Eriogonum cernuum (a)	-	-	4	-	-	-	.01	-
F	Kochia scoparia (a)	$_{b}$156	$_{a}$-	$_{a}$-	$_{a}$-	5.71	-	-	-
F	Lactuca serriola (a)	-	-	-	1	-	-	-	.00
F	Lappula occidentalis (a)	$_{a}$-	$_{a}$-	$_{c}$107	$_{b}$84	-	-	2.24	.63
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{b}$34	$_{a}$-	-	-	4.15	-
F	Marrubium vulgare	-	-	-	-	-	-	.06	-
F	Medicago sativa	$_{b}$226	$_{a}$-	$_{a}$-	$_{a}$-	6.09	-	-	-
F	Mentzelia albicaulis (a)	-	-	3	-	-	-	.03	-
F	Nicotiana attenuata (a)	-	-	-	-	-	-	-	-
F	Ranunculus testiculatus (a)	-	-	-	3	-	-	-	.00
F	Salsola iberica (a)	$_{a}$-	$_{a}$-	$_{c}$233	$_{b}$41	-	-	1.33	.09
F	Sanguisorba minor	$_{b}$33	$_{a}$-	$_{a}$-	$_{a}$-	.22	-	-	-
F	Sisymbrium altissimum (a)	-	-	-	1	-	-	-	.03
F	Solanum triflorum (a)	-	5	-	1	-	4.94	-	.03
Total for Annual Forbs		163	5	347	134	5.78	4.94	3.62	0.81
Total for Perennial Forbs		261	0	34	4	6.36	0	4.22	0.17
Total for Forbs		424	5	381	138	12.14	4.94	7.85	0.99

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

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

Type	Species	Strip Frequency				Average Cover %			
		'97	'03	'08	'12	'97	'03	'08	'12
B	Artemisia tridentata wyomingensis	24	0	13	35	.58	-	.75	5.45
B	Atriplex canescens	21	0	0	0	.02	-	-	-
B	Atriplex confertifolia	0	0	0	0	.11	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	0	0	0	1	-	-	-	-
B	Kochia prostrata	0	0	0	7	-	-	-	.07
B	Opuntia sp.	1	0	0	0	.15	-	-	-
Total for Browse		46	0	13	43	0.86	0	0.75	5.52

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

Species	Percent Cover	
	'08	'12
Artemisia tridentata wyomingensis	.01	3.86
Kochia prostrata	-	.05

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

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata wyomingensis	-	2.4	0.3

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

Cover Type	Average Cover %			
	'97	'03	'08	'12
Vegetation	15.51	5.21	15.24	16.97
Rock	4.41	9.32	5.22	2.28
Pavement	4.51	3.75	4.11	4.87
Litter	20.42	36.52	35.11	31.60
Cryptogams	.18	.11	0	.01
Bare Ground	51.62	49.48	53.69	48.40

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 1, Greenwich Disking

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
14.8	6.4	57.6	25.1	17.3	1.0	22.7	288.0	0.5

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

Type	Quadrat Frequency			
	'97	'03	'08	'12
Sheep	-	-	-	3
Rabbit	11	91	94	54
Elk	-	4	2	5
Deer	6	-	-	1
Cattle	-	1	-	1

Days use per acre (ha)		
'03	'08	'12
-	-	-
-	-	-
2 (1)	6 (15)	11 (28)
-	-	-
-	-	9 (22)

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

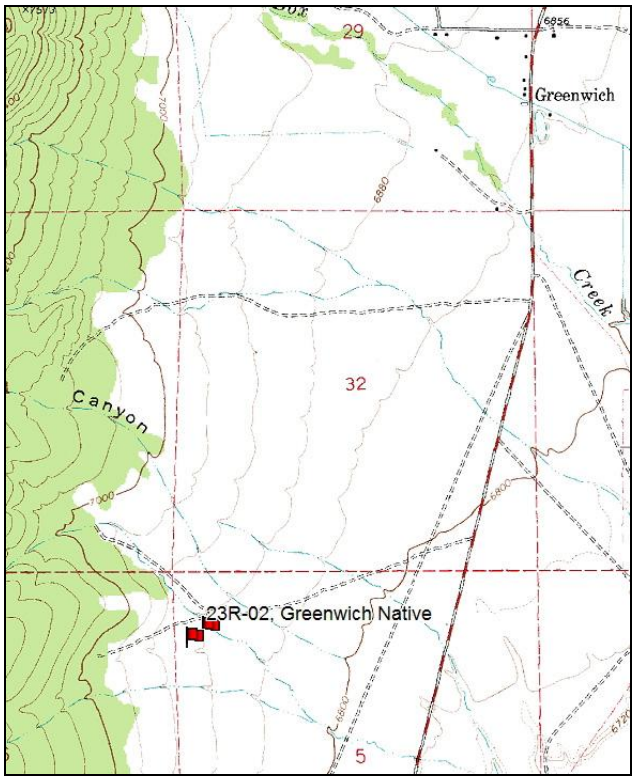
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis									
97	**740**	65	30	5	20	0	0	0	14/23
03	**0**	0	0	0	-	0	0	0	21/31
08	**300**	20	80	0	20	20	0	20	13/18
12	**3740**	72	28	1	1800	8	0	3	29/30
Atriplex canescens									
97	**720**	100	0	-	20	0	0	0	11/9
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Chrysothamnus nauseosus									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	32/50
Chrysothamnus viscidiflorus stenophyllus									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	15/17
12	**20**	0	100	-	-	0	0	100	4/3
Gutierrezia sarothrae									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	9/14
Kochia prostrata									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**420**	100	0	-	80	38	0	0	-/-
Opuntia sp.									
97	**20**	0	100	-	-	0	0	0	6/11
03	**0**	0	0	-	-	0	0	0	-/-
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-

GREENWICH NATIVE - TREND STUDY NO. 23R-2-12

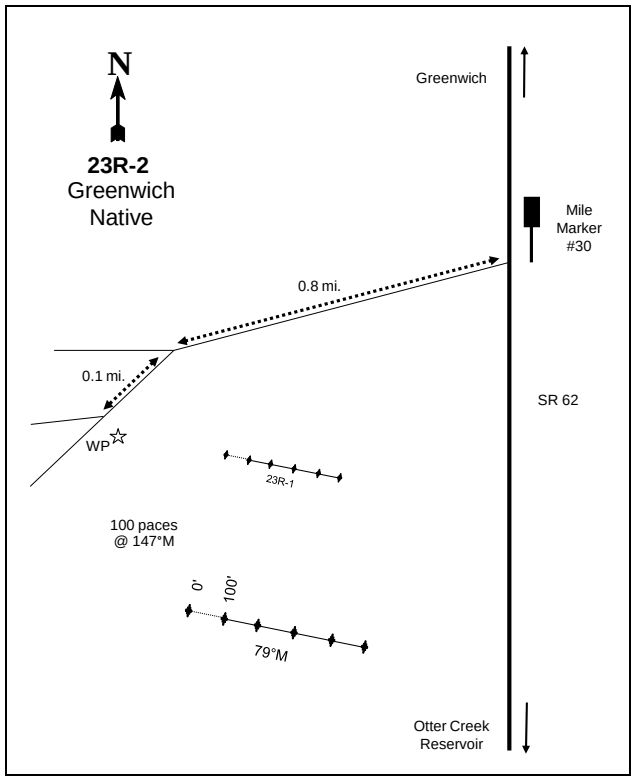
Vegetation Type: Wyoming Big Sagebrush
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Semidesert Loam (Wyoming Big Sagebrush), R047XB222UT
Land Ownership: BLM
Elevation: 6,870 ft (2,094 m)
Aspect: Northeast
Slope: 5%
Transect bearing: 79° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft)

Directions:
Start on Highway 62 between Greenwich and Otter Creek Reservoir. At mile marker 30 there is a road going west. Take this road for 0.8 miles to a fork. Stay right and go 0.1 mile to a witness post on the left (south) side of the road. From the witness post walk 100 paces at 147 degrees magnetic to the 0-foot stake. The study is marked with green, steel fenceposts approximately 12-18 inches in height.

Map Name: Greenwich



Diagrammatic Sketch:



Township: 28W Range: 1W Section: 5

GPS: NAD 83, UTM 12S 417894 E 4251555 N

GREENWICH NATIVE - TREND STUDY NO. 23R-2

Site Description

Site Information: The study is located approximately two miles southwest of Greenwich and west of Highway 62 on land administered by the Bureau of Land Management (BLM). The study is located in the North Narrows allotment. The area is considered big game winter range. The study was established as a reference site to the Greenwich Disking trend study (23R-1) in 1997 in an untreated Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) site adjacent to the disking and seeding treatment. In November of 2004, a second project (Narrows Project) was undertaken to establish grass, forb, and browse species on the previous treated areas and untreated areas. The Greenwich Disking site was broadcasted seeded with grass, forb, and browse species and then one-way harrowed in the previous strips left from the disking treatment in 1996. As part of the Narrows Project, a portion of this study site was two-way harrowed and seeded with grass, forb, and browse species. The seed was applied after the first pass of the harrow (Table - Seed Mix). A total of 3,600 acres were treated. Elk pellet groups have been sampled in low abundance since 1997. Deer pellet groups were sampled in low abundance in 1997, 2004, and 2008. Cattle sign was sampled in low abundance in 2008 and 2012. Rabbit pellet group quadrat frequency was high in 2003 and 2008 (Table - Pellet Group Data). For the purposes of this study the 2004 data was omitted from the tables and trends.

SEED MIX--
Management unit 23R, Study no: 2

Project Name: Narrows Project							
Application: Broadcast Seeder		Acres:	3,600	Application: Broadcast Seeder		Acres:	1,100
Seed type		lbs in mix	lbs/acre	Seed type		lbs in mix	lbs/acre
G	*Basin Wildrye	1800	0.50	B	*Forage Kochia 'Immigrant'	1100	1.00
G	*Crested Wheatgrass	3600	1.00	B	Sagebrush, Wyoming	550	0.50
G	*Indian Ricegrass	2550	0.71	Total Pounds:		1650	1.50
G	*Pubescent Wheatgrass	7200	2.00				
G	*Russian Wildrye	3600	1.00				
G	*Sandberg Bluegrass	3600	1.00				
G	*Sheep Fescue	3600	1.00				
F	*Lewis Flax	3550	0.99				
F	*Small Burnet	7200	2.00				
F	*Yellow Sweetclover	3600	1.00				
F	Alfalfa 'Ladak+'	5400	1.50				
F	Annual Sunflower	150	0.04				
F	Cicer Milkvetch 'Lutana'	525	0.15				
F	Prickly Lettuce	48	0.01				
F	Sainfoin	5400	1.50				
F	Western Yarrow	250	0.07				
B	*Four-wing Saltbush	3600	1.00				
Total Pounds:		55673	15.46				

*Seed provided by the Bureau of Land Management (BLM).

Browse: The preferred browse species on the site is Wyoming big sagebrush. The Wyoming big sagebrush is a light to moderately used population, with moderate to high decadence and poor vigor within the population over the sample years. Prior to the 2008 sample year, the recruitment of young sagebrush plants to the population was poor. Recruitment was good following the Narrows project treatment. The only other browse species sampled on the site are broom snakeweed (*Gutierrezia sarothrae*) and pricklypear cactus (*Opuntia sp.*) (Table - Browse Characteristics).

Herbaceous Understory: Grasses are not very abundant, but are somewhat diverse on the site. Grass species were rare on the site at the outset of the study, but have become more common following the Narrows Project harrow treatment. Blue grama (*Bouteloua gracilis*) and bottlebrush squirreltail (*Sitanion hystrix*) have been the most commonly sampled grass over the sample years, though seeded species were more common on the site in 2012. Seeded species sampled after the treatment include crested wheatgrass (*Agropyron cristatum*), Russian wildrye (*Elymus junceus*), sheep fescue (*Festuca ovina*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Oryzopsis hymenoides*). Forbs have been rare on the site since the outset of the study. Lewis flax (*Linum lewisii*) was the only seeded species sampled following the treatment (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a sandy loam with a slightly acidic soil reaction (pH 6.3) (Table - Soil Analysis Data). Bare ground cover is moderate, though there is a high amount of litter and pavement and a moderate amount of vegetation providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2003 and 2008, but was stable in 2004 and 2012.

Trend Assessments

Browse

- **1997 to 2003 - down (-2)**: The density of Wyoming big sagebrush remained similar at 4,220 and provided 17% canopy cover. The health of the sagebrush population decreased with decadence increasing from 17% to 82%, and poor vigor increasing from 7% to 40% of the population.
- **2003 to 2008 - slightly up (+1)**: Following the treatment, the density of Wyoming big sagebrush increased 46% to 6,160 plants/acre, but cover decreased to 14%. The health of the sagebrush population improved with decadence decreasing to 30%, and poor vigor decreasing to 13%. The recruitment of young sagebrush plants increased substantially from 4% to 31% of the population.
- **2008 to 2012 - stable (0)**: The density of Wyoming big sagebrush decreased 12% to 5,400 plants/acre, though cover increased to 18%. The health of the sagebrush population remained similar with decadence decreasing to 21%, and poor vigor increasing to 33%. The recruitment of young sagebrush plants remained similar at 24% of the population.

Grass

- **1997 to 2003 - slightly down (-1)**: The sum of nested frequency of perennial grasses decreased slightly. Grasses remained rare on the site.
- **2003 to 2008 - up (+2)**: The sum of nested frequency of perennial grasses increased substantially, and cover increased from less than 1% to 2%.
- **2008 to 2012 - stable (0)**: The sum of nested frequency of perennial grasses remained similar.

Forb

- **1997 to 2003 - stable (0)**: Perennial forbs remained rare on the site.
- **2003 to 2008 - slightly up (+1)**: The sum of nested frequency of perennial forbs increased slightly, and cover increased to 3% due to the seeded species Lewis flax.
- **2008 to 2012 - slightly down (-1)**: The sum of nested frequency of perennial forbs decreased slightly, and cover decreased to less than 1% due to the seeded species Lewis flax decreasing in abundance on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 23R, 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
97	28.7	9.9	3.0	1.5	0.0	0.1	0.0	**43.2**	Fair-Good
03	26.4	-9.6	2.0	0.2	0.0	0.0	0.0	**19.0**	Poor
08	18.0	3.6	15.0	3.2	0.0	6.5	0.0	**46.4**	Fair-Good
12	22.0	8.7	12.0	5.0	0.0	0.0	0.0	**47.7**	Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 23R, Study no: 2

Type	Species	Nested Frequency				Average Cover %			
		'97	'03	'08	'12	'97	'03	'08	'12
G	Agropyron cristatum	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$23	-	-	-	.66
G	Bouteloua gracilis	$_{b}$17	$_{ab}$9	$_{a}$3	$_{a}$2	.27	.07	.03	.00
G	Elymus junceus	$_{a}$-	$_{a}$-	$_{c}$41	$_{b}$20	-	-	.92	.85
G	Festuca ovina	$_{a}$-	$_{a}$-	$_{b}$24	$_{b}$15	-	-	.15	.57
G	Oryzopsis hymenoides	-	-	1	7	-	-	.00	.04
G	Poa secunda	-	-	-	7	-	-	-	.06
G	Sitanion hystrix	$_{ab}$42	$_{a}$11	$_{b}$38	$_{ab}$29	.49	.05	.49	.28
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		59	20	107	103	0.76	0.12	1.60	2.48
Total for Grasses		59	20	107	103	0.76	0.12	1.60	2.48
F	Astragalus sp.	2	-	-	2	.03	-	-	.00
F	Cryptantha sp.	-	-	-	2	-	-	-	.01
F	Descurainia pinnata (a)	$_{a}$-	$_{a}$-	$_{a}$1	$_{b}$50	-	-	.01	.18
F	Epilobium brachycarpum (a)	-	-	-	2	-	-	-	.00
F	Lappula occidentalis (a)	$_{a}$-	$_{a}$-	$_{ab}$6	$_{b}$17	-	-	.01	.04
F	Linum lewisii	$_{a}$-	$_{a}$-	$_{b}$41	$_{a}$2	-	-	3.26	.00
F	Orobanche sp.	-	-	-	3	-	-	-	.00
F	Phlox longifolia	-	-	1	-	-	-	.00	-
F	Salsola iberica (a)	$_{a}$-	$_{a}$-	$_{b}$19	$_{a}$3	-	-	.04	.01
F	Sisymbrium altissimum (a)	-	-	-	6	-	-	-	.01
F	Solanum triflorum (a)	-	1	-	2	-	.00	-	.03
F	Unknown forb-perennial	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	1	26	80	0	0.00	0.07	0.28
Total for Perennial Forbs		2	0	42	9	0.03	0	3.27	0.02
Total for Forbs		2	1	68	89	0.03	0.00	3.34	0.30

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

BROWSE TRENDS--
Management unit 23R, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'97	'03	'08	'12	'97	'03	'08	'12
B	Artemisia tridentata wyomingensis	88	86	91	87	22.94	21.12	14.43	17.59
B	Opuntia sp.	1	0	1	1	.06	-	.00	-
Total for Browse		89	86	92	88	23.00	21.12	14.43	17.59

CANOPY COVER, LINE INTERCEPT--
Management unit 23R, Study no: 2

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata wyomingensis	16.56	11.89	20.96

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23R, Study no: 2

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentata wyomingensis	2.0	1.6	0.2

BASIC COVER--
Management unit 23R, Study no: 2

Cover Type	Average Cover %			
	'97	'03	'08	'12
Vegetation	24.26	21.27	19.06	19.68
Rock	22.26	19.95	10.75	6.08
Pavement	37.05	18.17	14.98	16.81
Litter	23.88	22.29	39.42	39.84
Cryptogams	12.39	7.34	2.46	1.44
Bare Ground	25.52	21.89	30.23	27.15

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 2, Greenwich Native

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.8	6.3	55.3	26.2	18.6	1.2	17.7	147.2	0.4

PELLET GROUP DATA--
Management unit 23R, Study no: 2

Type	Quadrat Frequency			
	'97	'03	'08	'12
Sheep	-	-	-	1
Rabbit	1	64	87	22
Elk	-	-	1	-
Deer	3	-	-	2
Cattle	-	-	-	1

Days use per acre (ha)		
'03	'08	'12
-	-	-
-	-	-
1 (3)	3 (8)	5 (12)
-	-	1 (2)
-	1 (2)	4 (11)

BROWSE CHARACTERISTICS--
Management unit 23R, Study no: 2

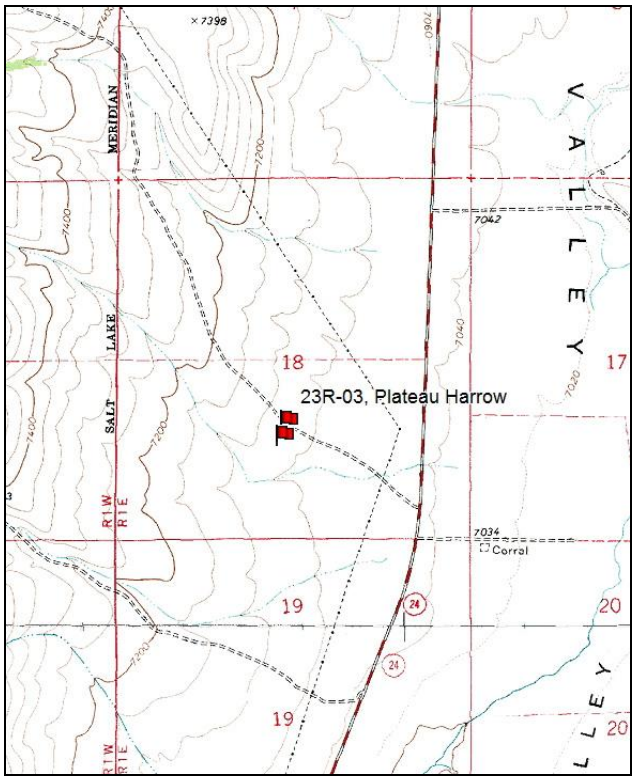
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis									
97	**4200**	6	77	17	160	42	.47	7	27/41
03	**4220**	4	14	82	-	11	1	40	22/28
08	**6160**	31	40	30	4940	17	17	13	20/26
12	**5400**	24	55	21	2400	23	29	33	24/35
Gutierrezia sarothrae									
97	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	8/6
08	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	-/-
Opuntia sp.									
97	**40**	0	100	0	-	0	0	0	-/-
03	**0**	0	0	0	-	0	0	0	5/13
08	**20**	0	0	100	20	0	0	100	5/13
12	**20**	0	100	0	-	0	0	0	3/10

PLATEAU HARROW - TREND STUDY NO. 23R-3-12

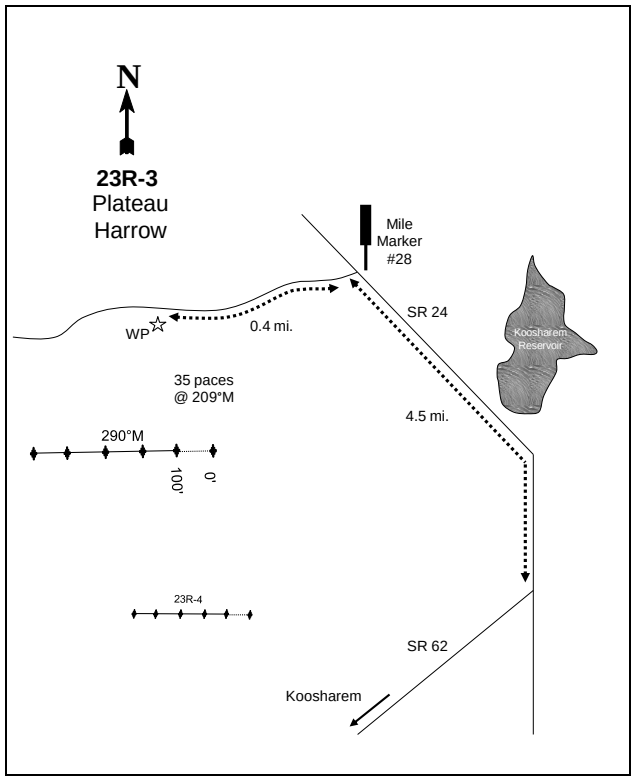
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Upland Shallow Loam (Mountain Big Sagebrush), R047XB322UT
Land Ownership: BLM
Elevation: 7,100 ft (2,164 m)
Aspect: Southeast
Slope: 5%
Transect bearing: 79° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft)

Directions:
Start at highway 62 and highway 24 in Koosharem. Drive north on Hwy 24 for 4.5 miles to mile marker 28. Near mile marker 28, turn on to a road going west. Travel 0.4 mile to the witness on the left side of the road. From the witness post, walk 35 paces at 209 degrees magnetic to the 0' stake.

Map Name: Boobe Hole Reservoir



Diagrammatic Sketch:



Township: 25S Range: 1E Section: 18

GPS: NAD 83, UTM 12S 426873 E 4276341 N

PLATEAU HARROW - TREND STUDY NO. 23R-3

Site Information

Site Description: The study is located approximately one and half miles north of Koosharem reservoir within a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) flat. This study was established following a two-way harrow and seeding treatment in 1999. The study is located on land administered by the Bureau of Land Management (BLM) within the Plateau allotment. Another study (Plateau Native, 23R-4) was placed in a nearby, untreated area as a comparison. The area serves as high-elevation winter and spring/summer range for deer and elk. Local biologists stated that deer have been regularly hit by cars during past winters, and that deer and elk had been seen on the study in the winter of 1998. Deer pellet groups have been sampled in low abundance over the sample years. Elk pellet groups were sampled in low abundance on the site in 1999, 2003, and 2012. Cattle sign was sampled in moderate abundance in 2008 and high abundance in 2012. Sheep pellet groups were sampled in low abundance in 2012 (Table - Pellet Group Data). Sheep had grazed on the area prior to the treatment, and following the treatment the area was rested from sheep grazing for a few years. It was noted in 2012 that a salt ground was established near the end of the transect.

Browse: Prior to the harrow treatment, the study was dominated by a thick stand of mountain big sagebrush, which provided the only preferred browse cover on the site (Table - Browse Trends). Following the harrow treatment, sagebrush has steadily increased in size and abundance on the site. The sagebrush is a moderately dense, lightly used population with low decadence and good vigor within the population. The recruitment of young sagebrush was good in 2012, but was poor prior to the 2012 sample year. Utah serviceberry (*Amelanchier utahensis*) occurs on the site, but has not been sampled in the density strips (Table - Browse Characteristics).

Herbaceous Understory: Grasses are abundant and diverse on the site. Needle-and-thread (*Stipa comata*) is the most abundant perennial grass, and has provided the majority of the grass cover on the site. Indian ricegrass (*Oryzopsis hymenoides*), bluebunch wheatgrass (*Agropyron spicatum*), and bottlebrush squirreltail (*Sitanion hystrix*) were also sampled each year, but provided little cover. The invasive annual grass species cheatgrass (*Bromus tectorum*) has fluctuated in abundance on the site over the sampled years, though abundance was higher at the outset of the study. Forbs are not very abundant or overly diverse on the site. Perennial forbs have decreased in abundance since the outset of the study. The most common forb species include western stoneseed (*Lithospermum ruderale*), silvery lupine (*Lupinus argenteus*), and Utah deervetch (*Lotus utahensis*). Pale alyssum (*Alyssum alyssoides*) is the only annual forb that has been sampled. Seeded species, including Lewis flax (*Linum lewisii*), yellow sweetclover (*Melilotus officinalis*), alfalfa (*Medicago sativa*), sainfoin (*Onobrychis viciaefolia*), and small burnet (*Sanguisorba minor*), were sampled in 1999, but provided little cover (Table - Herbaceous Trends).

Soil: The soil is classified as part of the Vicking-Krueger association, which is found on fan remnants and valleys. The parent material consists of alluvium derived from andesite, dacite, basalt, tuff, and some sedimentary rocks. The soils within this classification are characterized as deep, well drained, and with a moderately high permeable restrictively layer (Soil Survey Staff 2011). The soil texture is a sandy loam with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover is low with a high amount of litter and pavement and a moderate amount of vegetation providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2005, but was moderate in 2012.

Trend Assessments

Browse:

- **1999 to 2003 - stable (0):** Sagebrush density decreased 17% from 840 plants/acre to 700 plants/acre, but cover increased from 4% to 5%. Decadence increased from 7% of the population to 17%. Young recruitment increased from 5% of the population to 9%. Vigor remained good on most plants.

- **2003 to 2008 - slightly up (+1):** Sagebrush density increased 20% to 840 plants per acre, and decadence also increased to 31% of the population. However, sagebrush cover increased from 5% in 2003 to 7%. Young recruitment decreased to 5% of the population. Plants displaying poor vigor increased to 24% of the population.
- **2008 to 2012 - up (+2):** Sagebrush density increased 64% to 1,380 plants per acre, and decadence decreased to 3% of the population. Sagebrush cover increased to 10%. Young recruitment increased to 42% of the population. Plants displaying poor vigor decreased to 3% of the population.

Grass:

- **1999 to 2003 - up (+2):** The sum of nested frequency for perennial grasses increased 63%. Needle-and-thread increased significantly in nested frequency, while that for bluebunch wheatgrass and cheatgrass decreased significantly. Cheatgrass decreased significantly in nested frequency, and cover decreased from 9% to 1%.
- **2003 to 2008 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Cheatgrass increased significantly in nested frequency, but cover remained low at 1%.
- **2008 to 2012 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Cheatgrass decreased significantly in nested frequency, and cover remained similar at 1%.

Forb:

- **1999 to 2003 - down (-2):** The sum of nested frequency for perennial forbs decreased 58%. Utah deervetch and silvery lupine decreased significantly in nested frequency. Additionally, all of the seeded forbs that were sampled in 1999 were not sampled in 2003.
- **2003 to 2008 - slightly up (+1):** The sum of nested frequency for perennial forbs increased slightly, though cover decreased from 8% to 5%. Cryptantha (*Cryptantha sp*.) increased in nested frequency. Lewis flax and yellow sweetclover were sampled, although they provided little cover.
- **2008 to 2012 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 32%, though cover decreased to 2%. Most of the decrease in cover is due from the decrease of lupine and western stoneseed.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 23R, study no: 3

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
99	4.6	0.0	0.0	16.4	-6.5	10.0	0.0	**24.6**	Very Poor
03	5.7	0.0	0.0	30.0	-1.0	10.0	0.0	**44.7**	Poor
08	8.9	5.7	2.5	30.0	-1.1	10.0	0.0	**56.0**	Fair
12	12.4	14.1	15.0	30.0	-0.8	3.2	0.0	**73.9**	Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 23R, Study no: 3

Type	Species	Nested Frequency				Average Cover %			
		'99	'03	'08	'12	'99	'03	'08	'12
G	Agropyron spicatum	$_{b}$35	$_{a}$11	$_{a}$4	$_{a}$1	.87	.48	.15	.03
G	Bromus tectorum (a)	$_{d}$389	$_{b}$126	$_{c}$282	$_{a}$68	8.64	1.36	1.48	1.05
G	Carex sp.	$_{a}$-	$_{a}$-	$_{a}$3	$_{b}$18	-	-	.00	.16
G	Oryzopsis hymenoides	6	13	12	19	.24	1.14	.62	.34
G	Sitanion hystrix	$_{ab}$8	$_{b}$26	$_{b}$13	$_{a}$-	.04	.47	.11	-
G	Stipa columbiana	-	-	4	7	-	-	.15	.21
G	Stipa comata	$_{a}$165	$_{b}$276	$_{b}$286	$_{b}$309	7.05	19.36	15.03	20.45
G	Stipa lettermani	$_{a}$-	$_{b}$22	$_{b}$25	$_{a}$4	-	.44	.27	.15
Total for Annual Grasses		389	126	282	68	8.64	1.36	1.48	1.05
Total for Perennial Grasses		214	348	347	358	8.21	21.90	16.34	21.34
Total for Grasses		603	474	629	426	16.85	23.26	17.82	22.39
F	Alyssum alyssoides (a)	$_{c}$237	$_{a}$-	$_{b}$129	$_{c}$209	1.51	-	.31	.42
F	Astragalus convallarius	6	3	9	-	.04	.09	.22	-
F	Astragalus sp.	-	-	1	-	-	-	.00	-
F	Astragalus utahensis	-	-	1	3	-	-	.00	.01
F	Cryptantha sp.	$_{ab}$5	$_{a}$-	$_{ab}$9	$_{b}$17	.18	.00	.05	.10
F	Descurainia pinnata (a)	-	-	-	6	-	-	-	.01
F	Eriogonum racemosum	14	12	16	13	.17	.11	.13	.08
F	Eriogonum umbellatum	3	-	-	1	.00	-	-	.00
F	Ipomopsis aggregata	1	-	1	-	.00	-	.00	-
F	Linum lewisii	3	-	-	1	.00	-	.00	.01
F	Lithospermum ruderale	$_{b}$43	$_{b}$41	$_{b}$46	$_{a}$12	3.42	4.54	3.11	.05
F	Lotus utahensis	$_{c}$61	$_{a}$5	$_{a}$5	$_{b}$43	1.25	.24	.04	.29
F	Lupinus argenteus	$_{b}$23	$_{a}$15	$_{a}$10	$_{a}$6	4.44	3.11	1.46	.56
F	Medicago sativa	7	-	-	3	.02	-	-	.00
F	Melilotus officinalis	1	-	1	-	.00	-	.00	-
F	Oenothera pallida	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$25	-	-	-	.39
F	Onobrychis viciaefolia	11	-	-	-	.04	-	-	-
F	Phlox longifolia	$_{a}$-	$_{ab}$3	$_{ab}$3	$_{b}$13	-	.00	.01	.02
F	Polygonum douglasii (a)	-	-	-	2	-	-	-	.00
F	Sanguisorba minor	9	-	-	-	.09	-	-	-
F	Sphaeralcea grossulariifolia	1	-	-	1	.00	-	.00	.03
F	Streptanthus cordatus	-	2	3	-	-	.00	.00	-
F	Tragopogon dubius (a)	3	-	-	-	.00	-	-	-
F	Trifolium sp.	-	-	-	1	-	-	-	.00
Total for Annual Forbs		240	0	129	217	1.51	0	0.31	0.43
Total for Perennial Forbs		188	81	105	139	9.71	8.12	5.07	1.58
Total for Forbs		428	81	234	356	11.23	8.12	5.39	2.02

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

BROWSE TRENDS--
Management unit 23R, Study no: 3

Type	Species	Strip Frequency				Average Cover %			
		'99	'03	'08	'12	'99	'03	'08	'12
B	Artemisia tridentata vaseyana	28	27	28	45	3.71	4.59	7.15	9.94
B	Leptodactylon pungens	0	1	1	3	-	-	.00	-
B	Opuntia sp.	3	4	7	5	-	.03	.04	.00
Total for Browse		31	32	36	53	3.71	4.63	7.20	9.95

CANOPY COVER, LINE INTERCEPT--
Management unit 23R, Study no: 3

Species	Percent Cover		
	'03	'08	'12
Artemisia tridentata vaseyana	4.96	9.10	10.91
Leptodactylon pungens	-	.13	.03
Opuntia sp.	.06	.40	.35

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23R, Study no: 3

Species	Average leader growth (in)		
	'03	'08	'12
Artemisia tridentate vaseyana	1.7	0.8	0.1

BASIC COVER--
Management unit 23R, Study no: 3

Cover Type	Average Cover %			
	'99	'03	'08	'12
Vegetation	35.65	35.26	34.48	34.65
Rock	.58	1.15	.22	1.18
Pavement	15.69	20.71	9.61	23.50
Litter	29.06	41.16	51.57	46.30
Cryptogams	.01	0	.00	.53
Bare Ground	22.47	10.45	19.85	11.96

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 3, Plateau Harrow

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.5	7.1	63.6	19.8	16.6	1.6	10.9	198.4	0.5

PELLET GROUP DATA--
Management unit 23R, Study no: 3

Type	Quadrat Frequency			
	'99	'03	'08	'12
Rabbit	12	84	60	20
Elk	1	1	-	-
Deer	-	-	1	1
Cattle	-	-	14	14
Sheep	-	-	-	-

Days use per acre (ha)			
'99	'03	'08	'12
-	-	-	-
3 (7)	3 (7)	-	1 (2)
2 (5)	4 (10)	4 (10)	3 (8)
-	-	21 (52)	48 (118)
-	-	-	7 (18)

BROWSE CHARACTERISTICS--
Management unit 23R, Study no: 3

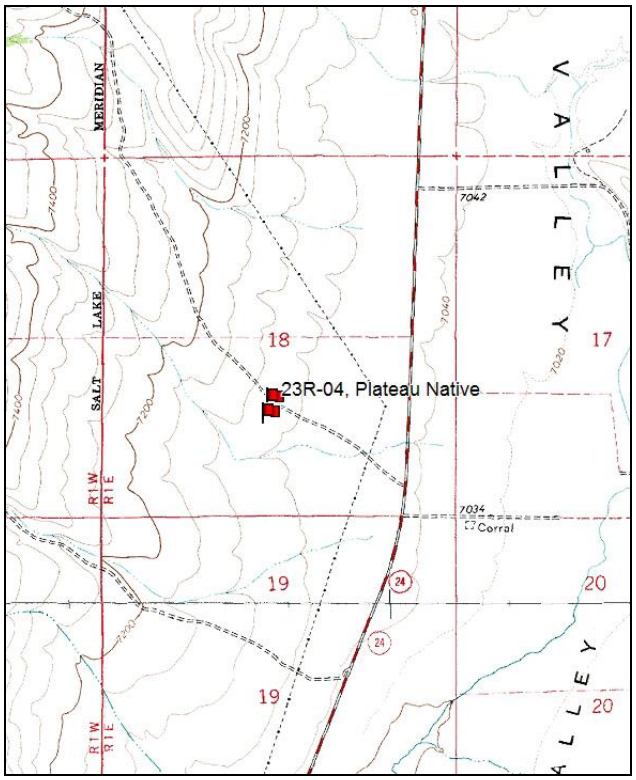
		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Amelanchier utahensis									
99	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	9/12
08	**0**	0	0	-	-	0	0	0	17/22
12	**0**	0	0	-	-	0	0	0	19/17
Artemisia tridentata vaseyana									
99	**840**	5	88	7	-	7	0	5	21/33
03	**700**	9	74	17	20	6	0	9	21/29
08	**840**	5	64	31	-	40	0	24	24/41
12	**1380**	42	55	3	440	19	14	3	25/41
Leptodactylon pungens									
99	**0**	0	0	0	-	0	0	0	-/-
03	**20**	0	100	0	-	0	0	0	5/9
08	**40**	0	50	50	-	0	0	0	8/13
12	**100**	0	100	0	-	0	60	20	3/9
Opuntia sp.									
99	**80**	50	25	25	-	0	0	25	4/13
03	**100**	0	100	0	-	0	0	0	5/12
08	**220**	0	91	9	-	0	0	9	4/14
12	**160**	0	88	13	60	0	0	25	4/13
Symphoricarpos oreophilus									
99	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	17/24
08	**0**	0	0	-	-	0	0	0	21/51
12	**0**	0	0	-	-	0	0	0	17/32

PLATEAU NATIVE - TREND STUDY NO. 23R-4-12

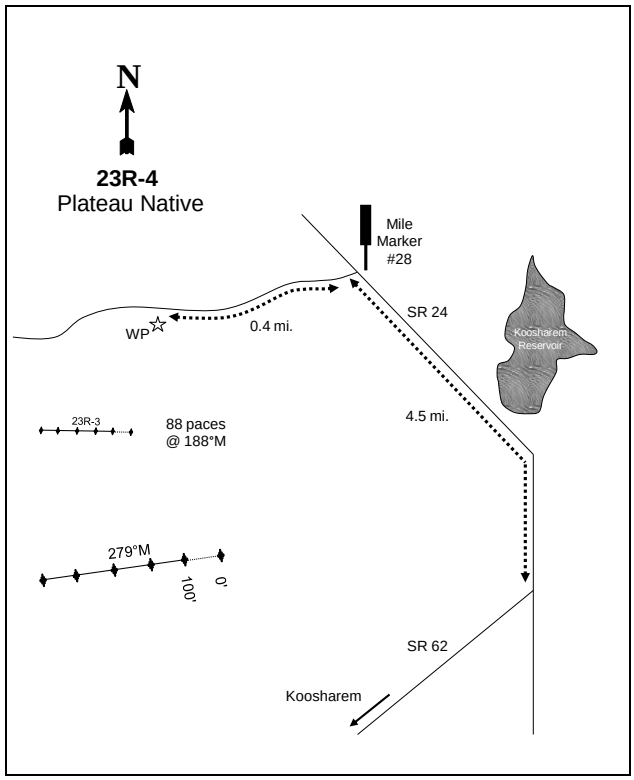
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Upland Shallow Loam (Mountain Big Sagebrush), R047XB322UT
Land Ownership: BLM
Elevation: 7,000 ft (2,133 m)
Aspect: West
Slope: 5%
Transect bearing: 279° magnetic
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft)

Directions:
Start at highway 62 and highway 24 in Koosharem. Drive north on Hwy 24 for 4.5 miles to mile marker 28. Near mile marker 28, turn on to a road going west. Travel 0.4 mile to the witness on the left side of the road. From the witness post, walk 88 paces at 188 degrees magnetic to the 0' stake.

Map Name: Boobe Hole Reservoir



Diagrammatic Sketch:



Township: 25S Range: 1E Section: 18

GPS: NAD 83, UTM 12S 426856 E 4276267 N

PLATEAU NATIVE - TREND STUDY NO. 23R-4

Site Information

Site Description: The study is located approximately one and half miles north of Koosharem reservoir within a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) flat. This trend study samples an untreated mountain big sagebrush site which is paired with previous harrowed trend study, 23R-3. The study is located on land administered by the Bureau of Land Management (BLM) within the Plateau allotment. The area serves as high-elevation winter and spring/summer range for deer and elk. Local biologists stated that deer have been regularly hit by cars during past winters, and that deer and elk had been seen on the study in the winter of 1998. Deer and elk pellet groups were sampled in low abundance in 1999 and 2012. Cattle and sheep pellet groups were sampled in low abundance in 2012 (Table - Pellet Group Data). Sheep grazed on the area prior to the treatment, and following the treatment the area was rested from sheep grazing for a few years. It was noted in 2012 that a salt ground was established near the end of the transect.

Browse: The site supports a rather dense stand of mountain big sagebrush. Preferred browse species sampled on the site are slenderbush eriogonum (*Eriogonum microthecum*) and mountain big sagebrush; however, sagebrush is the dominant browse species and provides the majority of the browse cover on the site (Table - Browse Trends). The sagebrush is a moderately dense, moderately used population with moderate decadence and poor vigor within the population. The recruitment of young sagebrush was good in 2012, but was poor prior to the 2012 sample year (Table - Browse Characteristics).

Herbaceous Understory: Grasses are abundant and diverse on the site. Needle-and-thread (*Stipa comata*) is the most abundant perennial grass, and has provided the majority of the grass cover on the site. Indian ricegrass (*Oryzopsis hymenoides*), bluebunch wheatgrass (*Agropyron spicatum*), and bottlebrush squirreltail (*Sitanion hystrix*) were also sampled each year, but provided little cover. The invasive annual grass species cheatgrass (*Bromus tectorum*) has fluctuated in abundance on the site over the sampled years, though abundance was higher at the outset of the study. Forbs are moderately abundant and diverse on the site. The most common forb species include western stoneseed (*Lithospermum ruderale*), silvery lupine (*Lupinus argenteus*), and Utah deervetch (*Lotus utahensis*). Seeded species, including Lewis flax (*Linum lewisii*), yellow sweetclover (*Melilotus officinalis*), and alfalfa (*Medicago sativa*) have been sampled on the site, but provided little cover (Table - Herbaceous Trends).

Soil: The soil is classified as part of the Vicking-Krueger association, which is found on fan remnants and valleys. The parent material consists of alluvium derived from andesite, dacite, basalt, tuff, and some sedimentary rocks. The soils within this classification are characterized as deep, well drained, and with a moderately high permeable restrictively layer (Soil Survey Staff 2011). The soil texture is a sandy loam with a neutral soil reaction (pH 7.1) (Table - Soil Analysis Data). Bare ground cover is low with a high amount of litter and pavement and a moderate amount of vegetation providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2003 and 2008, but was classified as slight in 2012.

Trend Assessments

Browse:

- **1999 to 2003 - stable (0):** Sagebrush density remained similar at 2000 plants/acre, and decadence increased from 21% of the population to 27%. Young recruitment remained poor on the site. Sagebrush plants displaying poor vigor decreased from 15% to 9% of the population.
- **2003 to 2012 - slightly up (+1):** Sagebrush density increased 18% to 2,360 plants/acre, and decadence also decreased to 17% of the population. Young recruitment increased to 19% of the population. Plants displaying poor vigor increased to 37% of the population.

Grass:

- **1999 to 2003 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Bottlebrush squirreltail increased significantly in nested frequency, while that for bluebunch wheatgrass and cheatgrass decreased significantly. Cheatgrass decreased significantly in nested frequency, and cover decreased from 3% to less than 1%.
- **2003 to 2012 - slightly down (-1):** The sum of nested frequency for perennial grasses decreased 19%, though cover remained similar at 8%. Cheatgrass increased significantly in nested frequency, and cover increased to 3%.

Forb:

- **1999 to 2003 - slightly down (-1):** The sum of nested frequency for perennial forbs decreased 17%. Utah deervetch and western stoneseed decreased significantly in nested frequency.
- **2003 to 2012 - slightly up (+1):** The sum of nested frequency for perennial forbs increased, though cover decreased from 6% to 4%. Lewis flax, alfalfa, and yellow sweetclover were sampled in 2012, although they provided little cover.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 23R, 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
99	21.1	8.7	2.5	15.5	-2.0	10.0	0.0	**55.9**	Fair
03	27.7	6.9	0.0	17.8	-0.5	10.0	0.0	**61.9**	Fair
12	26.2	9.9	9.5	16.8	-2.2	7.0	0.0	**67.1**	Good

Trend Summary

HERBACEOUS TRENDS--
Management unit 23R, Study no: 4

Type	Species	Nested Frequency			Average Cover %		
		'99	'03	'12	'99	'03	'12
G	Agropyron spicatum	$_{b}$63	$_{a}$22	$_{a}$24	1.26	.50	.96
G	Bromus tectorum (a)	$_{c}$248	$_{a}$81	$_{b}$169	2.67	.64	2.99
G	Carex sp.	-	-	3	-	-	.03
G	Dactylis glomerata	-	-	2	-	-	.00
G	Oryzopsis hymenoides	$_{b}$32	$_{ab}$17	$_{a}$11	.87	.46	.52
G	Poa secunda	$_{a}$2	$_{b}$8	$_{a}$-	.03	.16	-
G	Sitanion hystrix	$_{a}$2	$_{b}$54	$_{a}$2	.03	1.18	.03
G	Stipa comata	165	153	185	5.58	6.16	6.85
G	Stipa lettermani	$_{a}$-	$_{b}$27	$_{a}$-	-	.41	-
Total for Annual Grasses		248	81	169	2.67	0.64	2.99
Total for Perennial Grasses		264	281	227	7.77	8.88	8.41
Total for Grasses		512	362	396	10.45	9.53	11.40
F	Agoseris glauca	2	-	3	.00	-	.03
F	Alyssum alyssoides (a)	$_{c}$368	$_{a}$5	$_{b}$234	1.87	.01	.64
F	Arabis sp.	9	-	-	.04	-	-
F	Astragalus convallarius	$_{a}$7	$_{b}$31	$_{a}$7	.02	.38	.09
F	Astragalus utahensis	-	-	3	-	-	.00

Type	Species	Nested Frequency			Average Cover %		
		'99	'03	'12	'99	'03	'12
F	Cirsium sp.	-	-	3	-	-	.03
F	Cryptantha sp.	$_{a}$-	$_{b}$13	$_{b}$30	-	.14	.59
F	Descurainia pinnata (a)	-	-	8	-	-	.01
F	Eriogonum racemosum	44	35	47	.42	.29	.75
F	Linum lewisii	$_{a}$4	$_{a}$-	$_{b}$17	.01	-	.13
F	Lithospermum ruderale	$_{b}$69	$_{b}$56	$_{a}$20	2.77	3.51	.48
F	Lotus utahensis	$_{b}$54	$_{a}$16	$_{b}$66	.70	.09	.75
F	Lupinus argenteus	22	19	16	1.20	1.33	.38
F	Medicago sativa	-	-	3	-	-	.06
F	Melilotus officinalis	-	-	3	-	-	.03
F	Oenothera pallida	-	-	3	-	-	.00
F	Penstemon comarrhenus	5	-	-	.00	-	-
F	Phlox longifolia	$_{a}$-	$_{a}$8	$_{b}$24	-	.01	.11
F	Polygonum douglasii (a)	-	-	1	-	-	.00
F	Sphaeralcea grossulariifolia	-	-	3	-	-	.00
F	Streptanthus cordatus	2	-	6	.00	-	.02
F	Tragopogon dubius (a)	-	-	3	.00	-	.00
F	Trifolium sp.	-	3	-	-	.00	-
Total for Annual Forbs		368	5	246	1.87	0.01	0.66
Total for Perennial Forbs		218	181	254	5.18	5.77	3.49
Total for Forbs		586	186	500	7.06	5.79	4.15

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

BROWSE TRENDS--
Management unit 23R, Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'99	'03	'12	'99	'03	'12
B	Artemisia tridentata vaseyana	62	63	67	16.89	22.17	20.92
B	Leptodactylon pungens	4	3	6	.18	.15	.18
B	Opuntia sp.	1	4	4	-	-	.00
B	Symphoricarpos oreophilus	0	0	1	-	-	.15
Total for Browse		67	70	78	17.07	22.32	21.25

CANOPY COVER, LINE INTERCEPT--
Management unit 23R, Study no: 4

Species	Percent Cover	
	'03	'12
Artemisia tridentata vaseyana	23.51	28.83
Leptodactylon pungens	-	.21

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 23R, Study no: 4

Species	Average leader growth (in)	
	'03	'12
Artemisia tridentate vaseyana	1.4	0.8

BASIC COVER--
Management unit 23R, Study no: 4

Cover Type	Average Cover %		
	'99	'03	'12
Vegetation	31.04	33.57	35.48
Rock	.59	.85	.11
Pavement	30.20	39.80	29.52
Litter	22.84	30.55	40.34
Cryptogams	4.03	.93	2.14
Bare Ground	20.36	10.06	16.33

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 4, Plateau Native

Effective rooting depth (in)	pH	Sandy Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.5	7.1	63.6	19.8	16.6	1.6	10.9	198.4	0.5

PELLET GROUP DATA--
Management unit 23R, Study no: 4

Type	Quadrat Frequency		
	'99	'03	'12
Sheep	-	-	2
Rabbit	35	86	15
Elk	5	-	-
Deer	2	-	-
Cattle	-	-	5

Days use per acre (ha)		
'99	'03	'12
-	-	1 (3)
-	-	-
1 (2)	-	1 (2)
1 (3)	-	1 (2)
-	-	2 (5)

BROWSE CHARACTERISTICS--
Management unit 23R, 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)
Artemisia tridentata vaseyana									
99	**1920**	5	74	21	-	40	29	15	35/50
03	**2000**	0	73	27	-	30	1	9	36/47
12	**2360**	19	64	17	220	28	47	37	36/55
Eriogonum microthecum									
99	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
12	**0**	0	0	-	-	0	0	0	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)
Leptodactylon pungens									
99	**140**	0	100	0	-	0	0	0	6/11
03	**140**	0	100	0	-	0	43	0	4/6
12	**220**	0	91	9	-	9	18	18	4/11
Opuntia sp.									
99	**20**	0	100	-	-	0	0	0	3/16
03	**120**	0	100	-	-	0	0	0	6/12
12	**100**	0	100	-	-	0	0	0	5/17
Symphoricarpos oreophilus									
99	**0**	0	0	-	-	0	0	0	-/-
03	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	100	0	0	4/5

SUMMARY
WILDLIFE MANAGEMENT UNIT 23 - MONROE

Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which inlude **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. Ten interagency range trend studies were sampled in Unit 23 during the summer of 2012.

Six studies [Bear Ridge (23-1), Thompson Basin (23-3), Smith Canyon (23-5), Koosharem Canyon (23-6), Plateau Harrow (23R-3), and Plateau Native (23R-4)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush communities. The Bear Ridge, Thompson Basin, smith Canyon, and Koosharem Canyon studies are also considered to be elk winter range. Four studies [Saul Meadow (23-2), Poverty Flat (23-4), Greenwich Disking (23R-1), and Greenwich Native (23R-2)] are categorized as low potential sites for deer winter range, and sample Wyoming big sagebrush communities. The Saul Meadow 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 South Central division (Division 4). The South Central division had a historic annual mean precipitation of 12.52 inches from 1895 to 2012. The mean annual PDSI of the South Central division displays a cycle of several wet years followed by several drought years over the course of study years (Figure 1 and Figure 2) (Time Series Data 2013).

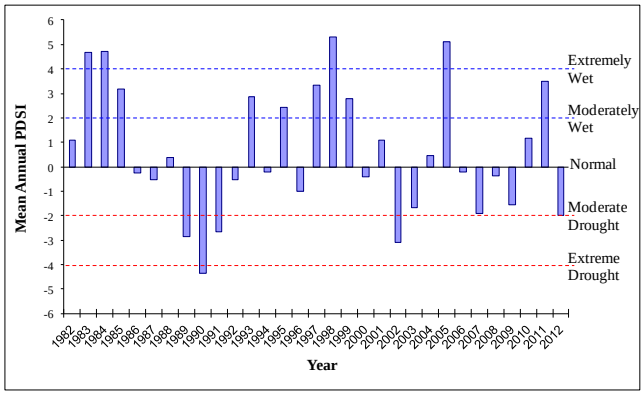


Figure 1. The 31 year mean annual Palmer Drought Severity Index (PDSI) for the South Central division (Division 4). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

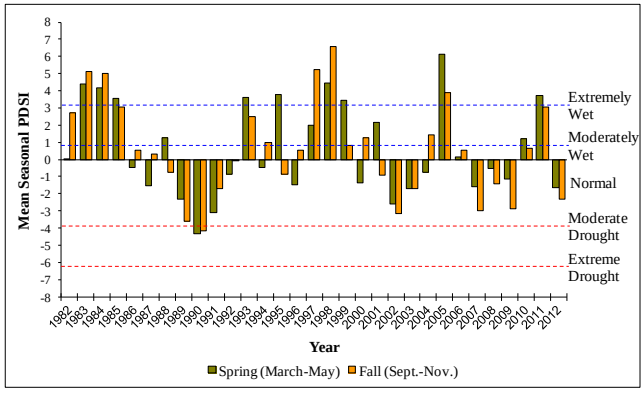


Figure 2. The 31 year mean spring (March-May) and fall (Sept-Nov.) Palmer Drought Severity Index (PDSI) for the South Central division (Division 4). The PDSI is based on climate data gathered from 1895 to 2012. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.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 2013).

The 1961-1990 mean annual precipitation was 8-10in on the Greenwich Disking study; 10-12 in. on the Saul Meadow, Greenwich Native, Plateau Harrow, and Plateau Native studies; 12-14 in. on the Bear Ridge, Thompson Basin, Poverty Flat, and Koosharem Canyon studies; and 18-20 in on the Smith Canyon study (PRISM Climate Group 2011).

Mid-Level Potential Deer Range

Browse: The mid-level potential site cumulative median browse trend has decreased slightly in 2001, and again in 2008 before increasing slightly in 2012 (Figure 9b). Mountain big sagebrush is a dominant browse species on all of the mid-level potential studies. The mean density of mountain big sagebrush was similar from 1998/99 to 2008, but increased significantly in 2012 (Figure 5a). The large increase in density was primarily due to a substantial increase in the recruitment of young plants on the Smith's Canyon study. The mean cover of mountain big sagebrush was significantly lower in 2008 than the other sample years (Figure 5b). The mean decadence of mountain big sagebrush had been steadily increasing from 1998/99 to 2008, but decreased significantly in 2012 (Figure 5c).

Herbaceous Understory: The mid-level potential median cumulative grass trend increased slightly in 1991, steadily decreased through 2003, and then remained stable throughout the subsequent sample years (Figure 9b). Perennial grass species are typically abundant and diverse on the studies, and the mean sum of nested frequency has remained high throughout the study years (Figure 4a). The mean

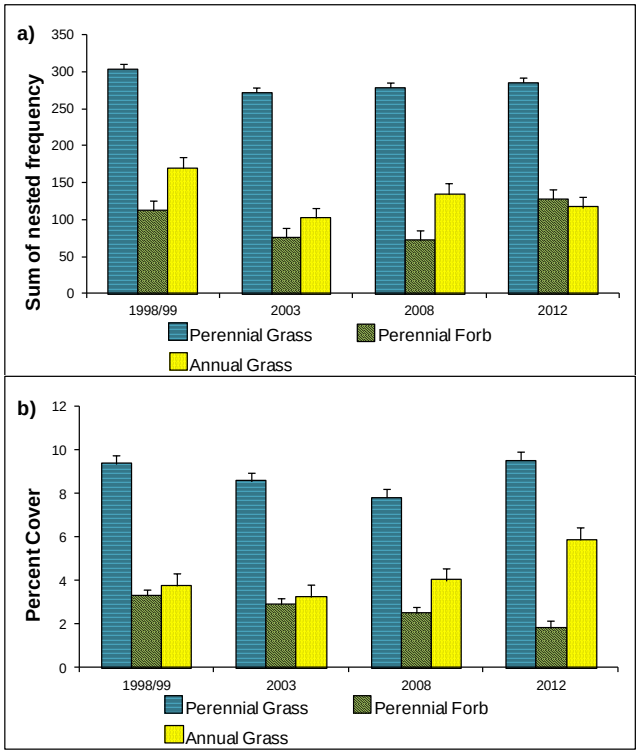


Figure 4. a) Mid-level potential sites mean perennial grass, perennial forb, and annual grass sum of nested frequency by year for WMU 23, Monroe. **b)** Mid-level potential sites mean perennial grass, perennial forb, and annual grass cover by year for WMU 23.

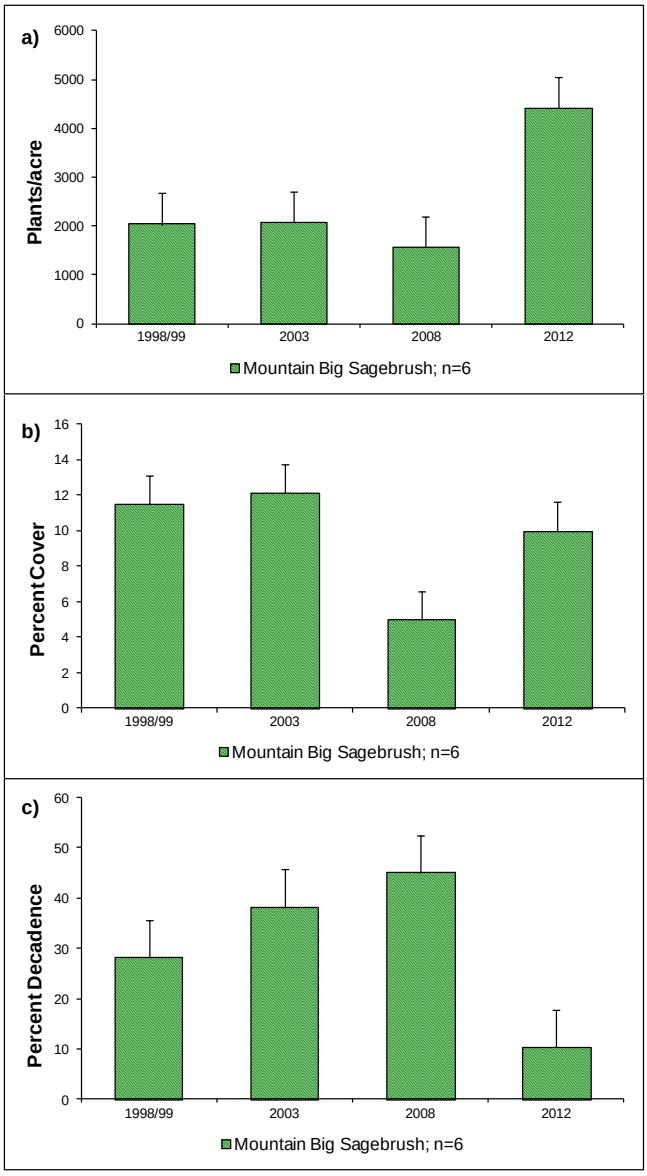


Figure 5. a) Mid-level potential sites mean density of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) by year for WMU 23, Monroe. **b)** Mid-level potential sites mean cover of mountain big sagebrush by year for WMU 23. **c)** Mid-level potential mean decadence of mountain big sagebrush by year for WMU 23.

cover of perennial grass species steadily decreased from 1998/99 to 2008, but increased significantly in 2012 returning to 1998/99 levels (Figure 4b). Annual grass species, primarily cheatgrass (*Bromus tectorum*), is rare on most studies, but is the dominant grass on the Smith's Canyon study. Trends for annual grasses are almost entirely driven by changes on the Smith's Canyon study. The mean sum of nested frequency of annual grasses has fluctuated since 1998/99, but the mean cover of annual grasses increased significantly in 2012 (Figure 4a and Figure 4b).

The mid-level potential median cumulative forb trend increased in 1991, decreased steadily through 2003, remained similar in 2008, and then increased in 2012 (Figure 9b). Perennial forb species are rare on most of the studies. The mean sum of nested frequency of perennial forb species decreased significantly in 2003, but increased significantly in 2012. The mean sum of nested frequency of perennial forb species was significantly higher in 2012 than in any prior sample year (Figure 4a). Despite the increases in the mean sum of nested frequency the mean cover of perennial forb species has steadily decreased over the course of the sample years, and was significantly lower in 2012 than the prior sample years (Figure 4b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these mid-level potential study areas. The mean abundance of deer pellet groups was high on most studies from 1998 to 2008, but was substantially lower in 2012. The decrease in pellet abundance is likely due to the mild winter of 2011-2012 which allowed animals to remain on higher elevation range. The mean abundance of elk and livestock sign has been generally low since 1998 (Figure 10b).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI decreased from poor to very poor in 2008, but increased to a poor rating again in 2012. Most of the decrease in score is due to decreases in preferred browse cover and increased decadence on the sites (Table 1 and Figure 8).

Discussion: Treatments on the Bear Ridge and Plateau Harrow studies, and a wildfire on the Smith's Canyon study reduced the browse component, but mountain big sagebrush appears to be reestablishing well in the area. The treatments have helped to improve the health of the sagebrush stand and the herbaceous understory on both the Bear Ridge and Plateau Harrow sites. Cheatgrass remains a concern on the Smith's Canyon study, and could contribute to an increase in the fire return interval in this area.

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
98/99	17.0	5.5	2.6	18.8	-2.8	5.0	0.0	**46.0**	Poor
03	18.3	4.6	1.1	14.9	-2.4	4.5	0.0	**40.9**	Poor
08	9.5	1.5	1.8	15.1	-3.0	4.9	0.0	**29.9**	Very Poor
12	15.1	8.2	7.2	16.9	-3.9	3.7	0.0	**47.3**	Poor

Table 1. Mid-level potential scale mean deer DCI scores and rankings (n=6) by year for WMU 23, Monroe. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

Low Potential Deer Range

Browse: The low potential site cumulative median browse trend steadily decreased from 1991 to 2003, but steadily increased from 2003 to 2012 (Figure 9c). Wyoming big sagebrush is a dominant browse species on all of the low potential studies. The mean density of Wyoming big sagebrush has steadily increased from 1997/98 to 2012, and was significantly higher in 2012 than in the prior sample years (Figure 7a). The mean cover of Wyoming big sagebrush was significantly lower in 2008, but was similar in the other sample years (Figure 7b). The mean decadence of Wyoming big sagebrush was high in 1991 and 1997/98, but decreased significantly in 2008 and remained lower in 2012 (Figure 7c).

Herbaceous Understory: The low potential median cumulative grass trend has fluctuated, but has generally increased over the course of the sample years (Figure 9c). Perennial grass species are fairly diverse and abundant on most of the low potential studies. The mean sum of nested frequency and cover of perennial grasses decreased significantly in 2003, but increased significantly in 2008 and remained at elevated levels in 2012 (Figure 6a and Figure 6b). These trends are almost entirely driven by the treatments that occurred on the Greenwich Disking study. Annual grass species, primarily cheatgrass (*Bromus tectorum*), dominate the grass component on the Saul Meadow and Poverty Flat study. The mean sum of nested frequency of annual grasses increased significantly in 2003 and remained at elevated levels in subsequent sample years (Figure 6a). The mean cover of annual grasses has fluctuated, but was significantly higher in 2003 and 2012 (Figure 6b).

The low potential median cumulative forb trend has remained stable since the outset of the study (Figure 9c). Perennial forb species are rare on most of the studies. The mean sum of nested frequency and cover of perennial forb species has remained low since 1997/98 (Figure 6a and Figure 6b).

Occupancy: Pellet group transect data indicates that deer predominantly occupy these low potential study areas. The mean abundance of deer pellet groups was high on most studies in 1991, but decreased to moderate levels in 1997/98 and to low levels in 2012. The mean abundance of elk and livestock sign has been very low since 1997/98 (Figure 10c).

Deer Desirable Components Index (DCI): The low potential deer DCI increased from poor to fair in 2008. Most of the increase was due to an increase in the perennial grass score (Table 2 and Figure 8).

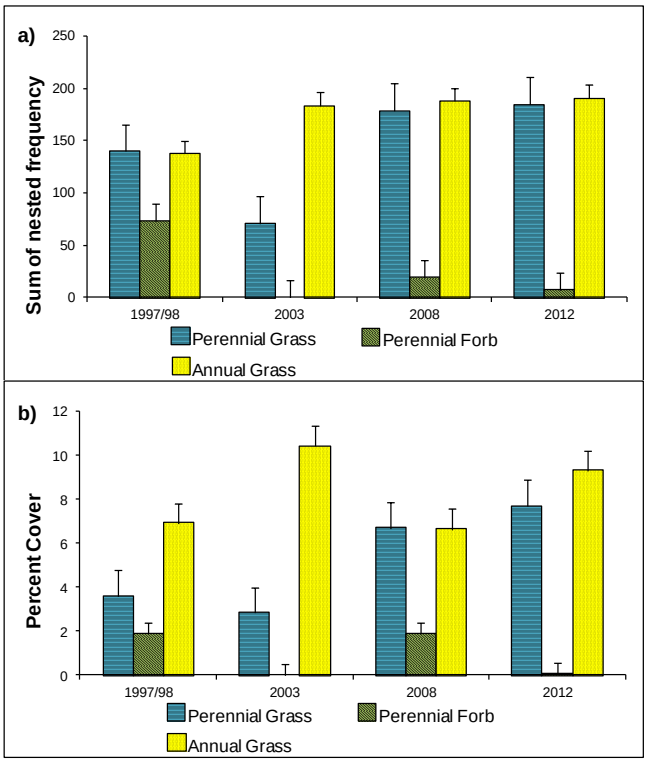


Figure 6. a) Low potential sites mean perennial grass, perennial forb, and annual grass sum of nested frequency by year for WMU 23, Monroe. **b)** Low potential sites mean perennial grass, perennial forb, and annual grass cover by year for WMU 23.

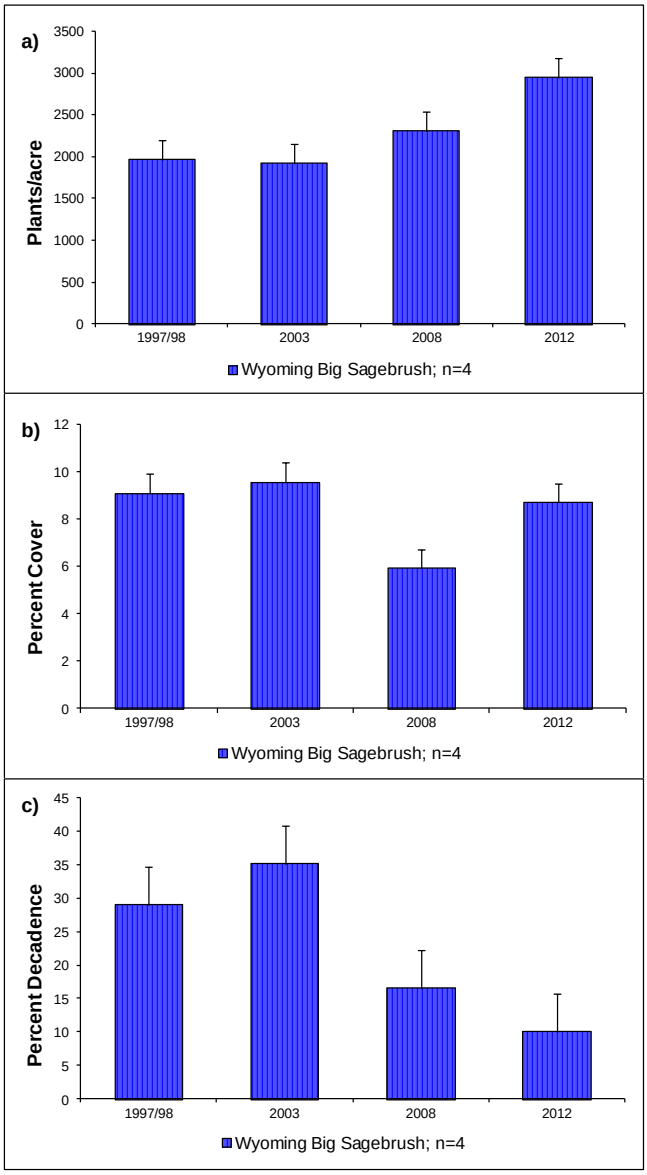


Figure 7. a) Low potential sites mean density of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) by year for WMU 23, Monroe. **b)** Low potential sites mean cover of Wyoming big sagebrush by year for WMU 23. **c)** Low potential sites mean decadence of Wyoming big sagebrush by year for WMU 23.

Discussion: Sagebrush treatments on the Greenwich Disking and Greenwich Native studies have helped to improve the sagebrush and herbaceous components in that area. Cheatgrass remains a concern on the Saul Meadow and Poverty Flat studies. This weedy species can form dense mats of cover that compete with other more desirable herbaceous species and with seedlings and young sagebrush which limits establishment of new plants into the population. 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
97/98	11.4	2.9	1.8	7.2	-3.9	3.1	0.0	**22.4**	11.4
03	12.0	-0.8	4.3	5.7	-5.9	0.0	0.0	**15.3**	12.0
08	8.1	2.0	4.9	13.4	-3.7	3.7	0.0	**28.3**	8.1
12	12.3	8.3	7.3	15.4	-5.2	0.1	0.0	**38.1**	12.3

Table 2. Low potential scale mean deer DCI scores and rankings (n=4) by year for WMU 23, Monroe. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

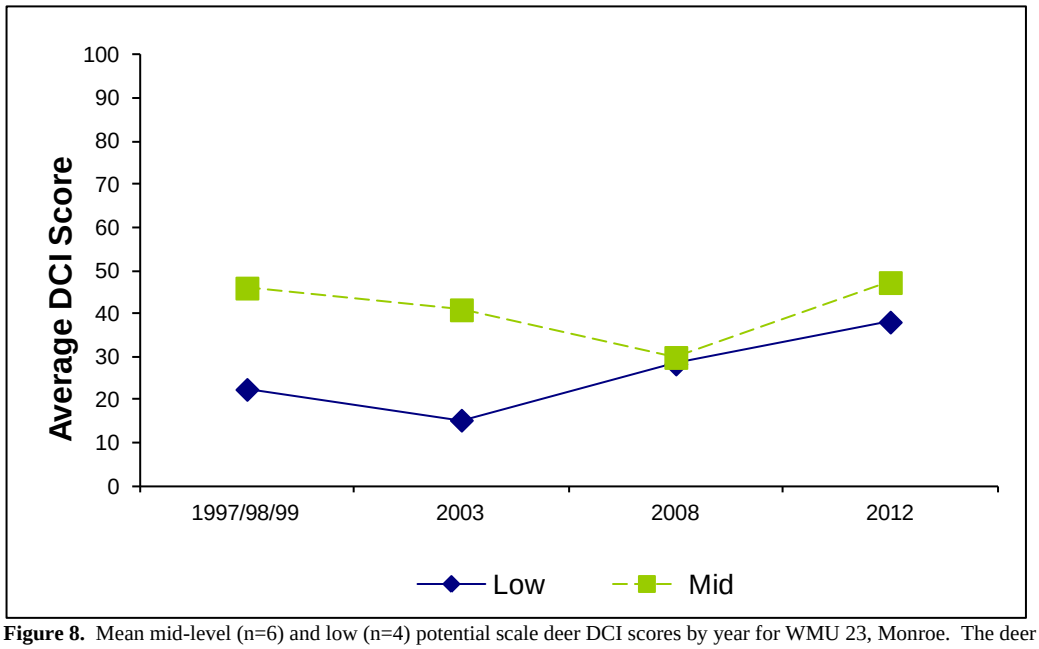


Figure 8. Mean mid-level (n=6) and low (n=4) potential scale deer DCI scores by year for WMU 23, Monroe. The deer DCI rankings are divided into three categories based on ecological potentials which inlude low, mid-level and high.

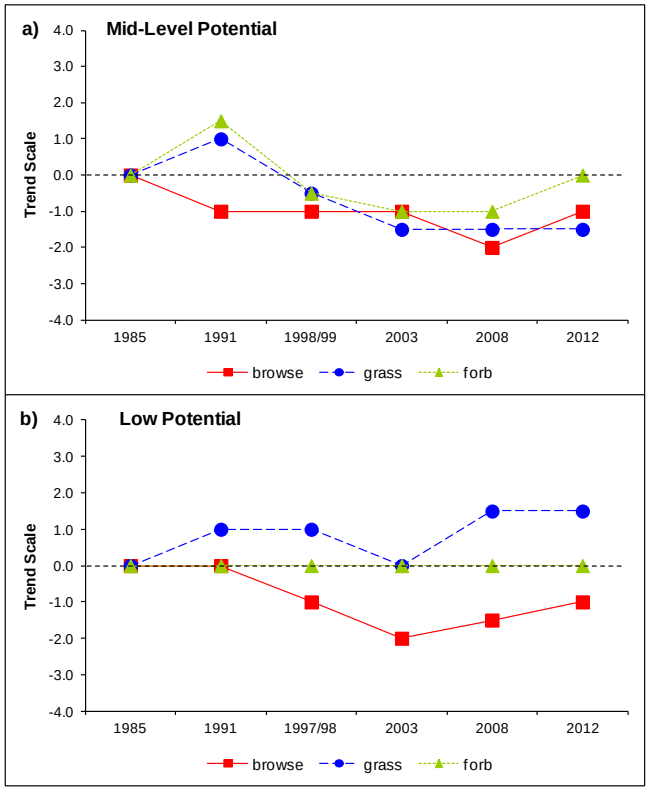


Figure 9. a) Mid-level potential sites cumulative median browse, grass, and forb trends by year for WMU 23, Monroe. **c)** Low potential sites cumulative median browse, grass, and forb trends by year for WMU 23.

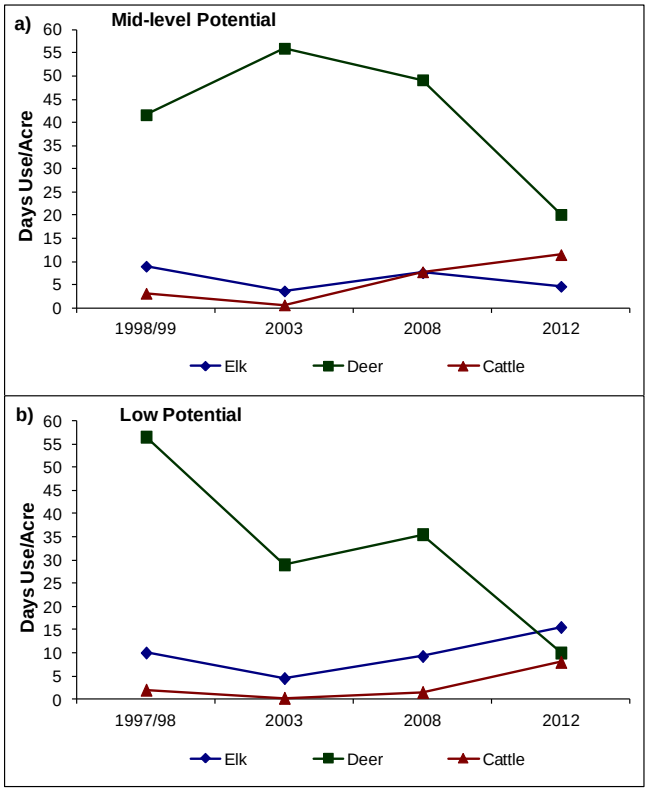


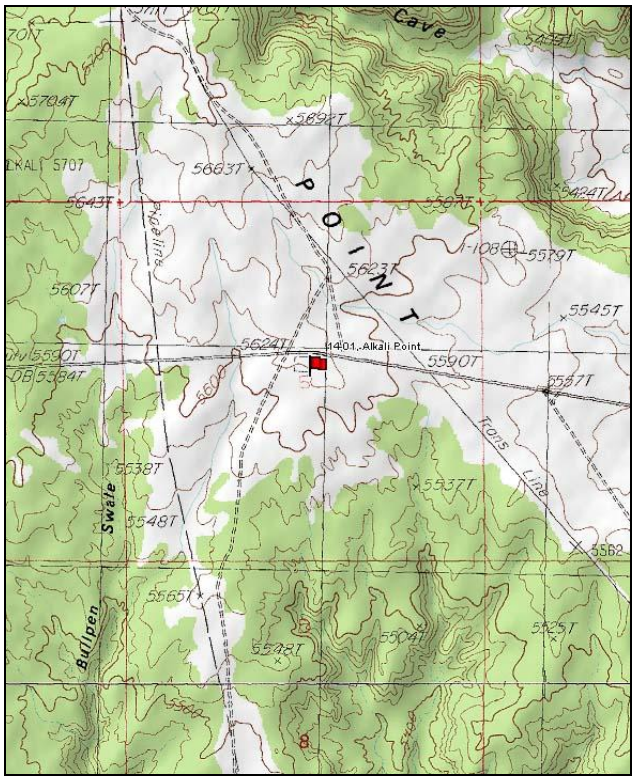
Figure 10. a) Mid-level potential sites mean animal days use/acre (n=6) by year for WMU 23, Monroe. **c)** Low potential sites mean animal days use/acre (n=4) by year for WMU 23.

ALKALI POINT - TREND STUDY NO. 14-1-12

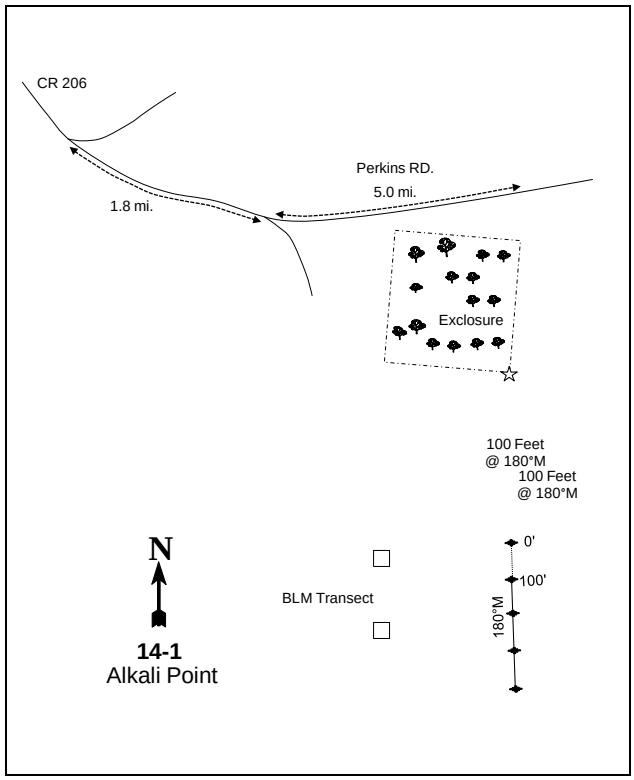
Vegetation Type: Annual Grass
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Semidesert Loam (Wyoming Big Sagebrush), R035XY209UT
Land Ownership: BLM
Elevation: 5,600 ft (1,706 m)
Aspect: West
Slope: 5%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
Turn east by A & M Propane 0.2 miles south of the UDOT shed on the south end of Blanding on SR-l91. Go 1.15 miles. Turn right (south) on county road #206 and travel along the main gravel road 7.0 miles to a fork. Stay right (passing the turnoff to "mustang", county road #207) and proceed 1.8 miles to another fork. Stay left and go 5 miles. Stop at the northeast corner of the exclosure. The transect starts 100 feet off the southeast corner (in line with the east boundary fence) and runs south from there. The 0-foot baseline stake is a fence post marked with a browse tag.

Map Name: Bradford Canyon



Diagrammatic Sketch:



Township: 38S Range: 24E Section: 5

GPS: NAD 83, UTM 12S 649869 E 4153067 N

ALKALI POINT - TREND STUDY NO. 14-1

Site Information

Site Description: The study samples an area on land administered by the Bureau of Land Management (BLM) as part of the Cave Canyon allotment. The areat is important to wintering deer deer moving southwest off the Abajo Mountains. The long and flat tablelands are cut by intermittent-flow canyons which support pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodlands with open Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) flats. This study is in a Wyoming big sagebrush community that has been invaded by cheatgrass. Water is limited on the flat. Deer pellet groups were sampled in very high abundance from 1999 to 2004, but were sampled in moderate abundance in 2004. Elk pellet groups were sampled in low abundance in 2004 and 2012. Cattle pats have been sampled in low abundance since 1999 (Table - Pellet Group Data). Human activity in the area includes gas and oil exploration, drilling, pipeline and road construction, livestock grazing, and recreational activities.

Browse: The dominant browse species found on the site is Wyoming big sagebrush, which is a moderately dense, aged population that has decreased in density over the course of the study. Decadence and poor vigor have both been very high each sample year. Recruitment of young sagebrush to the population has been absent over the course of the study. Utilization of sagebrush has been moderate to very heavy throughout the study years (Table - Browse Characteristics). Cover of sagebrush was high in 1994, but has precipitously decreased over the duration of the study and is now considered to be low (Table - Browse Trends). The increaser species broom snakeweed (*Gutierrezia sarothrae*) has comprised a significant component of the community in many sample years, but was not sampled in 2009. The population of broom snakeweed was sparse in 2012 (Table - Browse Characteristics). There are a few mature juniper trees on the flat, but they do not appear to be encroaching on the site and provide very little escape or thermal cover (Table - Canopy Cover, Line-Intercept).

Herbaceous Understory: The herbaceous understory is poor and dominated by annual grasses, primarily the invasive species cheatgrass (*Bromus tectorum*), which is the dominant species on the site. Cheatgrass provides nearly all of the grass cover on the site. Bottlebrush squirreltail (*Sitanion hystrix*) was common at the outset of the study, but declined significantly in 1999 and has not increased since. Forbs are lacking on the site with many annual species present (Table - Herbaceous Trends).

Soil: The soil is in the Ruinpoint-Cahona association and likely part of the Ruinpoint component, which occurs on mesas. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone (Soil Survey Staff 2011). The soil texture is a sandy clay loam with a slightly alkaline soil reaction (pH 7.4). Phosphorus and potassium may be limiting plant growth and development at 8 ppm and 54.4 ppm, respectively (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Protective ground cover is composed primarily of sagebrush with an understory of annual cheatgrass. Bare ground cover has fluctuated, but has been moderately high since 1994 (Table - Basic Cover). The soil erosion condition has been determined to be stable since 2004.

Trend Assessments

Browse:

- **1986 to 1994 - slightly down (-1):** Differences in density may be related to the larger sample area used in 1994; therefore, trend was determined using other parameters. Decadence of sagebrush remained high and the proportion of plants displaying poor vigor increased from 21% to 49%. There has been no new recruitment of young sagebrush plants.
- **1994 to 1999 - down (-2):** Density of sagebrush decreased by 19% from 2,680 plants/acre to 2,160 plants/acre, and cover decreased from 11% to 9%. Decadence of sagebrush increased from 63% to 80%, but poor vigor decreased to 18%.

- **1999 to 2004 - slightly down (-1):** There was little change in the density of sagebrush, but cover decreased to 7%. Decadence increased to 80% and poor vigor increased to 85% of the population. There is still no new recruitment of young sagebrush plants.
- **2004 to 2009 - down (-2):** The density of sagebrush decreased by 21% to 1,660 plants/acre, and cover decreased to 4%. Decadence and poor vigor both decreased slightly, but remained very high at 82% and 75%, respectively. No young sagebrush plants were sampled.
- **2007 to 2012 - down (-2):** The density of Wyoming big sagebrush decreased 23% to 1,280 plants/acre, and cover decreased to 3%. Decadence decreased to 67%, and poor vigor increased to 84%. Recruitment of young sagebrush to the population remained absent.

Grass:

- **1986 to 1994 - stable (0):** There was little change in the sum of nested frequency of perennial grasses.
- **1994 to 1999 - down (-2):** The sum of nested frequency of perennial grasses decreased by 78% and cover decreased from 2% to near 0%. There was a significant decrease in the nested frequency of bottlebrush squirreltail and a significant increase in the nested frequency of cheatgrass. Cheatgrass cover increased from 4% to 23%.
- **1999 to 2004 - stable (0):** There was little change in the sum of nested frequency or cover of perennial grasses. The nested frequency of cheatgrass and sixweeks fescue both decreased significantly.
- **2004 to 2009 - stable (0):** The site is still dominated by cheatgrass with little change in the sum of nested frequency of perennial grasses.
- **2007 to 2012 - stable (0):** The sum of nested frequencies of perennial grasses increased 61%, but perennial species remain rare on the site. Cheatgrass increased significantly in nested frequency, but cover decreased from 19% to 16%.

Forb:

- **1986 to 1994 - slightly up (+1):** The sum of nested frequency of perennial forbs increased, but cover is still only 1%.
- **1994 to 1999 - down (-2):** The sum of nested frequency of perennial forbs decreased markedly. Perennial forbs were almost nonexistent on the site with almost no cover.
- **1999 to 2004 - stable (0):** The sum of nested frequency of perennial forbs increased slightly, but the sum of nested frequency of annual forbs increased substantially. Almost all of the forb cover was provided by annual forbs.
- **2004 to 2009 - up (+2):** There was a substantial increase in the sum of nested frequency and cover of perennial forbs. The increase was almost entirely due to an increase in Fendler euphorbia (*Euphorbia fendleri*).
- **2007 to 2012 - down (-2):** The sum of nested frequencies of perennial forbs decreased 68%. Perennial forbs are rare on the site.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 14, 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
94	14.1	-3.9	0.0	3.5	-3.0	2.0	0.0	**12.7**	Poor
99	10.9	-9.0	0.0	0.8	-18.2	0.0	0.0	**-15.5**	Very Poor
04	9.3	-12.0	0.0	0.5	-10.8	0.3	0.0	**-12.7**	Very Poor
09	4.8	0.0	0.0	0.6	-14.1	2.8	0.0	**-5.9**	Very Poor
12	3.4	0.0	0.0	1.3	-12.3	0.8	0.0	**-6.9**	Very Poor

Trend Summary

HERBACEOUS TRENDS--
Management unit 14, Study no: 1

Type	Species	Nested Frequency						Average Cover %				
		'86	'94	'99	'04	'09	'12	'94	'99	'04	'09	'12
G	Bromus tectorum (a)	-	a287	c388	a261	a273	b346	3.65	22.55	14.39	18.83	16.38
G	Hilaria jamesii	5	11	6	6	11	13	.12	.16	.07	.21	.19
G	Oryzopsis hymenoides	-	9	6	7	3	6	.19	.04	.09	.03	.06
G	Sitanion hystrix	b111	b105	a16	a8	a9	a15	1.42	.20	.10	.07	.39
G	Stipa comata	-	-	-	-	-	3	-	-	-	-	.00
G	Vulpia octoflora (a)	-	b171	b159	a9	a8	a36	.36	1.65	.02	.01	.08
Total for Annual Grasses		0	458	547	270	281	382	4.01	24.21	14.41	18.85	16.46
Total for Perennial Grasses		116	125	28	21	23	37	1.74	0.40	0.26	0.31	0.64
Total for Grasses		116	583	575	291	304	419	5.75	24.62	14.67	19.16	17.11
F	Astragalus convallarius	ab13	ab9	ab6	ab14	a5	b30	.02	.01	.05	.01	.07
F	Astragalus mollissimus	4	-	-	-	-	-	-	-	-	-	-
F	Astragalus nuttallianus (a)	-	a-	a-	b182	a-	a-	-	-	2.12	-	-
F	Astragalus sp.	a-	b48	a-	a-	a-	a-	a.12	-	-	-	-
F	Cordylanthus sp. (a)	a6	b60	a-	a-	a3	a-	.25	-	-	.15	-
F	Cryptantha sp.	a-	b13	a-	a-	a-	a-	.06	-	-	-	-
F	Cryptantha sp.(a)	-	-	-	-	-	4	-	-	-	-	.01
F	Cymopterus acaulis	-	2	-	-	-	-	.00	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	5	-	4	-	-	.01	-	.01
F	Eriogonum cernuum (a)	-	-	-	2	-	-	-	-	.03	-	-
F	Erodium cicutarium (a)	-	a7	b49	b34	b59	c122	.01	.33	.53	.87	1.54
F	Euphorbia fendleri	a13	a-	a-	a-	b162	a-	-	-	-	1.09	-
F	Gilia sp. (a)	-	4	-	3	-	-	.01	-	.00	-	-
F	Lappula occidentalis (a)	-	b26	a-	c44	ab4	ab16	.05	-	.97	.03	.04
F	Navarretia intertexta (a)	-	a-	ab7	b11	a-	ab4	-	.01	.02	-	.01
F	Phlox longifolia	-	2	-	3	3	4	.01	-	.00	.00	.01
F	Plantago patagonica (a)	-	a7	a2	a5	a4	b27	.04	.00	.01	.03	.09
F	Sphaeralcea coccinea	a5	ab17	a-	ab10	ab16	b25	.80	-	.10	.30	.33
Total for Annual Forbs		6	104	58	286	70	177	0.35	0.35	3.71	1.10	1.71
Total for Perennial Forbs		35	91	6	27	186	59	1.01	0.01	0.17	1.41	0.41
Total for Forbs		41	195	64	313	256	236	1.37	0.37	3.88	2.52	2.12

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

BROWSE TRENDS--
Management unit 14, Study no: 1

Type	Species	Strip Frequency					Average Cover %				
		'94	'99	'04	'09	'12	'94	'99	'04	'09	'12
B	Artemisia tridentata wyomingensis	65	67	61	55	49	11.27	8.68	7.43	3.81	2.70
B	Chrysothamnus nauseosus	4	0	0	0	0	-	-	-	-	-
B	Echinocereus sp.	0	1	1	1	1	-	.00	.15	.03	.15
B	Gutierrezia sarothrae	74	61	93	0	26	2.88	1.33	6.14	.00	.61
B	Juniperus osteosperma	0	0	0	0	0	.63	.00	.85	.85	.63
B	Lycium pallidum	0	0	0	0	1	-	-	-	-	-
B	Opuntia sp.	5	0	0	0	0	.03	-	-	-	-
Total for Browse		148	129	155	56	77	14.82	10.02	14.58	4.70	4.09

CANOPY COVER, LINE INTERCEPT--
Management unit 14, Study no: 1

Species	Percent Cover		
	'04	'09	'12
Artemisia tridentata wyomingensis	5.51	4.71	3.91
Gutierrezia sarothrae	5.91	-	.36
Juniperus osteosperma	1.00	1.56	1.75

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 14, Study no: 1

Species	Average leader growth (in)		
	'04	'09	'12
Artemisia tridentata wyomingensis	1.3	1.3	0.5

BASIC COVER--
Management unit 14, Study no: 1

Cover Type	Average Cover %					
	'86	'94	'99	'04	'09	'12
Vegetation	3.00	22.54	32.62	33.73	24.41	25.42
Rock	1.00	.03	.68	.24	.45	.18
Pavement	.25	.20	.02	.01	.01	.16
Litter	45.75	24.08	41.93	30.83	52.59	40.54
Cryptogams	8.00	1.78	1.97	.80	1.29	2.11
Bare Ground	42.00	52.84	30.11	45.40	36.15	40.64

SOIL ANALYSIS DATA --
Management unit 14, Study no: 1, Study Name: Alkali Point

Effective rooting depth (in)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.8	7.4	62.9	14.6	22.6	1.7	5.8	54.4	0.4

PELLET GROUP DATA--
Management unit 14, Study no: 1

Type	Quadrat Frequency				
	'94	'99	'04	'09	'12
Rabbit	67	36	4	23	4
Elk	6	-	-	1	1
Deer	43	37	53	48	40
Cattle	-	5	-	3	1

Days use per acre (ha)			
'99	'04	'09	'12
-	-	-	-
-	2 (5)	-	1 (3)
135 (333)	103 (255)	119 (294)	25 (63)
2 (5)	4 (11)	12 (29)	4 (9)

BROWSE CHARACTERISTICS--
Management unit 14, 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)
Artemisia tridentata wyomingensis									
86	**4399**	0	35	65	-	12	88	21	22/23
94	**2680**	0	37	63	120	26	13	49	23/35
99	**2160**	0	20	80	-	52	46	18	26/33
04	**2100**	0	10	90	20	35	64	85	23/32
09	**1660**	0	18	82	20	40	52	75	26/37
12	**1280**	0	33	67	40	0	97	84	25/30
Chrysothamnus nauseosus									
86	**0**	0	0	0	-	0	0	0	-/-
94	**100**	0	80	20	40	0	0	0	-/-
99	**0**	0	0	0	-	0	0	0	-/-
04	**0**	0	0	0	-	0	0	0	-/-
09	**0**	0	0	0	-	0	0	0	-/-
12	**0**	0	0	0	-	0	0	0	-/-
Echinocereus sp.									
86	**0**	0	0	-	-	0	0	0	-/-
94	**0**	0	0	-	-	0	0	0	-/-
99	**20**	0	100	-	-	0	0	0	8/13
04	**20**	0	100	-	-	0	0	0	6/15
09	**20**	0	100	-	-	0	0	0	7/20
12	**20**	0	100	-	-	0	0	0	6/12
Gutierrezia sarothrae									
86	**5999**	4	96	0	199	1	2	0	8/9
94	**6840**	23	73	3	2380	0	0	2	8/9
99	**4660**	14	84	2	80	7	0	.85	9/9
04	**31760**	14	86	1	-	8	0	31	6/7
09	**0**	0	0	0	-	0	0	0	-/-
12	**880**	32	68	0	120	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)
Lycium pallidum									
86	**0**	0	0	-	-	0	0	0	-/-
94	**0**	0	0	-	-	0	0	0	-/-
99	**0**	0	0	-	-	0	0	0	-/-
04	**0**	0	0	-	-	0	0	0	-/-
09	**0**	0	0	-	-	0	0	0	-/-
12	**20**	0	100	-	-	0	0	0	14/2
Opuntia sp.									
86	**0**	0	0	0	-	0	0	0	-/-
94	**120**	17	67	17	20	0	0	0	2/4
99	**0**	0	0	0	-	0	0	0	-/-
04	**0**	0	0	0	-	0	0	0	4/10
09	**0**	0	0	0	-	0	0	0	4/14
12	**0**	0	0	0	-	0	0	0	7/25

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