

UTAH BIG GAME RANGE TREND STUDIES 2003 Volume 1 Southern Region



**PUBLICATION NUMBER 04-17
REPORT FOR FEDERAL AID PROJECT W-82-R-48**

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

**UTAH BIG GAME
RANGE TREND STUDIES
2003 Volume 1**

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Performance Report for Federal Aid Project W-82-R-48

Publication No. 04-17

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TABLE OF CONTENTS

PROGRAM NARRATIVE	<u>Page</u> iv
REMARKS	v
MAP OF UTAH WILDLIFE MANAGEMENT UNITS.....	.vi
RANGE TREND STUDY METHODSvii
REPORT FORMAT.....	xviii

	<u>Page</u>	<u>Page</u>
Wildlife Management Unit 20		
Southwest Desert	1	
20-01 Upper Indian Peak		22-12 Big Cedar Cove
20-02 Lower Indian Peak		22-13 Minersville Reservoir
20-03 Mountain Home Seeding		22-14 Antelope Mountain
20-05 Upper Hamblin Valley		22-15 South Creek
20-06 Wah Wah Pass		22R-4 Above Fremont Wash
20-07 South Spring		22R-1 Tushar Mountain Goat #1
		22R-2 Tushar Mountain Goat #2
Wildlife Management Unit 21 Fillmore	55	Wildlife Management Unit 23 Monroe
21-01 Long Canyon		23-01 Bear Ridge
21-02 Lovell Hollow		23-02 Saul Meadow
21-03 Cascade Spring		23-03 Thompson Basin
21-04 Horse Hollow		23-04 Poverty Flat
21-06 "M" Hill		23-05 Smith Canyon
21-07 Bennett Field		23-06 Koosharem Canyon
21-08 Smiths Ridge		23R-1 Greenwich Disking
21-09 Wide Canyon BLM		23R-2 Greenwich Native
21-10 Wide Canyon DWR		23R-3 Plateau Harrow
21-11 Dog Valley		23R-4 Plateau Native
21-12 Dameron Canyon		Wildlife Management Unit 24
21-13 Walker Canyon		Mount Dutton
21-14 Meadow Creek		24-01 North Pole Canyon
21-15 Fillmore East Cemetary		24-02 Deer Creek Bench
21-16 Baker Canyon		24-03 North Bull Rush
21-17 Pioneer Peak		24-04 Mud Spring Chaining
21-18 Teeples Ridge		24-06 Table Mountain
21-19 Teeples Terrace		24-07 Cow Creek
21R-1 Corn Creek		24-08 Prospect Seeding
Wildlife Management Unit 22 Beaver	209	24-09 Mud Spring
22-01 Deer Flat		24-12 Marshall Basin
22-02 Piute Reservoir		24-13 Jones Corral
22-03 Oak Basin		24R-1 Sanford
22-04 Wades Canyon		
22-05 Bone Hollow		
22-06 Beaver Table		
22-07 Sheep Rock		
22-08 Muley Point		
22-09 Rocks Reseeding		
22-10 Doubleup Hollow		
22-11 "B" Hill		

	<u>Page</u>
Wildlife Management Unit 25C	
Plateau, Boulder	515
25C-01 Yergy	
25C-02 Wildcat	
25C-03 Happy Valley	
25C-04 North Slope	
25C-05 Giles Hollow	
25C-06 Terza Flat	
25C-07 Cedar Grove	
25C-08 South Narrows	
25C-09 Dry Wash	
25C-12 Nazer Draw	
25C-13 Short Neck	
25C-14 New Home Bench	
25C-15 Steep Creek Bench	
25C-17 Varney-Griffen Chaining	
25C-20 Baldys	
25C-23 Coal Bench	
25C-25 Center Creek	
25C-26 Black Canyon	
25C-27 Poison Creek Bench	
25C-28 North Creek	
25C-31 Parker Mountain Aerator	
References	724

PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

Need:

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

Objective:

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

Expected Results or Benefits:

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

REMARKS

The work completed during the 2003 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southern Region. Most trend studies surveyed in these management units were established in the 1980's with rereads at 5 year intervals.

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

Bureau of Land Management

- Cedar City Field Office
- Grand Staircase-Escalante National Monument
- Kanab Field Office
- Fillmore Field Office
- Richfield Field Office
- St. George Field Office

Dixie National Forest

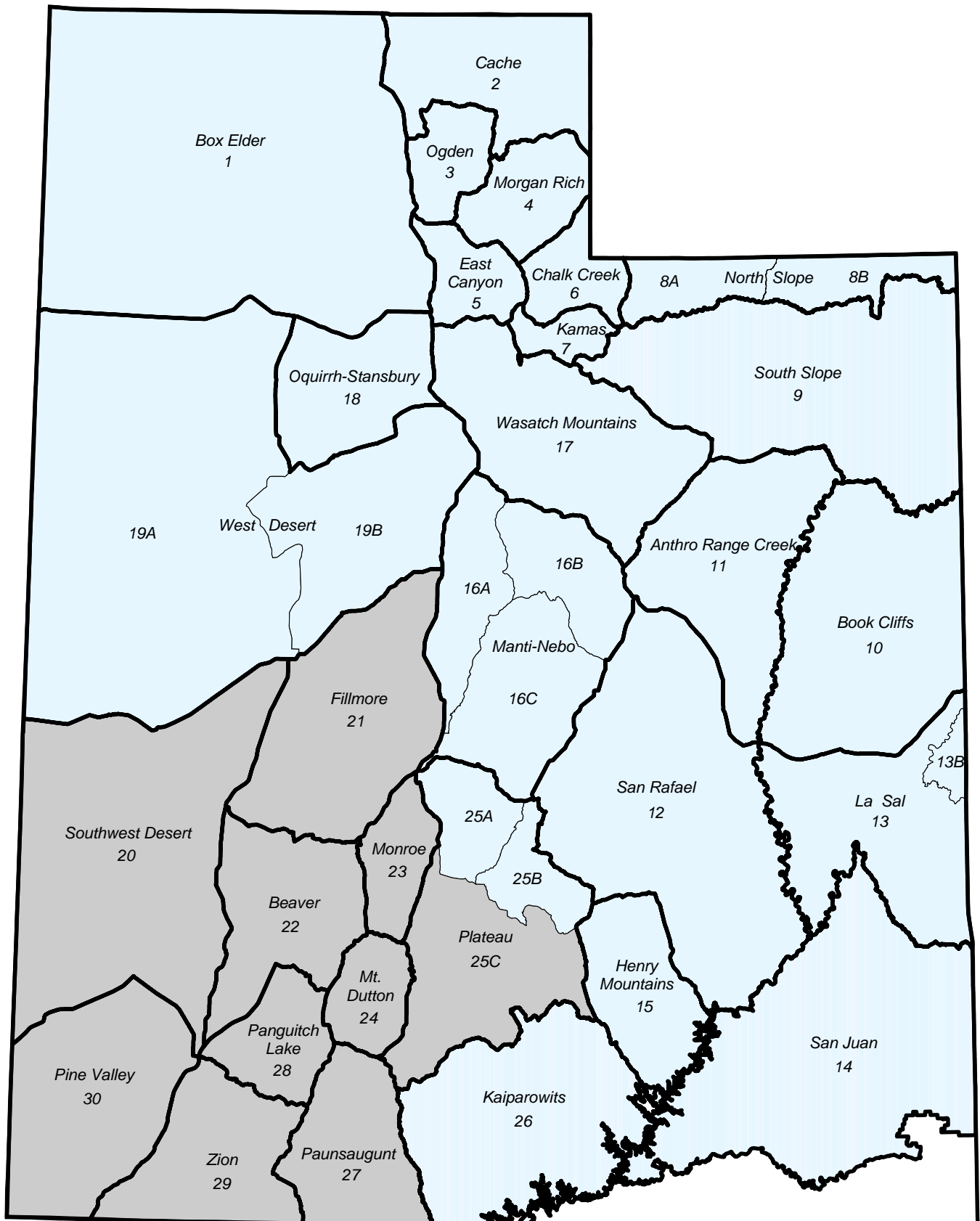
- Cedar City Ranger District
- Escalante Ranger District
- Pine Valley Ranger District
- Powell Ranger District
- Teasdale Ranger District

Fishlake National Forest

- Beaver Ranger District
- Fillmore Ranger District
- Richfield Ranger District

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

Utah Management Units Surveyed in 2003



RANGE TREND STUDY METHODS

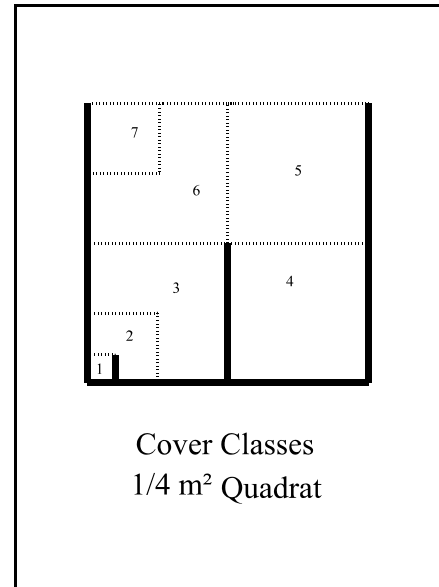
Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or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

Vegetative composition

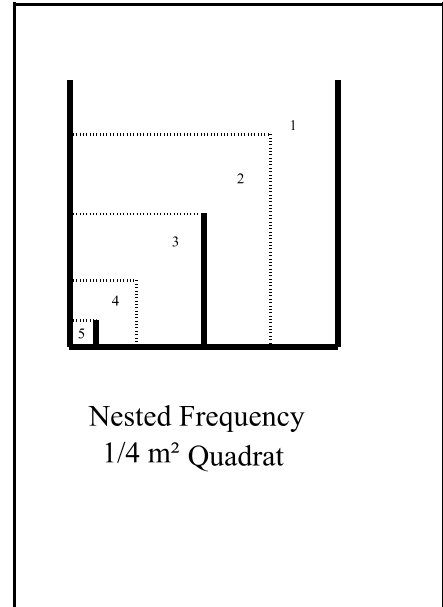
Determining vegetational characteristics for each “key” area is determined by setting up 5 consecutive 100 foot baseline transects in the area of interest. This 500 foot line is the baseline and one, 100 foot belt is placed perpendicular to each 100 foot section of the baseline at random foot marks and centered on the 50 foot mark. The beginning of each belt is marked by a rebar stake to ensure a more precise alignment of the originally sampled belt. A 1/4 m² quadrat is centered every 5 feet along the same side of the belt, starting at the 5 foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species.

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

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



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



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

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

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

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

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

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

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

Dead: A plant which is no longer living.

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

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

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

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

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

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

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

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

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

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

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

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

TREND DETERMINATION

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

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

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

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

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

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

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Agropyron spicatum</i>	_b 227	_b 227	_a 183	_a 160	7.78	5.59
G	<i>Bromus tectorum</i> (a)	-	-	_b 42	_a 15	.43	.03
G	<i>Oryzopsis hymenoides</i>	4	12	12	5	.17	.04
G	<i>Poa fendleriana</i>	_a 6	_{bc} 36	_c 49	_{ab} 24	.98	.46
G	<i>Poa secunda</i>	_a 3	_a 18	_b 94	_b 80	2.00	.94
G	<i>Sitanion hystrix</i>	_c 25	_{bc} 20	_{ab} 6	_a 2	.01	.01
Total for Annual Grasses		0	0	42	15	0.43	0.03
Total for Perennial Grasses		265	313	344	271	10.95	7.05
Total for Grasses		265	313	386	286	11.39	7.08
F	<i>Agoseris glauca</i>	_a -	_a 10	_{ab} 1	_a -	.00	-
F	<i>Arabis</i> spp.	_a -	_b 18	_a 1	_a 1	.00	.00
F	<i>Astragalus convallarius</i>	2	4	6	6	.15	.10
F	<i>Calochortus nuttallii</i>	4	8	-	-	-	-
F	<i>Crepis acuminata</i>	-	6	7	-	.06	-
F	<i>Eriogonum racemosum</i>	-	-	4	-	.03	-
F	<i>Eriogonum umbellatum</i>	_a -	_a 1	_b 9	_{ab} 5	.16	.07
F	<i>Phlox austromontana</i>	-	6	4	6	.16	.15
F	<i>Physaria chambersii</i>	1	4	-	-	-	-
F	<i>Phlox longifolia</i>	_a 8	_b 27	_a 16	_a 6	.20	.02
Total for Annual Forbs		0	0	0	0	0.00	0
Total for Perennial Forbs		15	84	48	24	0.83	0.35
Total for Forbs		15	84	48	24	0.83	0.35

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

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

The following “Browse Trends” table summarizes strip frequency and cover for all shrub species occurring on this site. All of the shrubs encountered at study number 23-1 are listed. For example, mountain big sagebrush (*Artemisia tridentata vaseyana*) had a strip frequency of 40 out of a possible 100 in 1998, declining to 26 in 2003. Average cover is determined using cover classes in conjunction with the 1/4m² quadrat and estimating the percent of the quadrat covered. In this case, mountain big sagebrush cover was estimated to be 2.54% in 1998, declining to only 0.76% in 2003.

BROWSE TRENDS --

Management unit 23 , Study no: 1

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

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

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 1

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

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

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 1

Species	Average leader growth (in)
	'03
<i>Artemisia tridentata vaseyana</i>	1.1
<i>Purshia tridentata</i>	4.0

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

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 1

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

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

BASIC COVER --

Management unit 23 , Study no: 1

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

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

SOIL ANALYSIS DATA --

Management unit 23, Study # 01, Study Name: Bear Ridge

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

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

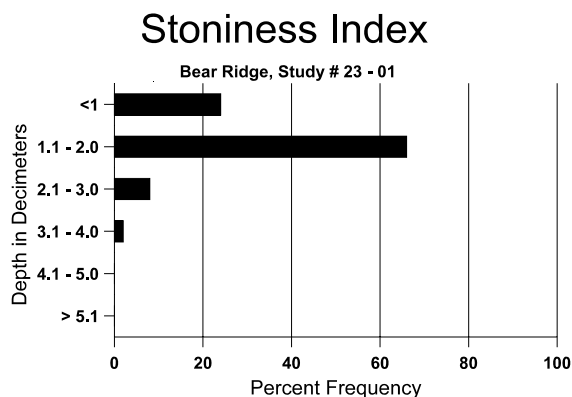
Ultra acid	< 3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	> 9.1

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

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

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

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



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

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

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

It was determined that additional information on pellet groups was necessary. Therefore, a pellet group transect is now sampled in conjunction with the vegetative transects. The pellet group transect utilizes 50, 100ft² circular plots which are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetative transect which runs 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre. In the above example, deer days use/acre was estimated at 51 in 1998 increasing slightly to 54 in 2003. If a trend study needs to be read annually and more precision is required, the pellet group transect is marked permanently (rebar) and the pellet groups within the circular plots are removed or marked after being counted.

On the following page is a section of a “Browse Characteristics” table which summarizes characteristics of

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

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

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

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

Considering all these factors, trend for sagebrush in 2003 is slightly downward due to a decline in density and increased percent decadence. Also, the number of dead plants encountered is more than double the number of live plants inventoried. No seedlings were encountered in 1998 or 2003 and young plants are only moderately abundant.

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

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REPORT FORMAT

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

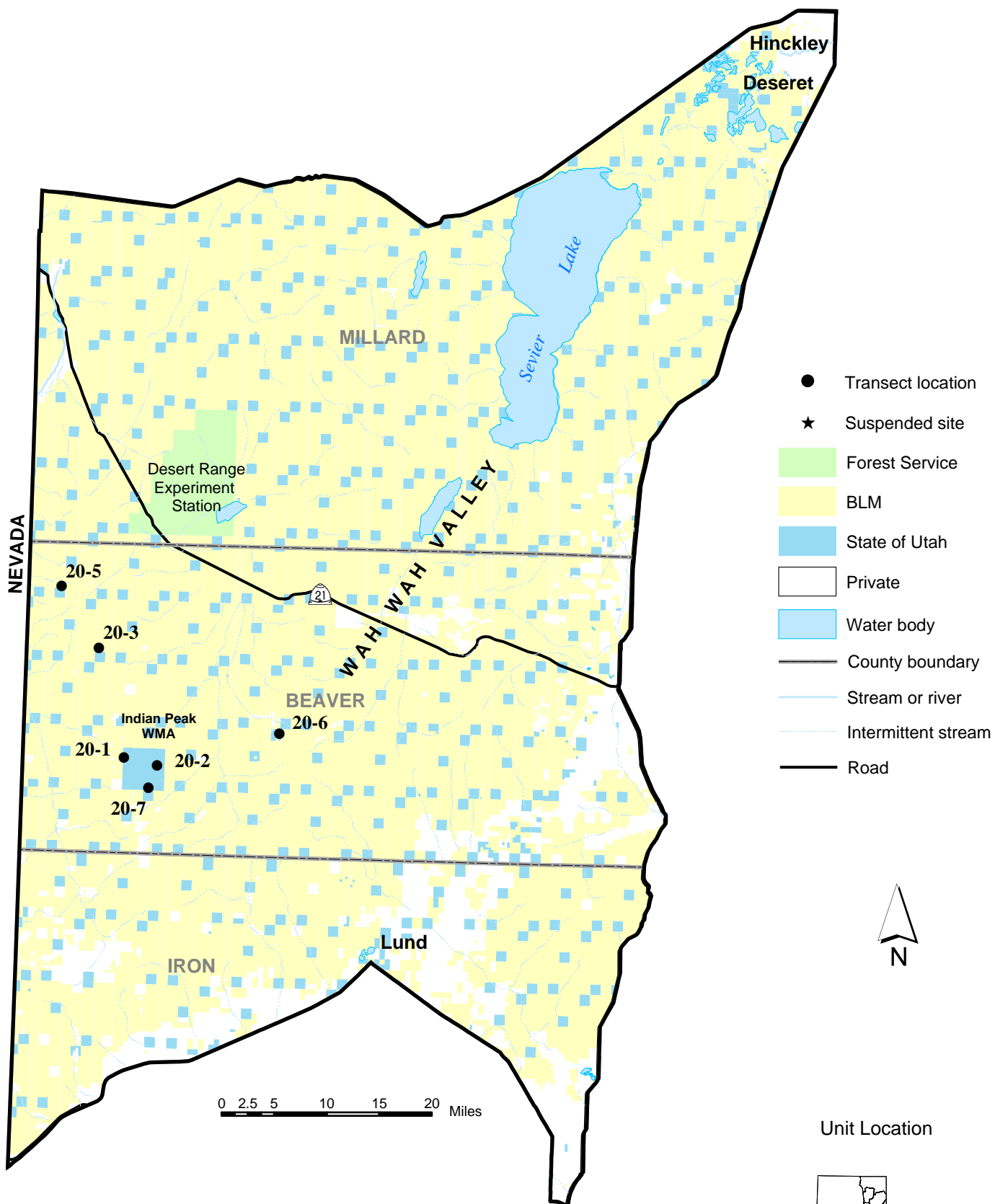
The name of the site and directions for locating the site are given on the location page. Also included on this page are the vegetation type, arrangement and diagrammatic sketch of the baseline, and the location on a topographical map. The 7.5 minute topographical map name and public land survey description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

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

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

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

Management Unit 20

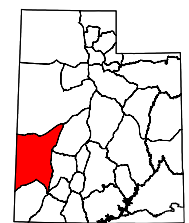


- Transect location
- ★ Suspended site
- Forest Service
- BLM
- State of Utah
- Private
- Water body
- County boundary
- Stream or river
- Intermittent stream
- Road



0 2.5 5 10 15 20 Miles

Unit Location



WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

Boundary Description

Beaver, Iron and Millard counties - Boundary begins at Highway US-50(6) and the Utah-Nevada state line; then east along US-50(6) to Highway SR-257; then south of SR-257 to Highway SR-21; then south on SR-21 to Highway SR-130; then south on SR-130 to Interstate 15; then south on I-15 to Highway SR-56; then west on SR-56 to the Lund Highway; then northwest along this highway to the Union Pacific railroad tracks at Lund; then south along this railway to the Utah-Nevada state line; then north along this state line to US-50(6) and beginning point.

Management Unit Description

The West 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 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. The elevation on the unit ranges from 4,700 feet at the hardpan in Wah Wah Valley to 9,790 feet at Indian Peak.

Most of the unit is administered by the BLM (>80%). The DWR manages the 10,240 acre Indian Peak Wildlife Management area and private interests control 5% of the deer and elk summer range and 4% and 8% of the deer and elk winter range. 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 vegetal composition 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 juniper-pinyon (*Pinus monophylla*) as the most prevalent, covering 74% of the deer range. Sagebrush was second, covering 19% of the range. The browse-shrub type and seeded areas cover 4% and 3% of the range respectively. The browse-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 of former pinyon-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 seedings for deer have been in the Indian Peaks area where bitterbrush is common.

Herd Unit Management Objectives

The West Desert was all considered to be one herd unit prior to 1971 when it was split into three subunits

(62A, 62B and 62C). Deer numbers and thus harvests have always been relatively low in these units. Unit 62C was renumbered to Wildlife Management unit 20 in 1998. Either sex hunts were conducted in unit 20 between 1951 and 1973 with a maximum harvest of 617 deer in 1972. The average harvest for the buck only hunts between 1974 and 1984 was 133, with a low of 50 in 1975, and a high of 197 in 1984 (Jense et al 1985). Harvests have declined between 1991 and 1995 from 261 in 1991 to only 55 by 1995. To get a better idea of what kind of trend is taking place on this herd unit, a regression of deer harvest since 1950 is best to help explain the trend. This type of analysis indicates a continued downward trend that is 37% lower than what took place in 1950 (Jense et al. 1991). Poor fawning and summering areas contribute to typically low fawn production (usually well below 70 fawns/100 does) which inhibits the rate of increase. Fawn/doe ratios were estimated at only 14 in 1986-87 and 45 in 1988-89 (Jense et al. 1991). This increased to 51 by 1991-92, but dropped to 33 fawns/100 does in 1992-93 (Evans et al. 1996). These low counts are reflective of the downward trend in deer populations for Utah's western desert areas.

Current population objectives for deer are to reach a target winter population of 4,000. More recently, only 2,500 deer were estimated in the post season counts of 1996. The herd composition is to be maintained with a post season buck to doe ratio of 15:100, with 30% of the bucks being 3 point or larger. Overall deer numbers on this unit are significantly below recent averages and greatly below historic highs and averages (Evans et al. 1996). Elk objectives are to achieve a population of 975 wintering animals with a minimum post season bull to cow ratio of 16:100. At least 8 of these bulls are to be 2 ½ years old or older. The bull harvest objective is to maintain a bull harvest of 90% to 100% mature bulls with an average age of at least 7-8 years.

Competition between 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 resulting in reduced forage production and erosion problems. Many of these riparian areas should be fenced to alleviate some of these problems. Chaining and seeding of closed juniper-pinyon stands at higher elevations would enhance the area for elk and could have limited benefits for deer.

Study Site Description

Because of unit 20's limitations as big game range, it had been given a low priority and only two permanent trend monitoring studies were established in 1985. These studies were both on DWR lands in the Indian Peak Wildlife Management area. Due to increasing competition with deer, elk, and wild horses, 3 additional trend studies were established in 1998 and one in 1999. These include Mountain Home Seeding, Upper Hamblin Valley, Wah Wah Pass, and South Spring. A discussion of each site's trends follows.

Trend Study 20-1-03

Study site name: Upper Indian Peak.

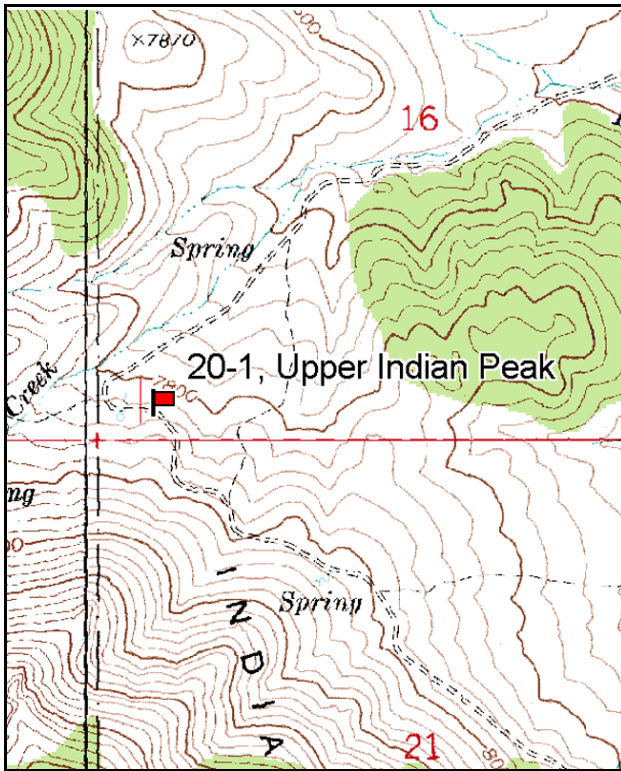
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

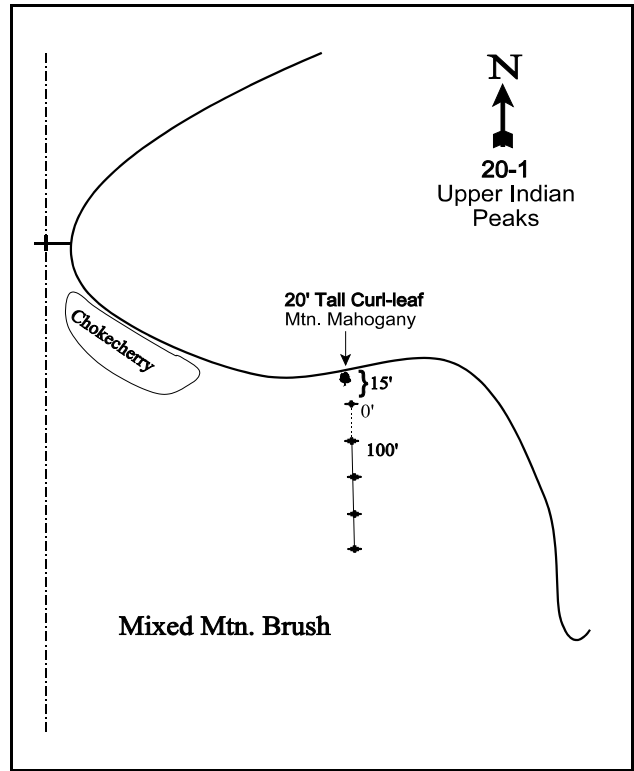
LOCATION DESCRIPTION

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 two to three foot tall steel rebar.



Map Name: Buckhorn Spring

Township 29S, Range 18W, Section 16



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4240553 N, 248679 E

DISCUSSION

Upper Indian Peak - Trend Study No. 20-1

The Upper Indian Peak range trend study samples an area of mixed mountain brush, northeast of Indian Peak. This limited browse-shrub range type is important to the resident deer and elk herds. The site is at an elevation of 7,900 feet with a northerly aspect and a slope which varies from 20% to 30%. It is used year-round except when there is deep snow. There is ample, although low quality, winter range within the pinyon-juniper belt. Water can be limiting on these dry mountains, but there are several springs and a small perennial stream within one-quarter mile of this site.

Deer, elk, trespass cattle, and feral horses are found in the area. Pellet group data from 1991 estimated only 6 deer and 5 elk days use/acre (14 ddu/ha and 13 edu/ha). Pellet group data from 1998 estimated 8 deer and 26 elk days use/acre (20 ddu/ha and 64 edu/ha). Some trespass cattle use occurred in 1998 estimated at 4 cow days use/acre (10 cdu/ha). Data from 2003 showed increased elk use at 60 days use/acre (148 edu/ha), while deer use was estimated at only 2 days use/acre (5 ddu/ha). The allotment has been closed to livestock grazing since 1978. However, cattle continued to trespass onto DWR land until the late 1990's.

The soil varies in depth because of a rocky subsurface horizon. This rockiness effects rooting depth which averages just over 15 inches. Some loose rock fragments occur on the surface and pavement accounts for 25% to 30% of the ground surface. There is some moderate downslope movement of rocks and soil which causes pedestalling on the uphill side of shrubs and terracing of trails parallel to the slope. However, erosion is not a serious problem and vegetation and litter provide adequate ground cover to prevent most erosion.

A variety of browse species comprise the vegetative community. The most prominent browse species are both valuable and palatable forage species. These include true mountain mahogany, Utah serviceberry, and mountain big sagebrush. Other important but less abundant species include curleaf mountain mahogany, bitterbrush, slenderbush eriogonum, and mountain snowberry. All of the palatable browse species have increased in density since the 1998 reading. The three most abundant preferred browse, mountain big sagebrush, true mountain mahogany, and serviceberry currently make up 77% of the total browse cover. Mountain big sagebrush has always provided the most cover (production) of all browse species since the site was set up in 1985. It provided 38% of the browse cover in 2003 with a cover value of 13%. The next two browse in order of abundance are still Utah serviceberry and true mountain mahogany, but have switched their order in amount of cover they provide. Utah serviceberry accounts for 24% of the browse cover, while true mountain mahogany provides an additional 15%. Preferred browse species displayed mostly light to moderate use in 1985, increasing to moderate and heavy use by 1991, 1998, and 2003, except for mountain big sagebrush which has shown mostly light to moderate use. Vigor is good overall and populations appear to be stable to improving.

The herbaceous understory in the past has been abundant and diverse. Seven perennial grasses provided 13% cover in 1998. The only abundant grass was mutton bluegrass which made up 91% of the grass cover in 1998. It was still the most abundant species in 2003, but it now makes up only 55% of the grass cover. Grass cover has decreased by 43% since 1998. Utilization of the grasses has always appeared to be light. A variety of forbs were found growing in close proximity to the shrubs, although few are within the interspaces. Cover of forbs has also decreased since 1998 by 32%. This could be due to soil condition, moisture availability or providing protection from grazing animals. Many valuable forage species are present which are very important in providing succulent summer forage. Some of the more common forbs include Indian paintbrush, Eaton fleabane, tapertip hawksbeard, dusty penstemon, and desert phlox. Paintbrush was heavily utilized in 1991 and 1998. The dry conditions in 2002 and 2003 have caused a decrease in overall herbaceous cover by two-thirds since the 1998 reading.

1985 APPARENT TREND ASSESSMENT

Signs indicate some soil movement, although erosion is not a serious problem. The increasing vegetative and litter cover will help stabilize the soil and may also aid the establishment of forbs. Density of desirable browse species appears to be increasing. Cattle grazing should be closely regulated to ensure they do not further damage the water sources and over utilize the vegetation in riparian areas which appear to be critical big game habitat.

1991 TREND ASSESSMENT

The soil trend appears slightly down but no severe erosion problems are occurring on the site. Vegetation and litter cover have increased slightly, but percent bare ground has increased from 12% to 20% since 1985. The key browse species show decreases in population densities and slight increases in decadent plants, with the exception of sagebrush which makes up half of the preferred browse. However, there are still good numbers of young and seedlings so the trend overall appears stable. Grass and forb trend is slightly up due to a large increase in nested frequency values.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground declined but litter cover also declined. However, this was compensated for by a substantial increase in vegetative cover. Some erosion is occurring but it is minimal. Trend for the key browse species, serviceberry, mountain big sagebrush, and true mountain mahogany is stable with changes in population densities primarily related to the much larger sample used in 1998. These shrubs show similar use compared to 1991, vigor is generally good, and percent decadence is low. Current reproduction appears adequate to maintain these populations. Trend for the herbaceous understory is mixed. Trend for perennial grasses is stable, but sum of nested frequency of perennial forbs has declined dramatically. Some of the difference would also be due to the larger sample. The original 100 ft frequency baseline was placed in an area with heavier cover of herbaceous plants. The new baseline is 400 feet long and stretches further up the hill where there is larger bare shrub interspaces and less forbs. The largest decline in nested frequency for forbs comes from Indian paintbrush, Eaton fleabane, longleaf and desert phlox. With this in mind, trend is considered stable.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil appears to be downward with decreases in vegetative and litter cover, and a significant increase in bare soil. Some erosion is occurring but it is minimal. Trend for the key browse species, serviceberry, mountain big sagebrush, and true mountain mahogany, which makes up 77% of the total browse cover, is stable. Trend has remained stable with slight increases in density for each of the primary species. Use on these shrubs remains similar compared to 1998, vigor is generally good, and percent decadence remains about the same. Current reproduction appears adequate to maintain these populations. Trend for the herbaceous

understory is down from 1998, with significant reductions in both grass and forb cover and sum of nested frequency. This has been a dramatic decline because of the drought. The largest decline in nested frequency for forbs comes from Indian paintbrush, Eaton fleabane, and desert phlox.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 20 , Study no: 1

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	-	-	-	6	-	.01
G	Agropyron spicatum	_a 10	_{ab} 38	_a 23	_b 54	.26	.87
G	Koeleria cristata	1	-	6	-	.06	-
G	Leucopoa kingii	-	-	2	-	.01	-
G	Poa fendleriana	_b 267	_b 267	_b 265	_a 135	11.69	2.57
G	Poa secunda	_a -	_{ab} 4	_b 17	_c 63	.55	1.25
G	Sitanion hystrix	-	-	1	-	.06	-
G	Stipa comata	-	-	3	-	.15	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		278	309	317	258	12.78	4.70
Total for Grasses		278	309	317	258	12.78	4.70
F	Achillea millefolium	1	-	3	-	.00	-
F	Agoseris glauca	_a -	_a -	_b 14	_{ab} 6	.04	.04
F	Allium spp.	_a -	_a -	_b 18	_a 3	.09	.00
F	Antennaria rosea	-	2	-	1	-	.00
F	Androsace septentrionalis (a)	-	-	5	-	.01	-
F	Arabis drummondi	4	6	2	2	.01	.00
F	Astragalus mollissimus	_b 33	_b 20	_b 18	_a -	.14	-
F	Astragalus utahensis	-	-	7	-	.33	-
F	Balsamorhiza hookeri	_a -	_a -	_b 35	_a -	.57	-
F	Balsamorhiza sagittata	1	3	1	4	.03	.06
F	Castilleja angustifolia	_b 62	_c 113	_b 66	_a 25	1.40	.13
F	Calochortus nuttallii	1	-	5	1	.04	.00
F	Collinsia parviflora (a)	-	-	_b 12	_a -	.05	-
F	Crepis acuminata	_{ab} 32	_c 66	_b 39	_a 16	.29	.03
F	Cymopterus spp.	_a -	_a -	_b 25	_b 11	.32	.05
F	Delphinium nuttallianum	-	-	2	-	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Erigeron eatonii</i>	_b 162	_b 153	_a 112	_a 106	2.01	.92
F	<i>Erigeron pumilus</i>	3	5	3	-	.00	-
F	<i>Eriogonum racemosum</i>	41	35	24	18	.22	.17
F	<i>Eriogonum umbellatum</i>	27	40	46	28	.95	.21
F	<i>Fritillaria atropurpurea</i>	_a -	_a -	_b 13	_a -	.05	-
F	<i>Galium multiflorum</i>	3	3	6	4	.18	.03
F	<i>Lappula occidentalis</i> (a)	-	-	3	-	.00	-
F	<i>Lomatium</i> spp.	_a -	_a -	_b 38	_a 6	.47	.01
F	<i>Lupinus argenteus</i>	_c 42	_{bc} 38	_{ab} 20	_a 11	.92	.72
F	<i>Lygodesmia spinosa</i>	-	4	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	3	-	.00	-
F	<i>Penstemon bridgesii</i>	7	17	4	6	.15	.04
F	<i>Penstemon comarrhenus</i>	_{ab} 21	_b 22	_b 20	_a 2	1.24	.37
F	<i>Phlox austromontana</i>	_b 163	_b 197	_a 91	_a 80	4.61	3.40
F	<i>Phlox longifolia</i>	_b 69	_b 86	_a 33	_a 30	.15	.10
F	<i>Senecio integerrimus</i>	_a -	_a -	_b 15	_b 13	.13	.08
F	<i>Streptanthus cordatus</i>	4	2	7	7	.01	.07
F	Unknown forb-perennial	5	-	-	-	-	-
Total for Annual Forbs		0	0	23	0	0.08	0
Total for Perennial Forbs		681	812	667	380	14.46	6.48
Total for Forbs		681	812	690	380	14.54	6.48

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	'98	'03
B	Amelanchier utahensis	30	30	8.40	5.89
B	Artemisia tridentata vaseyana	87	86	15.96	13.22
B	Cercocarpus ledifolius	4	4	.39	1.60
B	Cercocarpus montanus	30	32	5.22	7.63
B	Chrysothamnus parryi	0	14	-	.04
B	Chrysothamnus viscidiflorus viscidiflorus	22	21	.91	1.05
B	Eriogonum microthecum	30	47	.79	1.09
B	Gutierrezia sarothrae	0	1	-	-
B	Opuntia erinacea	19	15	.22	.09
B	Pinus monophylla	2	0	-	-
B	Purshia tridentata	3	4	.68	.66
B	Symphoricarpos oreophilus	35	40	1.87	3.34
B	Tetradymia canescens	5	10	.18	-
Total for Browse		267	304	34.66	34.63

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 1

Species	Percent Cover
	'03
Amelanchier utahensis	11.14
Artemisia tridentata vaseyana	11.85
Cercocarpus ledifolius	1.25
Cercocarpus montanus	7.75
Chrysothamnus parryi	.43
Chrysothamnus viscidiflorus viscidiflorus	.50
Eriogonum microthecum	.43
Opuntia erinacea	.01
Purshia tridentata	1.29
Symphoricarpos oreophilus	5.03
Tetradymia canescens	.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 20 , Study no: 1

Species	Average leader growth (in)
	'03
Amelanchier utahensis	3.7
Cercocarpus ledifolius	3.0
Cercocarpus montanus	4.3
Purshia tridentata	3.1

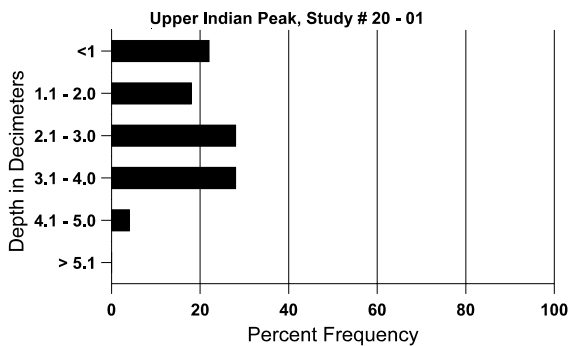
BASIC COVER --
Management unit 20 , Study no: 1

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	12.50	14.50	49.77	42.25
Rock	1.00	1.75	4.53	2.73
Pavement	36.25	22.00	33.65	22.38
Litter	38.75	42.00	34.09	25.88
Cryptogams	0	0	.08	0
Bare Ground	11.50	19.75	8.10	22.10

SOIL ANALYSIS DATA --
Management unit 20, Study no: 1, Study Name: Upper Indian Peak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
15.3	59.7 (15.6)	7.3	62.0	21.1	16.9	2.2	9.3	112.0	0.4

Stoniness Index



PELLET GROUP DATA --
 Management unit 20 , Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	19	-	-	-
Elk	19	24	26 (64)	60 (149)
Deer	14	3	8 (20)	2 (5)
Cattle	3	-	4 (10)	-

BROWSE CHARACTERISTICS --
 Management unit 20 , Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	1066	133	-	1066	-	-	0	0	0	0	27/23
91	399	400	133	200	66	-	17	0	17	0	33/35
98	900	60	320	560	20	-	27	9	2	0	42/46
03	920	20	80	820	20	-	15	78	2	0	41/50
Artemisia tridentata vaseyana											
85	11332	1200	4066	6933	333	-	19	2	3	1	8/13
91	11599	66	1000	7933	2666	-	50	31	23	11	8/18
98	6840	840	1040	4920	880	240	34	13	13	3	15/23
03	7100	-	200	5660	1240	240	25	.28	17	3	9/17
Cercocarpus ledifolius											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	100	-	40	60	-	-	40	20	-	0	76/59
03	100	-	20	80	-	-	20	60	-	0	73/77
Cercocarpus montanus											
85	1466	333	200	1200	66	-	36	0	5	0	30/12
91	1132	333	200	866	66	-	41	35	6	6	31/37
98	740	20	140	540	60	20	46	24	8	3	43/52
03	1040	-	140	900	-	-	12	81	0	0	39/51
Chrysothamnus parryi											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	340	-	-	320	20	-	6	24	6	0	7/10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus											
85	866	-	200	600	66	-	0	0	8	0	8/6
91	332	-	133	133	66	-	20	0	20	0	9/11
98	720	20	80	520	120	20	11	0	17	0	10/14
03	960	-	-	900	60	-	19	4	6	0	10/12
Eriogonum microthecum											
85	10532	666	1733	7933	866	-	0	0	8	3	6/4
91	7133	733	2200	4200	733	-	10	.93	10	7	7/7
98	1000	120	60	900	40	-	0	2	4	0	7/10
03	2240	-	20	2180	40	-	4	2	2	0	7/8
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	6/9
Opuntia erinacea											
85	3399	133	1133	2266	-	-	0	0	0	2	5/8
91	2599	200	733	1133	733	-	0	0	28	26	4/6
98	440	-	160	200	80	-	0	0	18	18	4/9
03	420	-	60	340	20	-	0	0	5	10	4/9
Pinus monophylla											
85	266	-	266	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	60	-	60	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	60	-	-	60	-	-	0	33	-	0	11/53
03	80	-	-	80	-	-	25	75	-	0	11/55
Symphoricarpos oreophilus											
85	1266	133	666	600	-	-	0	0	0	0	10/9
91	866	-	533	333	-	-	15	0	0	0	12/22
98	1420	60	400	1020	-	-	3	0	0	0	12/22
03	1900	-	220	1620	60	-	8	0	3	2	11/22

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Tetradymia canescens											
85	533	133	-	333	200	-	0	0	38	13	10/6
91	399	66	133	-	266	-	0	0	67	50	-/-
98	100	-	-	80	20	-	0	0	20	0	12/13
03	320	-	40	240	40	-	19	0	13	0	12/16

Trend Study 20-2-03

Study site name: Lower Indian Peak.

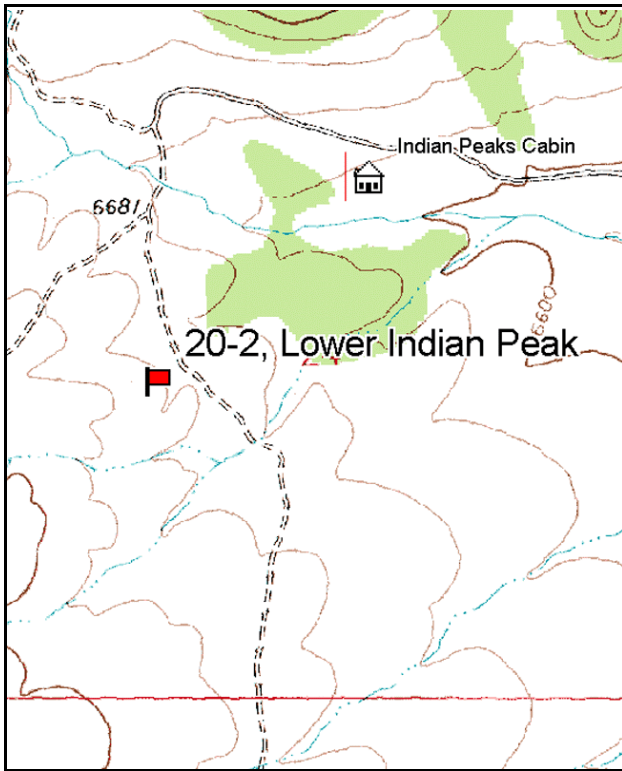
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (59ft). Rebar: belt 1 on 6ft, belt 5 on 1ft, belt 3 on 8ft.

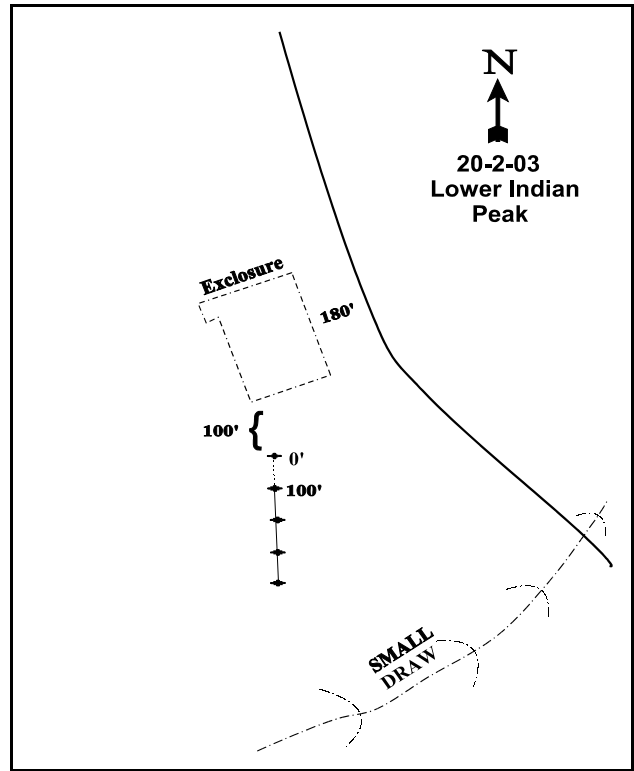
LOCATION DESCRIPTION

From the Indian Peaks state cabin travel 0.4 miles west to a fork, turn left. Turn left and cross the stream. Continue 0.1 miles and turn left at the fork. Go 0.30 miles to an enclosure which is about 180 feet off the right side of the road. The frequency baseline starts 100 feet south (in line with the fence) of the southwest corner of the enclosure. The 0-foot baseline stake is a rebar with browse tag #7076 attached.



Map Name: Buckhorn Spring

Township 29S, Range 18W, Section 24



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4239423 N, 253743 E

DISCUSSION

Lower Indian Peak - Trend Study No. 20-2

The Lower Indian Peak study is located on a chained and seeded section of DWR land. One hundred acres were treated in 1959 by chaining and drilling with a mixture of grasses, forbs, and browse species. The area is now dominated by perennial grasses with scattered sagebrush and pinyon-juniper. The terrain is gently sloping with a generally eastern aspect and an elevation of 6,770 feet. Deer use in this open area appears light. Pellet group counts in 1991 estimated only 2 deer and 3 elk days use/acre (5 ddu/ha and 7 edu/ha). Pellet group data from 1998 estimated 7 deer, 16 elk and 6 cow days use/acre (17 ddu/ha, 40 edu/ha and 15 cdu/ha). Pellet group data from 2003 estimated increased big game use at 11 deer days use/acre (27 ddu/ha) and 44 elk days use/acre (109 edu/ha). Rabbit sign was abundant with a quadrat frequency of 57% in 2003.

The soil is quite variable in depth and rocky with an effective rooting depth estimated at 14 inches. Variable soil depth is evident with the presence of the shallow rooted black sagebrush over most of the site as well as the deeper rooted mountain big sagebrush which is found in areas of deeper soil. Soil texture is a sandy loam which is slightly acidic (pH 6.4). Many large rocks are found on the surface. Along with this and erosion pavement, rock covers almost one-third of the soil surface. Buildup of litter is limited to mostly remnants of old pinyon-juniper chaining slash. Some erosion does occur, but appears insignificant at this time.

Key browse species include black sagebrush and mountain big sagebrush. There are also low numbers of bitterbrush and green ephedra which provide some additional preferred forage. Mountain sagebrush and black sagebrush are present in relatively low numbers. Since 1998, mountain big sagebrush has decreased both in cover (3.9 to 1.9%) and strip frequency (21 to 12%), while conversely black sagebrush has increased in both cover (2.0 to 4.8%) and strip frequency (30 to 33%). It would appear that initially the extended drought has had more of an effect on the low elevation accession of mountain big sagebrush than to black sagebrush. The data demonstrates that as mountain big sagebrush has thinned out with the stress of drought, percent decadence went down. Conversely, black sagebrush has become more dense, and with increased intraspecific competition between individual plants, black sagebrush decadence has increased with drought. Use has continued to be mostly light to moderate for both sagebrush species.

Bitterbrush was not sampled in 1985 or 1991. Typically they are in low numbers and always show heavy hedging. A small number were picked up in the larger sample used in 1998. All displayed extremely heavy use. Even though they have increased in numbers since 1991, they still contribute only 7% of the total browse cover. The most abundant shrub on the site in 1985 was the undesirable increaser species, broom snakeweed with a density of 3,732 plants/acre. Since then their numbers have decreased by almost 90% and they provide less than 1% of the browse cover on the site.

Young pinyon are scattered throughout the area and may begin to have more of an influence on the surrounding vegetation. There has been a slight increase in density for singleleaf pinyon since 1991. In 2003, almost 70% of the trees were greater than 8 feet in height, where only 25% were in this height category in 1991. Juniper tree density has also slightly increased since 1991. Currently ('03), 62% are over 8 feet in height, where before 58% were over 8 feet. This would indicate that there has been little change in their height structure. No seedling pinyon or juniper were encountered. Average basal diameter has increased substantially for both species since 1991. Average basal diameter was estimated at 5.5 inches for pinyon and 7.1 inches for juniper in 2003. Only juniper trees were found to be tipped over from the chaining, and that would be less than 10%. Pinyon and juniper dominant the surrounding area, making the rehabilitated areas very valuable to wintering big game.

The herbaceous understory is diverse and moderately productive, and dominated by perennial grasses.

Common species include seeded crested and intermediate wheatgrass, and smooth brome which accounted for 77% of the grass cover in 1998. The grass composition has become increasingly dominated by crested wheatgrass due to declines in frequency and cover of other species since 1998. Cheatgrass was quite common in 1998 when it provided 14% of the grass cover. With low precipitation since 1998, cheatgrass had significantly lower cover and nested frequency values in 2003. The area was heavily utilized by trespassing cattle in the past. They concentrate on the treated sites, resulting in depressed vigor of the grasses. Some trespass grazing still occurs but at a much lower rate. Forbs are still very scarce, and those found are not especially valuable species. The species encountered still only produce just about ½ of 1% cover.

1985 APPARENT TREND ASSESSMENT

The vegetative and soil trends were both effected by the pinyon-juniper rehabilitation work. Soil erosion is continuing at a slow rate. The lack of litter and vegetative cover on much of the area perpetuates this erosion. Vegetative trend may be up for a while on grasses and sagebrush. Christmas tree sales and firewood cutting should be encouraged to reduce the encroachment of pinyon and juniper and prolong the longevity of the seeding. Closer regulation of cattle grazing is also important.

1991 TREND ASSESSMENT

The soil trend is slightly down. Erosion from high intensity summer thunder storms was noticeable, but doesn't appear to be a major problem. Basal vegetative cover dropped by over 50% and bare ground increased by 28%. The browse trend is stable. Density has increased slightly for black sagebrush and there are reduced numbers of broom snakeweed. Use is heavier on black sagebrush, and reproduction continues to be poor. Pinyon and juniper trees number approximately 78 trees per acre, most of which are in the 4 to 8 foot height class. None were classified as seedlings. Follow up treatment on these trees should be considered to encourage increases in the browse and herbaceous vegetation. The grass trend is stable with similar sum of nested frequency values between readings. Forbs are not numerous enough to be of importance on this site.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable. There is some slight improvements in protective ground cover values, although not enough to warrant an upward trend. Trend for the key browse, mountain big sagebrush and black sagebrush, appears stable. The slight decline in density for black sagebrush appears to be caused by the larger sample used in 1998. Utilization is slightly lighter, vigor good, and decadence low at only 5%. Density of the increaser/invaser broom snakeweed continues to decline with only 180 plants/acre currently estimated. Trend for the perennial herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses. Most of the losses in perennial nested frequency value was by intermediate wheatgrass which declined significantly. Forbs occur at similar low frequencies.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

2003 TREND ASSESSMENT

Trend for soil is down because of a substantial decrease in vegetative cover and increase in bare soil. There has been an overall decrease in the ratio of protective ground cover to bare soil. Trend for the key browse, which is made up of mostly three species, black sagebrush, mountain big sagebrush and bitterbrush, appears slightly down. There has been a large increase in black sagebrush, where cover has more than doubled since 1998. Meanwhile, cover for mountain big sagebrush has decreased by 51%. Its density has also dropped dramatically from 500 to 240 plants/acre. Mountain big sagebrush now only makes up 14% of the browse cover where in 1998 it made up 35%. Both sagebrush are showing slightly increased utilization. We have lost a good number of mountain big sagebrush, yet numbers for black sagebrush are slightly up. However, percent decadence has greatly increased for black sagebrush. Overall, trend would be considered slightly down for the sagebrushes as they contribute 50% of the total browse cover. Density of the increaser/invaser broom snakeweed has increased slightly from 1998, yet it still makes up less than one-tenth of 1% of the browse cover. Trend for the perennial herbaceous understory is down, due mostly to the loss of crested wheatgrass which contributed 75% of the perennial herbaceous cover in 1998. Currently, its cover has decreased by almost 70% and its nested frequency value has also significantly decreased. Forbs occur at similar low frequencies.

TREND ASSESSMENT

soil - down (1)

browse - slightly down (2)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
 Management unit 20 , Study no: 2

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Agropyron cristatum</i>	_b 256	_b 241	_b 230	_a 156	12.79	3.93
G	<i>Agropyron dasystachyum</i>	16	2	1	1	.00	.00
G	<i>Agropyron intermedium</i>	_a 32	_b 86	_a 28	_a 18	1.25	.26
G	<i>Aristida purpurea</i>	_{ab} 18	_b 37	_a 7	_a 14	.06	.10
G	<i>Bouteloua gracilis</i>	_a -	_b 19	_a 1	_a -	.00	-
G	<i>Bromus inermis</i>	_{ab} 25	_{ab} 19	_b 46	_a 6	1.26	.04
G	<i>Bromus tectorum</i> (a)	-	-	_b 184	_a 34	2.86	.34
G	<i>Elymus junceus</i>	_b 87	_a 18	_a 9	_a 5	.05	.03
G	<i>Oryzopsis hymenoides</i>	-	-	-	1	-	.00
G	<i>Poa bulbosa</i>	_a -	_a -	_b 23	_b 36	.29	.99
G	<i>Poa fendleriana</i>	-	-	7	-	.21	-
G	<i>Poa secunda</i>	_a -	_a -	_b 20	_a 4	.25	.01
G	<i>Sitanion hystrix</i>	_b 19	_{ab} 6	_b 11	_a -	.72	-
G	<i>Stipa comata</i>	-	-	3	6	.04	.21
Total for Annual Grasses		0	0	184	34	2.86	0.34
Total for Perennial Grasses		453	428	386	247	16.96	5.60
Total for Grasses		453	428	570	281	19.83	5.94
F	<i>Astragalus cibaricus</i>	2	3	-	2	-	.15
F	<i>Cymopterus</i> spp.	-	-	2	-	.00	-
F	<i>Draba</i> spp. (a)	-	-	_b 36	_a -	.13	-
F	<i>Erigeron pumilus</i>	_b 8	_a -	_a 3	_a -	.03	-
F	<i>Gilia</i> spp. (a)	-	-	_a 19	_b 48	.05	.19
F	<i>Lappula occidentalis</i> (a)	-	-	1	-	.00	-
F	<i>Leucelene ericoides</i>	_a -	_b 15	_a 2	_a -	.00	-
F	<i>Navarretia intertexta</i> (a)	-	-	-	2	-	.00
F	<i>Penstemon palmeri</i>	-	3	-	-	-	-
F	<i>Phlox austromontana</i>	4	7	10	4	.37	.04
F	<i>Senecio multilobatus</i>	-	-	1	-	.00	-
F	<i>Sphaeralcea coccinea</i>	3	-	2	1	.01	.00
F	<i>Streptanthus cordatus</i>	-	-	-	3	-	.00
F	Unknown forb-perennial	2	1	-	-	-	-
Total for Annual Forbs		0	0	56	50	0.18	0.19
Total for Perennial Forbs		19	29	20	10	0.42	0.19
Total for Forbs		19	29	76	60	0.60	0.39

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	'98	'03
B	<i>Artemisia nova</i>	30	33	1.95	4.79
B	<i>Artemisia tridentata vaseyana</i>	21	12	3.90	1.91
B	<i>Chrysothamnus nauseosus hololeucus</i>	4	1	.15	.00
B	<i>Chrysothamnus parryi</i>	0	1	-	.00
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	3	.38	.03
B	<i>Echinocereus spp.</i>	1	3	-	-
B	<i>Ephedra viridis</i>	2	1	.15	.66
B	<i>Gutierrezia sarothrae</i>	7	12	.03	.15
B	<i>Juniperus osteosperma</i>	4	4	3.90	4.23
B	<i>Opuntia spp.</i>	1	0	-	-
B	<i>Opuntia whipplei</i>	1	0	.00	-
B	<i>Pediocactus simpsonii</i>	0	3	-	.03
B	<i>Pinus monophylla</i>	0	0	.00	.56
B	<i>Purshia tridentata</i>	2	2	.53	1.00
B	<i>Sclerocactus</i>	1	0	.03	-
Total for Browse		76	75	11.03	13.39

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 2

Species	Percent Cover	
	'98	'03
<i>Artemisia nova</i>	-	3.46
<i>Artemisia tridentata vaseyana</i>	-	1.01
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.16
<i>Ephedra viridis</i>	-	.40
<i>Gutierrezia sarothrae</i>	-	.18
<i>Juniperus osteosperma</i>	3.00	5.88
<i>Pinus monophylla</i>	-	.36
<i>Purshia tridentata</i>	-	.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 20 , Study no: 2

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.9
Purshia tridentata	2.8

POINT-QUARTER TREE DATA --
Management unit 20 , Study no: 2

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	22	29
Pinus monophylla	78	78

Average diameter (in)	
'98	'03
4.8	7.1
4.2	5.5

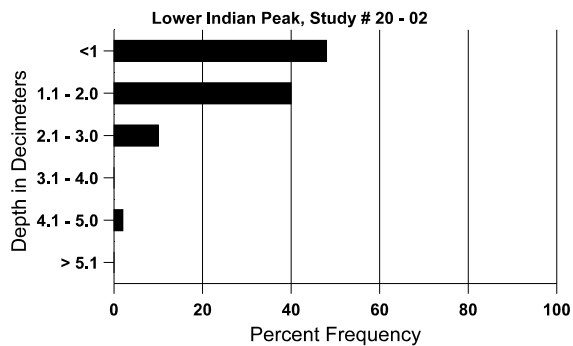
BASIC COVER --
Management unit 20 , Study no: 2

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	8.75	4.00	34.35	19.46
Rock	14.25	22.00	13.17	13.34
Pavement	23.25	16.25	10.75	14.92
Litter	36.00	32.50	37.12	34.44
Cryptogams	0	.25	1.24	.58
Bare Ground	17.75	25.00	21.53	27.68

SOIL ANALYSIS DATA --
Management unit 20, Study no: 2, Study Name: Lower Indian Peak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.9	68.7 (6.2)	6.4	64.0	17.4	18.6	2.1	12.7	99.2	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	25	57	-	-
Elk	8	36	16 (40)	44 (109)
Deer	3	4	7 (17)	11 (26)
Cattle	-	-	6 (15)	-

BROWSE CHARACTERISTICS --

Management unit 20 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	5/11
<i>Artemisia nova</i>											
85	1333	133	600	733	-	-	15	0	0	0	11/13
91	1533	-	600	933	-	-	43	13	0	0	9/16
98	1320	220	280	980	60	40	20	2	5	0	9/22
03	1420	-	100	720	600	240	32	1	42	7	10/20
<i>Artemisia tridentata vaseyana</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	500	40	20	360	120	20	16	4	24	4	21/34
03	240	-	60	140	40	60	50	0	17	8	20/35
<i>Chrysothamnus nauseosus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	16/35
<i>Chrysothamnus nauseosus hololeucus</i>											
85	266	-	-	66	200	-	0	0	75	0	8/9
91	266	-	-	66	200	-	25	0	75	75	20/22
98	100	-	-	60	40	-	40	0	40	40	19/23
03	20	-	-	-	20	-	0	0	100	0	21/30

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	132	-	66	66	-	-	50	50	0	0	7/22
98	40	-	-	40	-	-	0	0	0	0	13/23
03	60	-	-	40	20	-	0	0	33	33	13/24
Echinocereus spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	4/12
03	60	-	-	60	-	-	0	0	-	0	3/7
Ephedra viridis											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	40	-	20	20	-	-	50	0	0	50	27/39
03	20	-	-	-	20	-	100	0	100	100	25/38
Gutierrezia sarothrae											
85	3732	2266	1266	2066	400	-	5	0	11	0	6/7
91	1732	3066	1400	266	66	-	0	0	4	0	5/6
98	180	40	-	100	80	40	0	0	44	44	5/7
03	420	-	-	300	120	20	0	0	29	0	8/9
Juniperus osteosperma											
85	66	-	-	66	-	-	0	0	-	0	69/83
91	66	-	-	66	-	-	0	0	-	0	138/91
98	80	-	-	80	-	60	0	0	-	0	-/-
03	80	-	20	60	-	-	0	0	-	0	-/-
Opuntia spp.											
85	66	-	-	66	-	-	0	0	0	0	2/4
91	66	-	-	-	66	-	0	0	100	0	-/-
98	20	-	-	20	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia whipplei											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	4/11
03	0	-	-	-	-	-	0	0	-	0	4/11
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	-	0	2/2
Pinus monophylla											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	20	0	0	-	0	-/-
Purshia tridentata											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	40	-	-	20	20	-	0	100	50	50	21/60
03	60	-	-	-	60	-	0	100	100	0	21/68
Rhus trilobata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	25/70
Sclerocactus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	2/3
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 20-3-03

Study site name: Mountain Home Seeding.

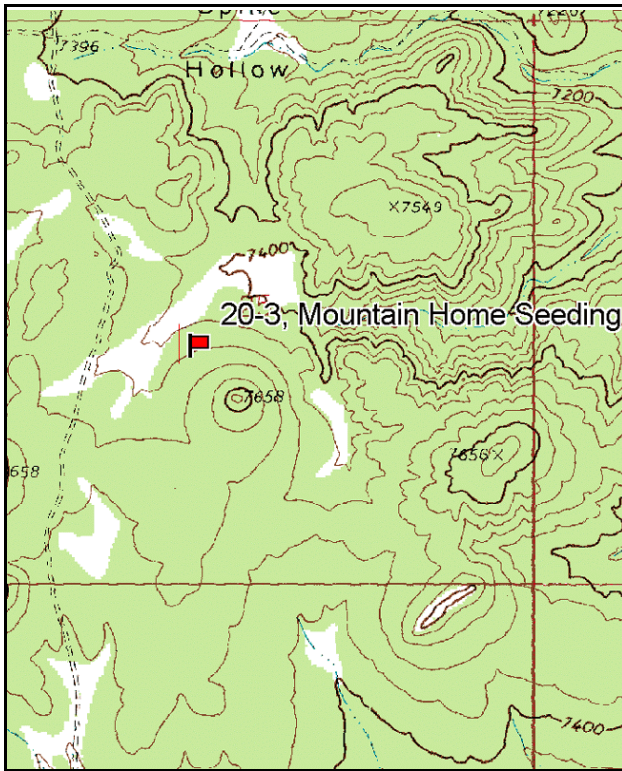
Vegetation type: Burn.

Compass bearing: frequency baseline 180 degrees magnetic.

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

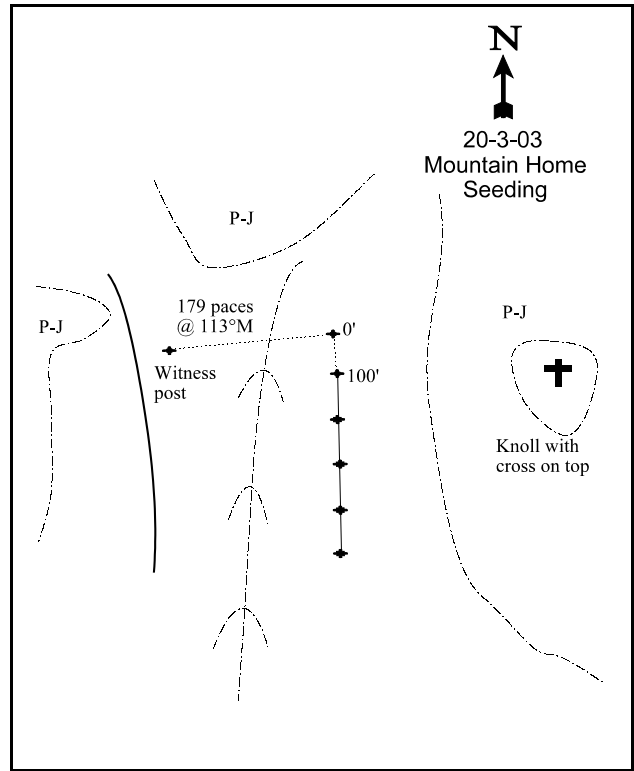
LOCATION DESCRIPTION

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

Township 27S, Range 19W, Section 25



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4257365 N, 244883 E

DISCUSSION

Mountain Home Seeding - Trend Study No. 20-3

The Mountain Home Seeding was established in 1998 on a burned and chained pinyon-juniper area. It has a west, northwest aspect with a gentle slope which varies from 3% to 7%. Elevation is about 7,500 feet. This treatment area is used heavily by wild horses and moderately by elk. The site is available most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site. Pellet group data collected on site in 1998 estimated 55 horse, 27 elk, and 7 deer days use/acre (136 hdu/ha, 67 edu/ha, and 17 ddu/ha). Some of the elk sign was recent with the study site being read on June 9th, 1998. In 2003, most use was for horses estimated at 48 days use/acre (118 days use/ha). Elk use was also moderately high at 40 days use/acre (98 days use/ha). Cattle and deer use was insignificant at less than 3 days use/acre (7 days use/ha).

Soil at the site is moderately shallow with an effective rooting depth of just over 12 inches. Parent material is granite. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.3). Rock and gravel sized pavement are common on the surface and throughout the profile. There is some localized soil movement occurring on the site, although it does not appear to be a problem at this time.

A few mountain big sagebrush and resprouting rabbitbrush were encountered in 1998 and 2003. However, almost all of the shrubs were eliminated by the fire. Currently, the few palatable shrubs that occur on the site (mostly mountain big sagebrush), were classified as heavily utilized. Dead pinyon and juniper stumps numbered approximately 80/acre.

In 1998, the site was initially dominated by seeded grasses, primarily crested wheatgrass, which provided 84% of the grass cover. Smooth brome and intermediate wheatgrass were also fairly common. All grasses combined produced 30% cover. In 2003, with continuing dry conditions, grass cover has decreased by almost 70%. For example, crested wheatgrass has gone from producing 25% cover in 1998 to less than 9% in 2003. Overall, the three most common perennial grasses all significantly decreased in frequency and cover. Productivity is very poor compared to 1998. Forbs are fairly diverse, but not abundant producing less than 1% cover. The most common forb in 1998 was alfalfa which provided 35% of the forb cover. It declined significantly in 2003 and was only sampled in 1 quadrat.

1998 APPARENT TREND ASSESSMENT

The soil appears to have been stabilized by the treatment. Herbaceous cover is abundant and well dispersed. There are few shrubs on the site. Establishment of a significant shrub population will take many years within the thick herbaceous cover unless they are inter-seeded. Seeded perennial grasses are well established and should remain so as long as the site is not overgrazed. However, the compositional diversity is poor with crested wheatgrass dominating the site. Forbs are very limited.

2003 TREND ASSESSMENT

The trend for soil now appears to be going downward with the loss of both vegetative and litter cover to the extended drought. They have decreased by 70% and 55% respectively since 1998. There are still very few useful shrubs growing on the site. Trend is considered stable but poor. All together they barely provide 1% cover. With the current weather conditions, it will be a long time before a significant shrub population becomes established on this site. Total herbaceous cover has decreased by almost 70%. The perennial grasses have been severely depressed by the length of the drought and utilization by wild horses and elk. The compositional diversity continues to be very poor with crested wheatgrass still dominating the site. Forbs

continue to be very limited.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 20 , Study no: 3

T y p e	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	Agropyron cristatum	_b 352	_a 318	25.30	8.56
G	Agropyron intermedium	_b 34	_a 18	.90	.08
G	Aristida purpurea	5	-	.15	-
G	Bromus inermis	_b 115	_a 82	3.25	.67
G	Bromus tectorum (a)	_b 84	_a 29	.65	.12
G	Sitanion hystrix	3	-	.03	-
Total for Annual Grasses		84	29	0.64	0.12
Total for Perennial Grasses		509	418	29.64	9.32
Total for Grasses		593	447	30.29	9.44
F	Astragalus spp.	1	-	.00	-
F	Collinsia parviflora (a)	_b 11	_a -	.03	-
F	Cymopterus spp.	_b 34	_a 2	.11	.00
F	Descurainia pinnata (a)	2	-	.03	-
F	Gilia spp. (a)	_b 25	_a -	.08	-
F	Halogeton glomeratus (a)	-	2	-	.00
F	Lappula occidentalis (a)	5	-	.01	-
F	Lupinus argenteus	3	-	.00	-
F	Lygodesmia spinosa	1	5	.03	.15
F	Medicago sativa	_b 7	_a 1	.22	.03
F	Microsteris gracilis (a)	_b 24	_a -	.05	-
F	Phlox longifolia	_a 1	_b 7	.00	.02
F	Sphaeralcea coccinea	2	-	.03	.00
Total for Annual Forbs		67	2	0.21	0.00
Total for Perennial Forbs		49	15	0.41	0.21
Total for Forbs		116	17	0.62	0.21

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	'98	'03
B	Artemisia tridentata vaseyana	0	1	-	.00
B	Chrysothamnus nauseosus	0	0	-	.03
B	Chrysothamnus nauseosus hololeucus	0	2	.38	1.00
B	Chrysothamnus parryi	0	1	-	-
B	Gutierrezia sarothrae	0	1	-	.00
Total for Browse		0	5	0.37	1.03

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 3

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	.28
Chrysothamnus nauseosus	.53

BASIC COVER --

Management unit 20 , Study no: 3

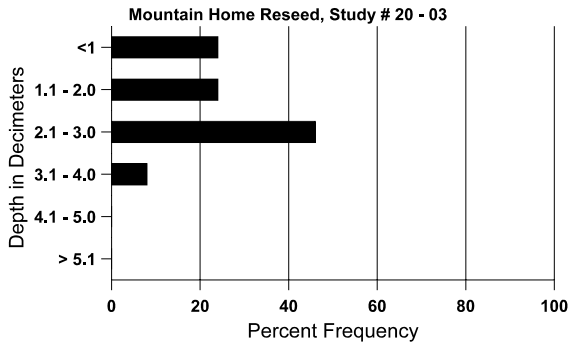
Cover Type	Average Cover %	
	'98	'03
Vegetation	35.65	10.62
Rock	13.67	11.80
Pavement	23.51	24.60
Litter	42.54	18.95
Cryptogams	.04	0
Bare Ground	15.58	41.51

SOIL ANALYSIS DATA --

Management unit 20, Study no: 3, Study Name: Mountain Home Reseed

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.2	65.0 (13.8)	6.3	70.0	15.1	14.9	2.1	21.5	163.2	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	5	-	-	-
Horse	30	27	44 (109)	38 (95)
Elk	27	16	16 (40)	39 (98)
Deer	14	7	7 (17)	3 (7)
Cattle	-	1	-	1 (2)

BROWSE CHARACTERISTICS --

Management unit 20 , Study no: 3

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	9/21
Artemisia tridentata vaseyana											
98	0	-	-	-	-	-	0	0	-	0	30/40
03	20	-	-	20	-	-	0	100	-	0	30/48
Chrysothamnus nauseosus											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	40	-	-	-	-	0	0	-	0	42/61
Chrysothamnus nauseosus hololeucus											
98	0	-	-	-	-	-	0	0	-	0	35/48
03	40	-	-	40	-	-	50	0	-	0	33/49

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	11/10
Chrysothamnus viscidiflorus viscidiflorus											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	12/21
Gutierrezia sarothrae											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	6/5
Juniperus osteosperma											
98	0	-	-	-	-	40	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Pinus monophylla											
98	0	-	-	-	-	40	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Ribes spp.											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	28/22

Trend Study 20-5-03

Study site name: Upper Hamblin Valley.

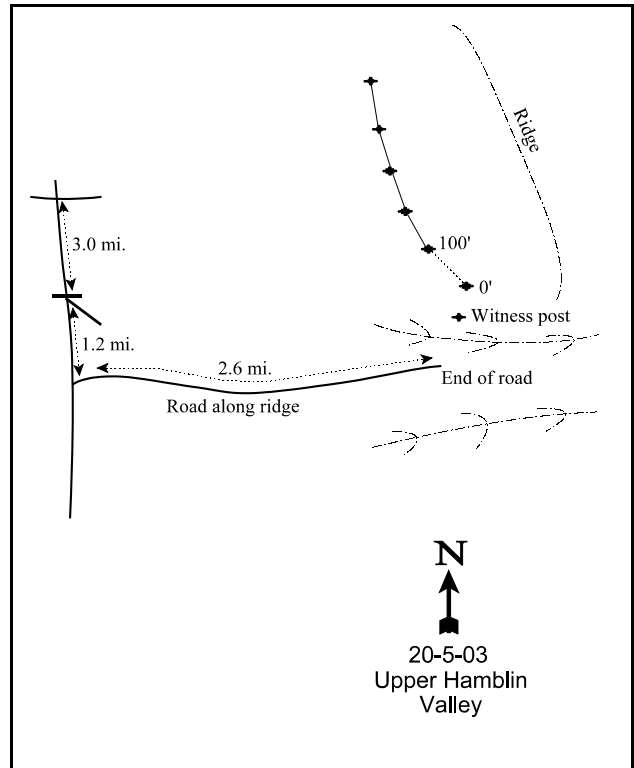
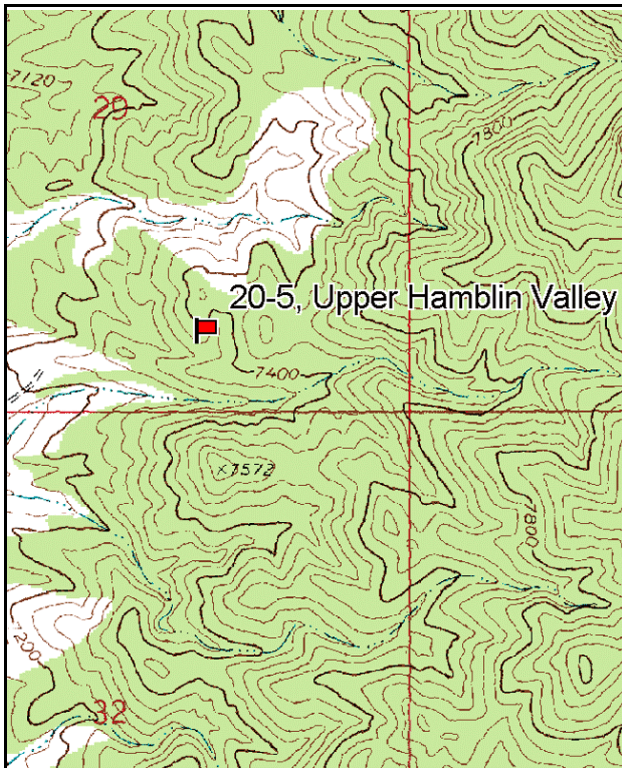
Vegetation type: Curleaf Mtn Mahogany.

Compass bearing: frequency baseline 320 degrees magnetic (line 2 @ 335° M, line 3 @ 340° M, line 4-5 @ 356° M).

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). Rebar: belt 2 on 5ft, belt 4 on 18ft.

LOCATION DESCRIPTION

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 cattleguard and stay right and travel south 1.2 miles to a intersection. Turn left and travel east 2.6 miles till the road ends. 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 side 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 27, UTM 12S 4266736 N, 239164 E

DISCUSSION

Upper Hamblin Valley - Trend Study No. 20-5

This trend study was established in 1998 to sample important winter range in upper Hamblin Valley. It samples a narrow ridge with a moderately steep (22%) southwest facing slope and an elevation of approximately 7,400 feet. The area supports a singleleaf pinyon pine and Utah juniper overstory with an understory of highly preferred curlleaf mountain mahogany. The site is used heavily by elk and wild horses and to a lesser extent by deer. Sign of horses is evident all over the area including several stud piles along the road to the site. Pellet group data from 1998 estimated approximately 21 elk, 9 deer, and 7 horse days/acre (52 edu/ha, 22 ddu/ha, and 17 hdu/ha). Elk sign appeared to be fairly recent, while most horse sign appeared to be a few months old. Horses have obviously been heavily utilizing the area, however our pellet group transect does not appear to accurately estimate their impact. In 2003, pellet group data indicated that elk use had increased to 44 days use/acre (109 days use/ha). Deer had increased slightly to 11 days use/acre (27 days use/ha), while horse use showed a slight decrease to 4 days use/acre (11 days use/ha).

Soil on the site is fairly shallow and very rocky on the surface and within the profile. Effective rooting depth was estimated at 13 inches. Soil is loam in texture and neutral in reactivity (pH 7.0). Phosphorus appears to be limiting at just 4.5 ppm when 10 ppm is considered to be a minimal value for normal plant development. There is evidence of soil movement in the open spaces between trees and shrubs, and soil pedestalling is also evident. The wash near the site showed signs of recent activity in 1998 but showed no sign of erosion in 2003. Vegetative cover on the site comes almost entirely from trees and shrubs. Herbaceous vegetation, which is more effective at protecting soil, is depleted.

The site supports a variety of preferred browse species including curlleaf mountain mahogany, green ephedra, snowberry, and black sagebrush. Mahogany accounts for about half of the browse cover with a population of 420 plants/acre in 1998 and 520 in 2003. Mature plants are nearly 4 feet in height with a crown diameter of a little over 5 feet. They exhibit some characteristics of littleleaf mountain mahogany (*Cercocarpus intricatus*) due to their characteristically narrow leaf forms. They are most likely hybrid forms between curlleaf and littleleaf mahogany which occurs often in this area. Utilization has been mostly heavy, with 90% of the plants displaying heavy use in 1998 and 65% in 2003. The majority of the mature curlleaf were classified as largely unavailable due to hedging. Even with this high level of use, the population has a fairly well balanced age structure which displays good vigor and no plants being classified as decadent in 2003.

Black sagebrush continues to be the most abundant shrub on the site with an estimated population of 1,000 relatively small statured plants/acre in 2003. Density was at 700 plants/acre in 1998. Use continues to be mostly light. Green ephedra occurs in moderate numbers. Use of this shrub is light to moderate. Most of the ephedra seen along the road to the site had been heavily hedged by what appeared to be mostly wild horses. A small population of snowberry shows mostly light to moderate use.

An overstory of mostly singleleaf pinyon pine trees provided 18% of the browse cover in 2003. Point quarter data shows a increase in pinyon density from 82 trees/acre in 1998 to 126 in 2003. Juniper density also increased from 13 trees/acre to 36 trees/acre. Average basal diameter was estimated at more than 7 inches for pinyon and almost 6 inches for juniper in 2003. Overhead canopy cover is variable, but averaged about 10% over the study site in 2003. As canopy cover for pinyon-juniper communities reaches 10%, this usually begins to depress the production of the understory.

The herbaceous understory is deficient and composed mostly of low value species. Of the four perennial grasses found on the site, only bluebunch wheatgrass is relatively abundant. However, production is poor with all grasses combined producing just over 2% total cover in 1998 and 1% in 2003. Forbs are fairly

diverse but most species are rare in their occurrence. The only common species is the low value rock goldenrod.

1998 APPARENT TREND ASSESSMENT

Soil condition is poor. Sheet erosion appears to be occurring in the bare shrub and tree interspaces. Rock and pavement cover are high and provide 56% cover. This would indicate moderate soil loss in previous years. Herbaceous vegetation and litter cover are poor, leaving the soil poorly protected. Trend will not improve until more herbaceous vegetation becomes established on the site. Trend for browse appears stable. Utilization is extremely high, yet not unusual for curleaf mountain mahogany. Even so, the population displays good vigor, low decadence, and a balanced age structure. Continued heavy use could eventually have a negative impact. Other preferred shrubs, green ephedra and snowberry, also appear stable. The herbaceous understory is depleted and composition is dominated by mostly poor value forbs. The trend will not improve in the future unless more preferred perennial grasses and forbs become established.

2003 TREND ASSESSMENT

Soil condition continues to be fair to poor, and trend is stable. Sheet erosion still appears to be occurring in the bare shrub and tree interspaces. Rock and pavement cover still remains high and provides the majority of the ground cover (55% cover). This would indicate moderate soil loss in previous years, but not much now because the majority has already been lost. Herbaceous vegetation and litter cover are relatively poor, leaving the soil with little protective cover. Trend will not improve until more herbaceous vegetation becomes established on the site. Trend for browse appears slightly upward. Utilization continues to be very high, yet not unusual for curleaf mountain mahogany. Even so, the population displays good vigor, low decadence, and a balanced age structure. Continued heavy use could eventually have a negative impact. However, this would probably result in high-lined plants. Other preferred shrubs, green ephedra, snowberry and black sagebrush, also appear stable to slightly up. The herbaceous understory remains depleted with the composition being dominated by one poor value forb, rock goldenrod. Herbaceous trend is slightly down due to a significant decline in the majority of the perennial grasses. The trend will not improve in the future unless more preferred perennial grasses and forbs become established.

TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --
 Management unit 20 , Study no: 5

Type	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	Agropyron spicatum	_b 87	_a 49	1.29	.58
G	Bromus tectorum (a)	_b 17	_a -	.06	-
G	Oryzopsis hymenoides	10	14	.06	.22
G	Poa secunda	_b 58	_a 21	.78	.27
G	Sitanion hystrix	4	-	.06	-
G	Stipa comata	_a -	_b 2	-	.01
G	Stipa pinetorum	-	11	-	.05
Total for Annual Grasses		17	0	0.06	0
Total for Perennial Grasses		159	97	2.20	1.14
Total for Grasses		176	97	2.25	1.14
F	Arabis spp.	2	-	.01	-
F	Arenaria spp.	_b 31	_a 7	.19	.02
F	Cryptantha spp.	_b 30	_a -	.45	-
F	Cymopterus spp.	10	10	.07	.04
F	Delphinium nuttallianum	1	1	.00	.00
F	Descurainia pinnata (a)	3	-	.00	-
F	Draba spp. (a)	_b 193	_a 2	1.47	.00
F	Epilobium brachycarpum (a)	3	-	.01	-
F	Erigeron eatonii	_b 12	_a -	.08	-
F	Gilia spp. (a)	10	5	.03	.01
F	Leucelene ericoides	69	79	.68	.90
F	Lomatium spp.	_b 31	_a 10	.22	.05
F	Oenothera spp.	5	-	.16	-
F	Petradoria pumila	150	156	4.73	5.77
F	Physaria chambersii	11	1	.07	.00
F	Senecio multilobatus	3	-	.00	-
Total for Annual Forbs		209	7	1.51	0.01
Total for Perennial Forbs		355	264	6.67	6.80
Total for Forbs		564	271	8.19	6.82

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	'98	'03
		B	Artemisia nova	17	17
B	Cercocarpus ledifolius	18	19	7.16	9.25
B	Ephedra viridis	7	7	1.08	1.94
B	Gutierrezia sarothrae	3	11	.03	.24
B	Pinus monophylla	6	6	5.34	3.16
B	Sclerocactus	2	3	.00	.03
B	Symphoricarpos oreophilus	10	9	1.62	1.46
Total for Browse		63	72	16.01	17.48

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 5

Species	Percent Cover	
	'98	'03
Artemisia nova	-	1.71
Cercocarpus ledifolius	-	8.11
Ephedra viridis	-	1.50
Pinus monophylla	10.19	8.61
Symphoricarpos oreophilus	-	1.45

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20 , Study no: 5

Species	Average leader growth (in)
	'03
Cercocarpus ledifolius	1.0

POINT-QUARTER TREE DATA --

Management unit 20 , Study no: 5

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	13	36
Pinus monophylla	82	126

Average diameter (in)	
'98	'03
9.9	5.5
7.1	7.4

BASIC COVER --

Management unit 20 , Study no: 5

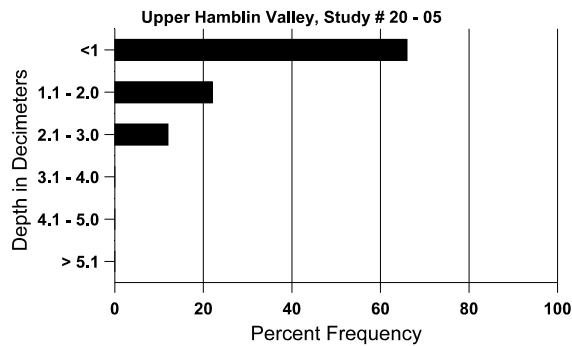
Cover Type	Average Cover %	
	'98	'03
Vegetation	24.20	24.50
Rock	27.03	23.28
Pavement	28.82	31.09
Litter	30.17	24.95
Cryptogams	1.11	.81
Bare Ground	14.01	8.71

SOIL ANALYSIS DATA --

Management unit 20, Study no: 5, Study Name: Upper Hamblin Valley

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.0	64.0 (12.2)	7.0	44.0	35.4	20.6	3.5	4.5	64.0	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 5

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	2	2	-	-
Horse	3	2	4 (10)	3 (9)
Elk	8	8	21 (51)	44 (109)
Deer	2	1	6 (15)	11 (26)

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 5

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
98	700	20	100	500	100	60	3	0	14	3	9/19
03	1000	-	20	940	40	-	2	0	4	0	6/13
<i>Cercocarpus ledifolius</i>											
98	420	20	40	320	60	60	5	90	14	5	41/58
03	520	-	20	500	-	40	23	65	0	0	47/63
<i>Ephedra viridis</i>											
98	160	-	20	80	60	-	25	25	38	0	28/43
03	160	-	-	140	20	20	25	13	13	0	24/32
<i>Gutierrezia sarothrae</i>											
98	100	-	-	100	-	-	0	0	-	0	4/6
03	240	-	20	220	-	-	0	0	-	0	5/5
<i>Pediocactus simpsonii</i>											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	1/4
<i>Pinus monophylla</i>											
98	120	100	40	80	-	-	0	0	-	0	-/-
03	200	60	60	140	-	-	0	0	-	0	-/-
<i>Sclerocactus</i>											
98	40	20	-	40	-	-	0	0	-	0	2/3
03	60	-	-	60	-	-	0	0	-	0	2/6
<i>Symphoricarpos oreophilus</i>											
98	260	-	60	200	-	-	31	8	0	0	23/34
03	240	-	20	160	60	-	33	0	25	0	24/29

Trend Study 20-6-03

Study site name: Wah Wah Pass .

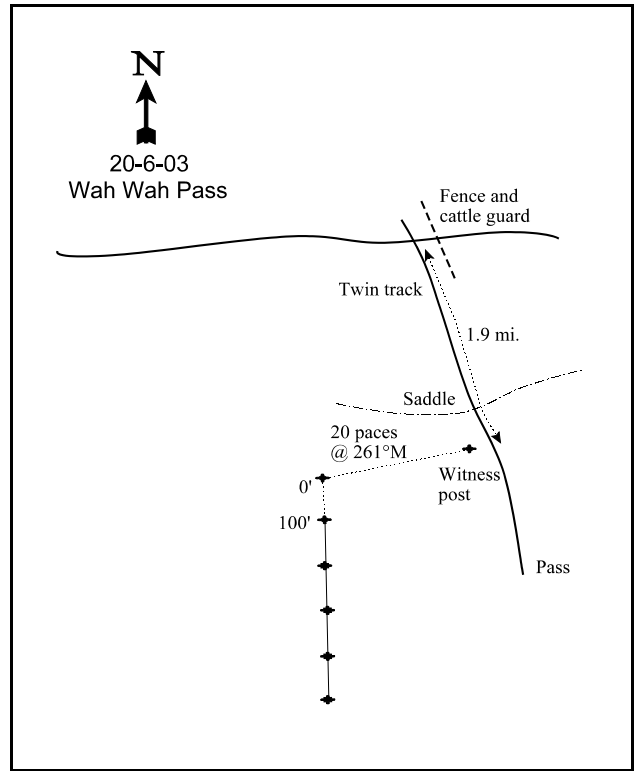
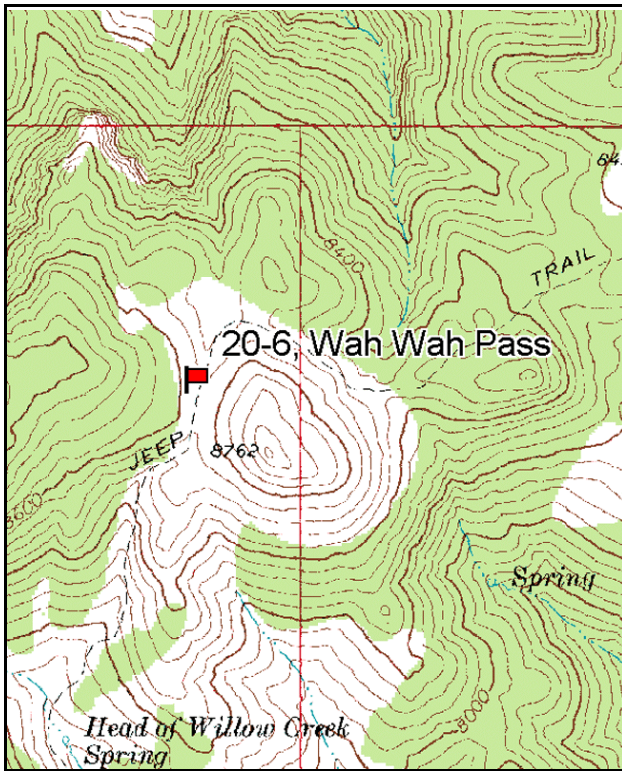
Vegetation type: Curleaf Mtn Mahogany .

compass bearing: frequency baseline 184 degrees magnetic.

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

LOCATION DESCRIPTION

From the Indian Peaks cabin turnoff from the Pine Valley Road, go north 3.5 miles thru an “S” turn in the road and 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 degrees magnetic.



Map Name: Lamerdorf Peak

Diagrammatic Sketch

Township 29S, Range 19W, Section 2

GPS: NAD 27, UTM 12S 4244242 N, 272488 E

DISCUSSION

Wah Wah Pass - Trend Study No. 20-6

This trend study was established in 1998 to monitor wildlife use on the Wah Wah Mountains. There were no trend studies previously established on these mountains because of low deer numbers. The study site was placed on the only area where significant deer and wild horse use could be found. It samples a saddle which supports a curlleaf mountain mahogany type with a sagebrush and snowberry understory. The slope is a gentle 5% to 10%. Aspect is northeast at an elevation of approximately 8,600 feet. The area is used by cattle, wild horses, deer, and elk. Cattle were observed on the site during establishment of the study on June 18, 1998. They were using many of the taller curlleaf mahogany for shade. Wild horses were also seen near the site in 1998 and 2003. In 1998, pellet group transect data estimated 18 cow, 11 deer, and 5 horse days use/acre (45 cdu/ha, 27 ddu/ha, and 12 hdu/ha). Some elk pellet groups were encountered along the frequency belts but not hit on the pellet group transect. Most of the cow and horse use is concentrated near the beginning of the baseline which borders an open meadow area. Deer use was more prevalent further down the baseline, where mahogany is more dense. Cattle had already heavily utilized the available grasses on the site prior to the 1998 reading. The area is considered high elevation winter range for deer, which is likely used year round with mild weather conditions. A wildfire burned the slope to the east of the study site sometime prior to the 2003 reading. This may have attracted more elk to the area. In 2003, pellet group transect data estimated 18 cow, 21 deer, 10 horse, and 14 elk days use/acre (47, 53, 24, and 35 days use/ha respectively).

Soil on the site is moderately deep with an effective rooting depth of just over 15 inches. Texture is a clay loam which is neutral in reaction (pH 6.8). Soil parent material is limestone. Phosphorus is low at just 2.6 ppm. Values of at least 10 ppm are considered a minimal value for normal plant development. The soil is fairly rocky with pavement and rock concentrated on the surface in the open interspaces. However, vegetation and litter cover are moderately abundant and erosion does not currently appear to be a problem.

The site supports a variety of browse species, but the most prominent is curlleaf mountain mahogany. Its density was estimated at 1,440 plants/acre in 1998 and 1,500 plants/acre in 2003. Overhead canopy cover of mahogany is variable but averaged 51% in 1998 and 56% in 2003. Available mahogany display moderate to heavy use. The stand is healthy with good vigor, fairly low decadence, and exceptionally good reproduction. Open areas between trees support mountain big sagebrush that are somewhat shorter in stature, showing some characteristics of black sagebrush. However, because of an effective soil depth of more than 15 inches and relatively cool soil temperatures, this population has more characteristics of what one would see in a tetraploid mountain big sagebrush. Density of sagebrush was initially estimated at 2,180 plants/acre in 1998 increasing to 4,080 plants/acre in 2003. Young plants are common and made up over 50% of the population in 2003. The population shows little utilization and fairly low decadence. There is also a good population of mountain snowberry under the mahogany. Density was estimated at 4,600 plants/acre in 2003. They appear lightly utilized with a few individual plants displaying moderate use. Vigor is good and percent decadence low at only 5%.

Singleleaf pinyon pine and white fir are found on the site in small numbers. Point quarter data from 1998 estimated 22 pinyon and 11 white fir trees/acre. Average basal diameter was 5 inches for pinyon and 6 inches for white fir. Total canopy cover was estimated at only 1.4% in 2003.

The herbaceous understory is depleted relative to its site potential. Initially, only 3 grasses were encountered on the site in 1998 and they produced only 2% total cover. During the 2003 reading, 6 grasses were sampled and they provided less than 1% total cover. Forbs are diverse, but they only made up about 6% total cover in 1998 and 2% in 2003. There are several preferred species present, but no single species produces a significant amount of cover. The most common forbs include pale agoseris, Eaton daisy, thistle, lousewort, and Palmer

penstemon.

1998 APPARENT TREND ASSESSMENT

Trend for soil appears stable due to the abundant vegetation and litter cover, combined with the gentle terrain. The key browse species, curleaf mountain mahogany, appear to be slowly increasing with many of the mature plants becoming unavailable to browsing due to height. Seedlings are abundant and young plants comprise 36% of the population. The herbaceous understory is poor. Grasses are lacking. Forbs are diverse with several preferred species present. Abundance could be better however, as 25 forb species produce only about 6% total cover. Herbaceous production may be somewhat suppressed by the overstory of mahogany (51% canopy cover), although it appears that grazing animals currently have a greater negative impact.

2003 TREND ASSESSMENT

Trend for soil continues to be stable with abundant vegetation and litter cover combined with the gentle terrain. Trend for browse is slightly up. The key browse species, curleaf mountain mahogany, appears to be slowly increasing with many of the mature plants becoming unavailable to browsing due to height. Seedlings continue to be abundant and young plants comprise 19% of the population. Mountain big sagebrush also appears to be in an upward trend with large increase in its population and excellent young recruitment (51% young plants). However, sagebrush is not an important aspect of this summer range and an increasing population is not necessarily desirable. Herbaceous trend would be slightly down because the majority of the cover (75% to 80%) has come from the forbs and they have decreased noticeably since 1998. The herbaceous understory is poor considering the site potential. Grasses were lacking in the past and are more so now. Forbs continue to be diverse with several preferred species present. However, their contribution to overall cover is still relatively low (<3% total cover) for such a high elevation site. Herbaceous production could be somewhat suppressed by the overstory of mahogany (56% canopy cover), although it appears that livestock currently has a greater negative impact on the herbaceous species.

TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 20 , Study no: 6

T y p e	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	Agropyron spicatum	7	12	.03	.04
G	Bromus tectorum (a)	-	3	-	.01
G	Carex spp.	-	3	-	.15
G	Oryzopsis hymenoides	3	3	.01	.01
G	Poa fendleriana	65	50	2.16	.40
G	Sitanion hystrix	-	2	-	.01

Type	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
	Total for Annual Grasses	0	3	0	0.00
	Total for Perennial Grasses	75	70	2.21	0.61
	Total for Grasses	75	73	2.21	0.62
F	<i>Agoseris glauca</i>	_b 37	_a 14	.73	.03
F	<i>Balsamorhiza hookeri</i>	_b 7	_a 1	.60	.03
F	<i>Balsamorhiza sagittata</i>	2	-	.15	-
F	<i>Calochortus nuttallii</i>	_b 11	_a 2	.05	.00
F	<i>Chaenactis douglasii</i>	9	5	.21	.01
F	<i>Chenopodium fremontii</i> (a)	_a -	_b 14	-	.08
F	<i>Cirsium</i> spp.	_b 43	_a 15	.70	.26
F	<i>Cryptantha</i> spp.	5	5	.03	.03
F	<i>Cymopterus</i> spp.	1	-	.00	-
F	<i>Erigeron eatonii</i>	33	27	.40	.22
F	<i>Eriogonum spathulatum</i>	3	6	.15	.16
F	<i>Gayophytum ramosissimum</i> (a)	-	1	-	.00
F	<i>Ipomopsis aggregata</i>	6	3	.04	.00
F	<i>Lappula occidentalis</i> (a)	14	3	.08	.01
F	<i>Linum lewisii</i>	9	-	.23	-
F	<i>Lupinus argenteus</i>	_b 18	_a 6	.43	.23
F	<i>Machaeranthera canescens</i>	2	1	.03	.00
F	<i>Mertensia arizonica leonardi</i>	3	-	.15	-
F	<i>Medicago sativa</i>	4	-	.38	-
F	<i>Pedicularis centranthera</i>	21	16	.70	.62
F	<i>Penstemon comarrhenus</i>	_b 13	_a -	.28	.01
F	<i>Penstemon palmeri</i>	_a -	_b 23	-	.58
F	<i>Penstemon pachyphyllus</i>	_b 13	_a -	.10	-
F	<i>Petradoria pumila</i>	14	11	.37	.24
F	<i>Physaria chambersii</i>	_b 19	_a 2	.58	.00
F	<i>Polygonum douglasii</i> (a)	-	7	-	.01
F	<i>Senecio multilobatus</i>	6	3	.06	.00
F	<i>Taraxacum officinale</i>	3	-	.03	-
	Total for Annual Forbs	14	25	0.07	0.12
	Total for Perennial Forbs	282	140	6.47	2.47
	Total for Forbs	296	165	6.55	2.59

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	'98	'03
B	Abies concolor	0	3	.15	.03
B	Artemisia tridentata vaseyana	40	37	6.40	4.03
B	Cercocarpus ledifolius	39	41	27.11	13.33
B	Chrysothamnus parryi	0	7	-	.59
B	Chrysothamnus viscidiflorus viscidiflorus	22	4	1.19	.30
B	Gutierrezia sarothrae	0	28	-	1.13
B	Leptodactylon pungens	0	1	-	-
B	Juniperus osteosperma	0	0	.38	.63
B	Mahonia repens	18	16	2.09	1.36
B	Pinus monophylla	2	2	.00	.03
B	Ribes cereum cereum	1	1	.63	.15
B	Symphoricarpos oreophilus	54	56	14.33	13.00
Total for Browse		176	196	52.30	34.60

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 6

Species	Percent Cover	
	'98	'03
Abies concolor	2.00	.98
Artemisia tridentata vaseyana	-	4.80
Cercocarpus ledifolius	50.79	56.43
Chrysothamnus parryi	-	.23
Gutierrezia sarothrae	-	1.95
Juniperus osteosperma	-	.80
Mahonia repens	-	1.28
Pinus monophylla	3.40	.60
Ribes cereum cereum	-	.11
Symphoricarpos oreophilus	-	16.14

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 20 , Study no: 6

Species	Average leader growth (in)	
	'98	'03
Artemisia tridentata vaseyana	0.9	
Cercocarpus ledifolius	3.3	

POINT-QUARTER TREE DATA --
Management unit 20 , Study no: 6

Species	Trees per Acre	
	'98	'03
Cercocarpus ledifolius	240	312

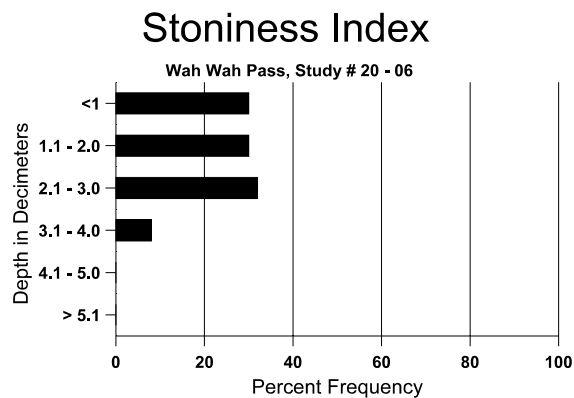
Average diameter (in)	
'98	'03
8.0	8.9

BASIC COVER --
Management unit 20 , Study no: 6

Cover Type	Average Cover %	
	'98	'03
Vegetation	49.24	36.05
Rock	7.25	7.03
Pavement	8.96	4.26
Litter	74.97	65.70
Cryptogams	.00	0
Bare Ground	7.97	6.56

SOIL ANALYSIS DATA --
Management unit 20, Study no: 6, Study Name: Wah Wah Pass

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
15.2	55.0 (13.0)	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		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	9	6	-	-
Horse	2	9	3 (9)	10 (24)
Elk	-	1	-	14 (35)
Deer	9	7	11 (26)	21 (53)
Cattle	8	5	3 (9)	19 (47)

BROWSE CHARACTERISTICS --
 Management unit 20 , Study no: 6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Abies concolor											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	60	-	60	-	-	-	0	0	-	0	-/-
Artemisia tridentata vaseyana											
98	2180	220	380	1240	560	180	0	0	26	10	11/20
03	4100	240	2100	1480	520	280	5	.48	13	2	10/18
Cercocarpus ledifolius											
98	1440	3960	520	880	40	100	32	4	3	1	68/102
03	1500	400	280	960	260	340	45	24	17	16	59/60
Chrysothamnus parryi											
98	0	-	-	-	-	-	0	0	0	0	-/-
03	460	-	140	280	40	-	61	13	9	0	8/11
Chrysothamnus viscidiflorus viscidiflorus											
98	860	20	100	700	60	20	0	0	7	5	6/10
03	200	-	60	120	20	-	0	0	10	0	11/14
Gutierrezia sarothrae											
98	0	-	-	-	-	-	0	0	0	0	9/14
03	2780	-	100	2660	20	120	0	0	1	0	8/9
Leptodactylon pungens											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	380	-	-	380	-	-	0	0	-	0	-/-
Mahonia repens											
98	4800	60	1140	3660	-	-	0	0	0	0	4/7
03	9500	-	-	9460	40	-	0	0	0	.42	3/5

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
98	0	-	-	-	-	-	0	0	-	0	3/9
03	0	-	-	-	-	-	0	0	-	0	3/7
Pinus monophylla											
98	40	80	20	20	-	-	0	0	-	0	-/-
03	80	60	60	20	-	-	0	0	-	0	-/-
Ribes cereum cereum											
98	20	-	-	-	20	-	100	0	100	0	25/27
03	20	-	-	20	-	-	0	0	0	0	30/40
Symphoricarpos oreophilus											
98	5000	20	780	3900	320	-	5	0	6	.40	13/27
03	4600	-	140	4220	240	20	6	2	5	3	11/26
Tetradymia canescens											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	10/26

Trend Study 20-7-03

Study site name: South Spring.

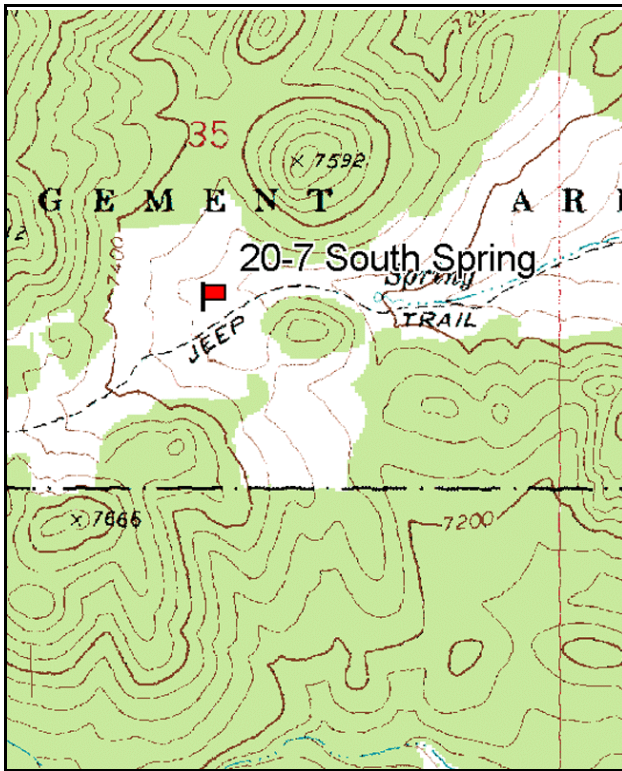
Vegetation type: Mountain Big Sagebrush.

compass bearing: frequency baseline 307 degrees magnetic.

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

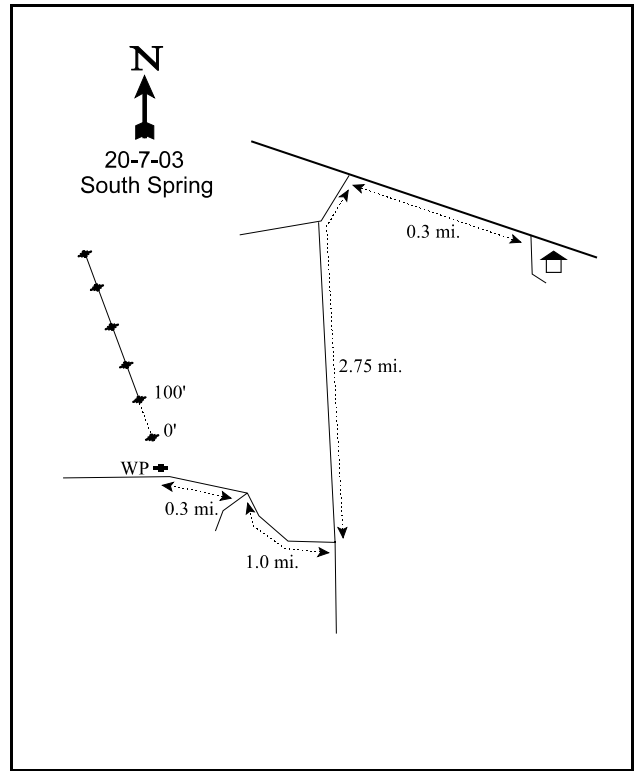
LOCATION DESCRIPTION

From the 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 degrees magnetic from the witness post.



Map Name: Pinto Spring

Township 29S, Range 18W, Section 35



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4235939 N, 252432 E

DISCUSSION

South Spring - Trend Study No. 20-7

The South Spring trend study was established in 1999 to monitor the effect of a control burn on a sagebrush community and subsequent wildlife use in the area. The transect samples a small valley which originally supported a population of mountain big sagebrush with a good understory of grass. The area had been chained in the early 1960's. The slope is a gentle 5% to 7% with an east-southeast aspect and an elevation of approximately 7,100 feet. The area had been used by cattle, deer, and elk in the past. In 1999, the pellet group transect estimated 4 cow, 15 deer, and 74 elk days use/acre (9, 36, and 184 days use/ha respectively). The site was supposed to have been burned in the fall of 1999 but may have been burned the following year. In 2003, the pellet group transect estimated 2 cow, 13 deer, and 89 elk days use/acre (5, 31, and 220 days use/ha respectively). These values are quite similar to those of 1999.

Soil on the site is moderately deep with an effective rooting depth of almost 16 inches. Texture is a sandy loam which is slightly acidic (pH 6.4). Soil parent material is granitic in origin. The soil is fairly stony with pavement near the surface. Initially, pavement cover was a little over 8% in 1999. In 2003, after the fire, there has been some obvious surface soil losses to the wind and a few high intensity storms. Percent pavement cover in 2003 has increased to over 53%. However, herbaceous vegetation cover is still moderately abundant (almost 21% in both sampling periods) and significant erosion does not currently appear to be a problem.

Before the control burn, the most prominent browse species of this community was mountain big sagebrush with a cover value of almost 14%. The community was fairly typical with percent young at only 1% and percent decadence at 29%. After the control burn, mountain big sagebrush density decreased from 4,100 plants/acre to only 40 plants/acre in 2003. There was scattered individuals of bitterbrush (140 plants/acre) sampled in 1999 which have all been lost to the fire. The preferred browse component which made up this community has been essentially lost to the control burn. The only common shrub found on the site is stickyleaf low rabbitbrush which increased in density from 580 plants/acre prior to the burn in 1999, to 1,200 plants/acre in 2003. A few rubber rabbitbrush and gray horsebrush are also found on the site.

In 1999, the herbaceous understory was dominated by seeded grasses, primarily crested wheatgrass, which provided 63% of the grass cover. Smooth brome and intermediate wheatgrass were also fairly common. They made up 15% and 12% of the grass cover respectively. All grasses combined produced almost 18% total cover. In 2003, after the control burn and with continuing dry conditions, grass cover has decreased by 54%. For example, crested wheatgrass has gone from producing 11% total cover to less than 1% in 2003. Overall, the most common perennial grasses all showed significant decreases except for intermediate wheatgrass which actually increased after the burn. Productivity for grasses would be considered only fair compared to 1999. Forbs have increased significantly. However, the improvement is almost entirely made up of silvery lupine which increases after fire. Lupine increased from a cover value of a little over 2% in 1999 to over 12% after the fire, and has contributed 98% of the forb cover in both surveys. The other forbs combined to make up less than 1% cover.

1999 APPARENT TREND ASSESSMENT

Trend for soil appears stable due to the abundant vegetation and litter cover, combined with the gentle terrain. The trend for the key browse species, mountain big sagebrush, appears to be stable or maybe more appropriately should be called stagnant and at carrying capacity. The herbaceous understory is initially good but basically a monoculture of crested wheatgrass.

2003 TREND ASSESSMENT

Trend for soil appears to be down with vegetative cover decreasing by 38% and litter cover decreasing by 70%. With the removal of much of the vegetation and litter cover due to fire, pavement cover has increased 6 fold. Trend for browse is also down with the loss of mountain big sagebrush and bitterbrush. Browse cover has decreased from 15% to less than 3%. Eighty-five percent of the remaining browse cover is currently contributed by the increaser stickyleaf rabbitbrush. The herbaceous trend is down because the sum of nested frequency of perennial grasses has declined by 66% since the fire. In addition, the majority of the herbaceous cover (60%) is made up by the increaser, silvery lupine.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 20 , Study no: 7

T y p e	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
G	Agropyron cristatum	_b 297	_a 9	11.23	.22
G	Agropyron dasystachyum	_a -	_b 61	-	1.56
G	Agropyron intermedium	52	70	2.17	4.23
G	Bouteloua gracilis	2	2	.03	.03
G	Bromus inermis	_b 118	_a 10	2.78	.07
G	Bromus tectorum (a)	_b 117	_a 59	1.16	1.80
G	Elymus cinereus	-	-	-	.03
G	Oryzopsis hymenoides	15	5	.55	.19
G	Sitanion hystrix	6	-	.01	-
G	Stipa comata	2	9	.00	.17
Total for Annual Grasses		117	59	1.16	1.80
Total for Perennial Grasses		492	166	16.78	6.52
Total for Grasses		609	225	17.95	8.33
F	Amaranthus spp.	-	-	-	.00
F	Astragalus spp.	2	1	.03	.00
F	Eriogonum racemosum	-	-	.03	-
F	Lithospermum ruderales	-	-	-	.00
F	Lupinus argenteus	_a 83	_b 118	2.51	12.23
F	Lygodesmia spinosa	-	-	-	.01
F	Navarretia intertexta (a)	-	-	-	.30
F	Phlox longifolia	_a -	_b 23	-	.05
F	Sphaeralcea coccinea	-	2	-	.03

Type	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
	Total for Annual Forbs	0	0	0	0.30
	Total for Perennial Forbs	85	144	2.57	12.33
	Total for Forbs	85	144	2.57	12.64

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	'99	'03
B	<i>Artemisia tridentata vaseyana</i>	81	2	13.75	.15
B	<i>Chrysothamnus nauseosus hololeucus</i>	0	5	-	.00
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	21	35	.45	2.51
B	<i>Juniperus osteosperma</i>	1	0	.00	-
B	<i>Pinus monophylla</i>	2	0	-	-
B	<i>Purshia tridentata</i>	6	0	.03	-
B	<i>Tetradymia canescens</i>	7	11	.53	.30
	Total for Browse	118	53	14.77	2.97

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 7

Species	Percent Cover
	'03
<i>Chrysothamnus nauseosus hololeucus</i>	.26
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	3.36
<i>Tetradymia canescens</i>	.71

POINT-QUARTER TREE DATA --
Management unit 20 , Study no: 7

Species	Trees per Acre	
	'99	'03
Juniperus osteosperma	48	0
Pinus monophylla	76	0

Average diameter (in)	
'99	'03
1.4	0.0
3.2	0.0

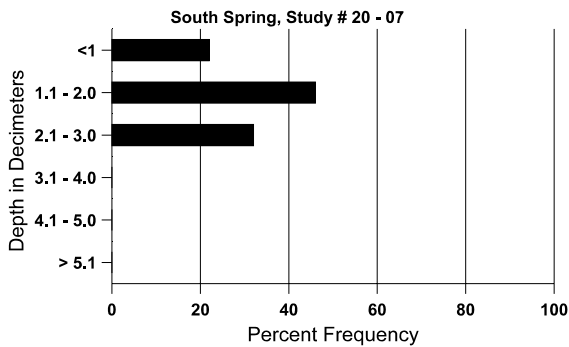
BASIC COVER --
Management unit 20 , Study no: 7

Cover Type	Average Cover %	
	'99	'03
Vegetation	36.65	22.70
Rock	.08	.10
Pavement	8.43	53.25
Litter	58.56	17.32
Cryptogams	.18	0
Bare Ground	8.90	15.23

SOIL ANALYSIS DATA --
Management unit 20, Study no: 7, Study Name: South Spring

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
15.7	68.0 (15.8)	6.4	72.0	15.4	12.6	2.5	12.3	256.0	0.5

Stoniness Index



PELLET GROUP DATA --
Management unit 20 , Study no: 7

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'03	'99	'03
Rabbit	8	46	-	-
Elk	28	83	74 (183)	89 (220)
Deer	8	9	15 (36)	13 (31)
Cattle	2	-	4 (9)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
99	4100	-	40	2860	1200	740	38	1	29	15	28/33
03	40	-	20	20	-	-	50	0	0	0	11/12
<i>Chrysothamnus nauseosus</i>											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	20/31
<i>Chrysothamnus nauseosus hololeucus</i>											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	120	-	60	60	-	-	0	0	-	0	17/23
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
99	580	-	100	440	40	-	0	3	7	0	17/17
03	1200	20	40	1160	-	-	5	0	0	0	14/20
<i>Juniperus osteosperma</i>											
99	20	-	20	-	-	60	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Pinus monophylla</i>											
99	40	-	40	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Purshia tridentata</i>											
99	140	-	20	80	40	-	14	71	29	29	15/28
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Tetradymia canescens</i>											
99	280	-	-	280	-	-	0	0	-	0	15/17
03	340	100	-	340	-	-	0	6	-	0	10/16

SUMMARY

WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

Two trend study sites were established in unit 20 in 1985, Upper Indian Peak (20-1) and Lower Indian Peak (20-2). Three additional sites were established in 1998, Mountain Home Seeding (20-3), Upper Hamblin Valley (20-5) and Wah Wah Pass (20-6), to monitor increasing elk and wild horse populations. One additional site was established in 1999, South Spring (20-7). Some common characteristics that these sites share is that they all occur at elevations greater than 7,000 feet, with the exception of Lower Indian Peak (6,710 ft). These sites are used mainly as transition/summer ranges, with some winter use occurring during mild winters.

Deer use on the majority of the sampled sites has remain relatively low and fairly consistent at about 10 days use/acre (25 ddu/ha). On the other hand, elk use has been increasing from rather moderately low numbers averaging 23 elk days use/acre (57 days use/ha) to moderately high numbers averaging 49 elk days use/acre (121 edu/ha). Horse use was only noted on three sites; Mountain Home Seeding, Upper Hamblin Valley and Wah Wah Pass. From initial establishment to now, average use for these three sites has remained about the same at 22 days use/acre. Although, the Mountain Home Seeding has always had the most horse use with an on average use of about 52 days use/acre.

Trends for soils for all sites except two have gone down in 2003, especially at South Spring. The trend study at South Spring was part of a prescribed burn and the downward trend was caused by significant decreases in vegetative and litter cover with an increase in bare soil. The two sites that did not decrease are the two sites associated with curleaf mountain mahogany which have stable soil trends but are in poor condition. Total grass cover for either site was at 1% or less, while forb cover was similarly very low except for Upper Hamblin Valley (20-5) where almost 75% of the forb cover was contributed by a low value forb, rock goldenrod.

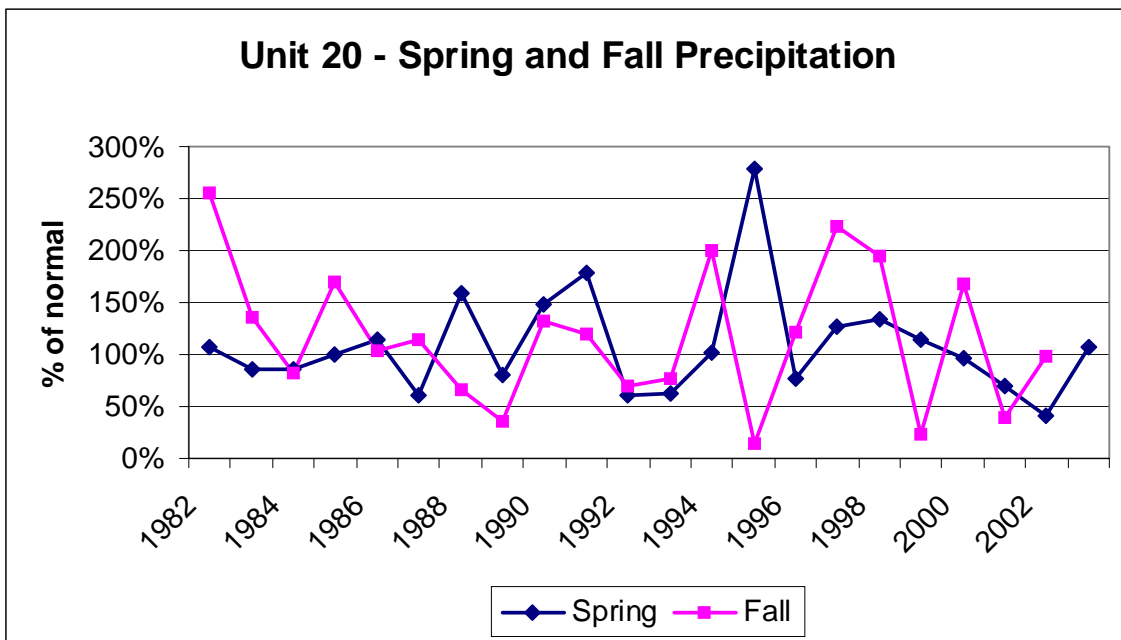
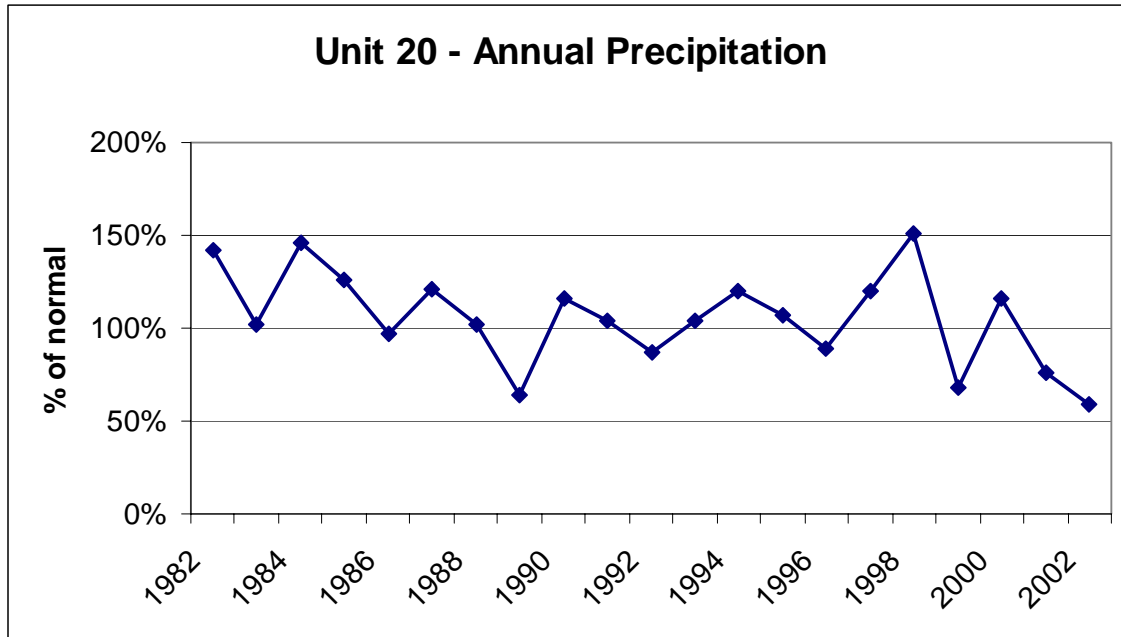
Browse trends were down at South Spring due to the prescribed burn eliminating sagebrush and bitterbrush from the site. The only other downward browse trend was found at Lower Indian Peak. The other 4 trend studies displayed stable or improving browse trends.

Herbaceous trends were down or slightly down at all sites due primarily to drought conditions which have effected this area for the past few years. Cover of perennial grasses declined at all 5 trend studies an average of 64%. Sum of nested frequency also declined at 3 sites, Lower Indian Peak, Mountain Home Seeding, and Upper Hamblin Valley. Cover and frequency declined at South Spring, but this was primarily due to the prescribed burn prior to the 2003 reading. An overall decline was also seed in perennial forb cover and frequency. Three trend studies, Upper Indian Peak, Upper Hamblin Valley, and Wah Wah Pass, contain significant amount of forbs in their respective herbaceous understories. Sum of nested frequency of perennial forbs declined on all sites an average of 34%. Average perennial forb cover declined by 55% at Upper Indian Peak and 62% at Wah Wah Pass but remained stable at Upper Hamblin Valley due to the dominance of the poor value rock goldenrod which remained stable in cover. Forbs are lacking at Lower Indian Peak and Mountain Home Seeding with cover values less than 1%. However, frequency and cover also declined at both sites.

The downward trends on this unit are primarily the result of drought which has effected much of the State for the past several years. Precipitation data from weather stations in and around unit 20, show very low annual precipitation in 1999, 2001, and 2002, averaging only 67.6% of normal (Utah climate summaries 2003). Conditions were exceptionally dry in 2002 when only about 59% of normal annual precipitation was recorded. Spring precipitation (April to June) was also well below normal in 2001 and 2002 at 70% and 40% of normal

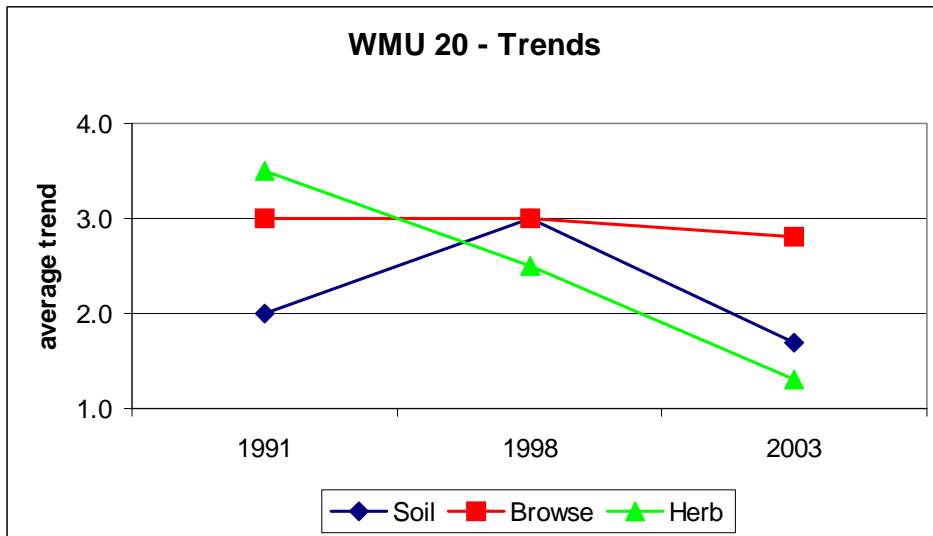
respectively. This lack of spring precipitation greatly reduces grass and forb production and hinders shrub recruitment. Precipitation graphs and trends for each study site can be found below.

Below are precipitation graphs for the Southwest Desert unit. Data represents percent of normal precipitation averaged for 4 weather stations which include the following: Modena, Eskdale, Wah Wah Ranch, and Milford (Utah Climate Summaries 2003).



Average Trends – WMU 20 Southwest Desert

	1991	1998	2003
Soil	2.0	3.0	1.7
Browse	3.0	3.0	2.8
Herb	3.5	2.5	1.3
	2 sites	2 sites	6 sites



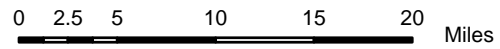
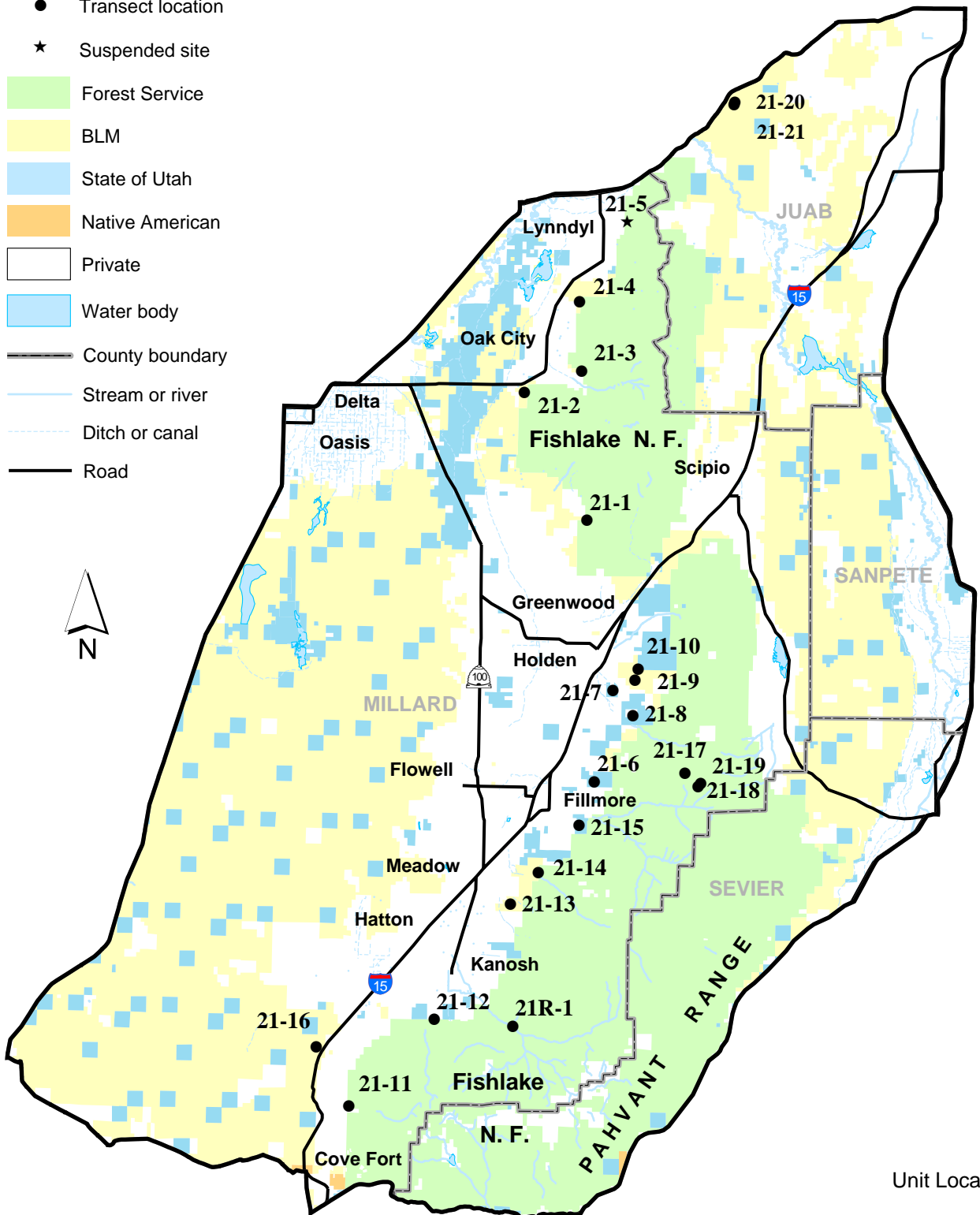
Trend Summary

	Category	1985	1991	1998	2003
20-1 Upper Indian Peak	soil	est	2	3	1
	browse	est	3	3	3
	herbaceous understory	est	4	3	1
20-2 Lower Indian Peak	soil	est	2	3	1
	browse	est	3	3	2
	herbaceous understory	est	3	2	1
20-3 Mountain Home Seeding	soil			est	1
	browse			est	3
	herbaceous understory			est	1
20-5 Upper Hamblin Valley	soil			est	3
	browse			est	4
	herbaceous understory			est	2
20-6 Wah Wah Pass	soil			est	3
	browse			est	4
	herbaceous understory			est	2
	Category			1999	2003
20-7 South Spring	soil			est	1
	browse			est	1
	herbaceous understory			est	1

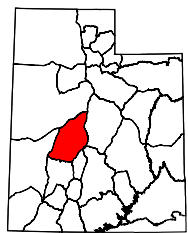
(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
 (est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Management Unit 21

- Transect location
- ★ Suspended site
- Forest Service
- BLM
- State of Utah
- Native American
- Private
- Water body
- County boundary
- Stream or river
- Ditch or canal
- Road



Unit Location



WILDLIFE MANAGEMENT UNIT 21 - FILLMORE

Boundary Description

Millard, Sevier, Sanpete, and Juab counties - Boundary begins at Interstate 70 and Interstate 15; north on I-15 to Black Rock Road; west on Black Rock Road to Highway SR-257; north on SR-257 to Highway US-50 & 6; east on US-50 & 6 to US-6, north on US-6 to Highway SR-132; east on SR-132 to Highway SR-28; south on SR-28 to Highway 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 old Oak Creek, Kanosh, and Fillmore units. Total usable mule deer range is estimated at about 1,126,800 acres. Yearlong deer range only makes up 1% of the area. Summer deer ranges are confined usually to elevations above 7,000 feet and would be limiting as it only makes up 30% of the range. The majority of mule deer range within the Fillmore unit is classified as winter range (69%). Total useable elk range is estimated at 505,047 acres. Yearlong, 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 USFS. 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. This in turn resulted in problems of periodic flash flooding and soil erosion which necessitated a great deal of costly watershed and soil stabilization work by the U.S. 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, especially forbs, 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, mostly in pinyon-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. Also, a deer-proof fence built along I-15 has severely limited the movement of deer between the Oak Creek and Fillmore portions of the unit 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 portion of the Fillmore unit. Additional revegetation projects are needed on the winter ranges. Emphasis should be placed on seeding and/or planting nursery stock of browse species for winter use and forbs for spring forage. Reductions in livestock grazing in the oakbrush and cutting or burning mature

stands to encourage resprouting could improve fawning and summer habitat. The driest portions of the summer range could also be improved by developing water sources and fencing existing water sources to protect them from livestock. These range improvements should also lessen depredation problems by providing alternate food sources to deer which feed in the orchards and fields near Oak Creek.

The Kanosh area is divided in half by I-15. The eastern half includes the southern two-thirds of the Pahvant Mountain range, 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 between 6,000 and 8,000 feet, but more gentle with rolling slopes, hills, and flats above and below these elevational 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 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. Overgrazing in the past has resulted in decreased production on both the summer and winter ranges, as well as increased flooding and soil losses. Stocking rates have been reduced in most allotments but overgrazing is still a problem in some local areas. Concentrations of deer on the winter range have also over utilized key browse species in several areas where livestock have already heavily utilized the browse species because of already existing poor range conditions. With these localized exceptions, both the summer and winter range are generally in good condition. Pinyon-juniper covers about 67% of the normal winter range. Dense pinyon-juniper stands between 5,000 and 6,000 feet have few plants in the understory and have relatively low forage production rates. The browse-shrub type, which is generally found above the pinyon-juniper zone and above the upper limits of severe winter range, usually have 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 creating high fire hazards and the eventual loss of sagebrush. Wildfires burned the Dog Valley (1996) and Smiths Ridge (2000) transects in part due to the dense cheatgrass understories that exist on many areas throughout this unit.

Herd Unit Management Objectives

Current management objectives for wildlife are to achieve a target population of 12,500 wintering deer with a post season buck to doe ratio of 15:100. Thirty percent of these bucks are to be 3 point or better. The target winter herd size for elk is 1,400 animals with a post season composition of 20 bulls to 100 cows. Half of the bulls are to be 2½ years of age or older (DeBloois 2001). Buck harvests ranged between 2,000 and 1,500 from 1988 and 1992. Numbers dropped in 1992 to only 630, but by 1995, the harvest had rebounded to 773 bucks. Buck harvest stabilized on the Fillmore ranging from 879-1,016 animals during the period 1997-2000 (DeBloois 2001). The elk herd on the Pahvant elk unit was estimated at 400 to 500 animals in 1993. The winter count of 1996 estimated 625 elk, still well below the objective. Between 1988 and 1994, an average of 14 bulls were harvested from the unit, 91% to 100% of which were mature bulls. Bull elk harvest ranged from 11 to 34 between 1997-2000 (DeBloois 2001). Antlerless permits were first issued in 1990 and steadily increased from 9 in 1990 to 49 in 1993. Antlerless permits, including both limited entry and CWMU tags, ranged from 55 to 106 between 1997-2000 (DeBloois 2001).

Trend Study Description

Trend studies were originally established in 1985 with rereads in 1991, 1998, and 2003. Four additional studies were established in 1997 and reread in 2003. One study was suspended in 2003, Wood Canyon (21-5).

Trend Study 21-1-03

Study site name: Long Canyon .

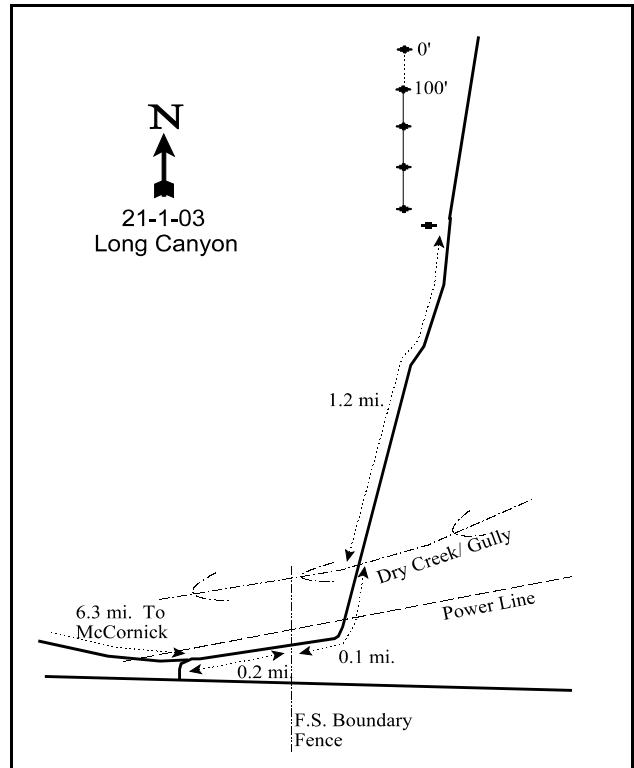
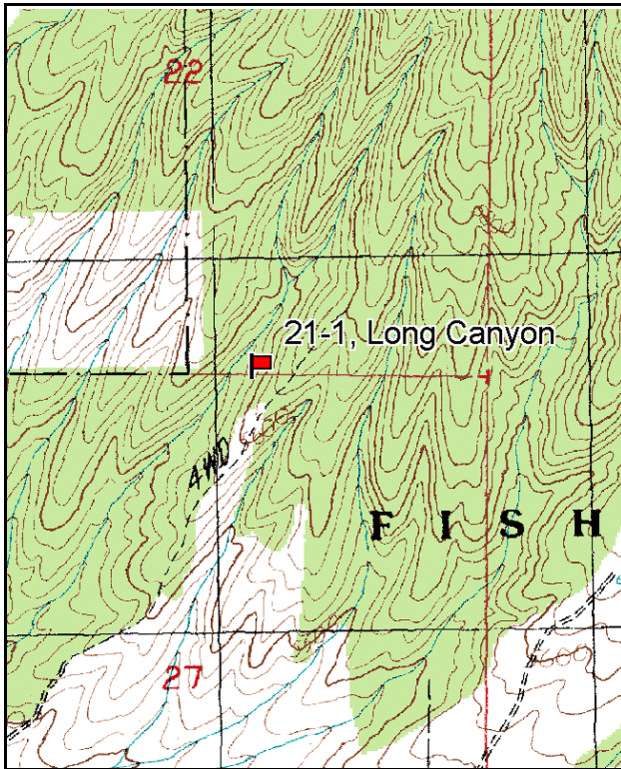
Vegetation type: Stansbury Cliffrose .

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

Take Exit 178 off of I-15 near Holden and travel on highway 50 to McCornick. Turn right at 11700 N. and travel east along the powerline road for ~6.3 miles to a fork. Take the left fork and travel 0.2 miles to the forest boundary line. From the forest boundary line, travel 0.1 miles to a dry creek. From the dry creek, drive 1.2 miles to the witness post (2ft rebar marked by tag # 7068) on the left side of the road. The 400' stake is down the hill 50 feet at 0° magnetic. The 0' stake is marked by browse tag # 7069.



Map Name: Holden

Diagrammatic Sketch

Township 18S, Range 4W, Section 22

GPS: NAD 27, UTM 12S 4342674 N, 389095 E

DISCUSSION

Long Canyon - Trend Study No. 21-1

The Long Canyon study is located on the southern end of the Canyon Mountains on Forest Service land. The transect is located on a moderately steep (27-30%), northwest facing slope at an elevation of 5,600 feet. Some of the surrounding area was burned by wildfire in 1981, with a large area to the west having been chained and seeded. The ridge where the trend study is located supports an open stand of mature Utah junipers and Stansbury cliffrose in association with a sagebrush-grass understory. The original baseline is located on a northwest aspect near the bottom of a draw. Juniper density is higher near the bottom of the draw and the key browse species, cliffrose and Wyoming big sagebrush, are not as abundant. The old density plots were placed near the top of the ridge on a more westerly aspect where juniper is more scattered and density of sagebrush and cliffrose is higher. In 1998, the original 100 foot frequency baseline was left in place and extended to 400 feet. Three of the 5 belts sample the more northwestern slope with a higher juniper density while the last 2 belts sample the more open ridge top. A nearby DWR Pellet group transect showed low deer use in this area between 1980 and 1991 (Jense et al. 1985, 1991). A pellet group transect read by range trend personnel parallel to the sampling baseline estimated 10 deer days use/acre (25 ddu/ha) in 1998 and only 1 deer day use/acre (3 ddu/ha) in 2003. Cattle use was estimated at 24 cow days use/acre (59 cdu/ha) in 1998, decreasing to 3 days use/acre (7 cdu/ha) in 2003.

Soil on the site is very rocky and moderately shallow. Effective rooting depth was estimated at just under 11 inches in 1998. Soils are loam in texture and neutral in reactivity (pH of 7.0). Phosphorus may be limiting to plant growth at only 3.2 ppm where 10 ppm is thought to be the minimum required for normal growth. Due to the rocky nature of the soil, average soil temperature was moderately high at 72°F at a depth of 14 inches in August of 1998. Soil temperature was resampled in May of 2003, averaging 55.4°F at 13 inches in depth. The large difference in average soil temperature between years is due to the time of sampling and soil moisture. Soil moisture is much higher in May compared to September which accounts for most of the difference. There is evidence of erosion on the scattered exposed patches of bare soil, but an erosion condition class assessment done in 2003 showed soils to be stable on the site.

Utah juniper and Stansbury cliffrose dominate the ridge. Point quarter data estimated a density of 225 juniper trees/acre with an average diameter of 6 inches in 2003. Juniper are more numerous along the original baseline than on the ridge top, but overhead canopy cover averages less than 5% over the whole site. Most of the junipers range from 4 to 12 feet in height. Some of the juniper on the ridge top have been chained with some tipped trees still alive. Cliffrose and big sagebrush are the key browse species. Density of cliffrose has remained fairly steady, averaging about 400 plants/acre over the last 2 readings. Browsing by deer has been mostly light during all readings. Mature cliffrose average 6 feet in height resulting in many plants being partly unavailable to browsing animals. Vigor was rated as generally good for cliffrose from 1985 to 1998, but in 2003, 41% of the population displayed poor vigor. Percent decadence has steadily increased from 0% in 1985 to 45% in 2003. Reproduction has been absent in all sampling years with the exception of 1998, when a few seedling and young cliffrose were sampled. Density of Wyoming big sagebrush declined by 84% between 1991 and 1998. With relatively few dead plants being sampled, most of this change is due to the much larger, more representative sample giving more accurate density estimates in 1998 and 2003. Sagebrush has displayed light to moderate use in all years, with the highest level coming in 1991. Poor vigor and decadence in the sagebrush population were within acceptable levels from 1985 to 1998, but both of these parameters showed marked increases in 2003. Half of the sagebrush were classified as decadent in 2003, with nearly one-third of the population displaying poor vigor characteristics. Annual leader growth on sagebrush and cliffrose was minimal in 2003 at 1 inch and 1.6 inches respectively. The undesirable increaser, broom snakeweed, showed an 89% decline in density in 2003.

The herbaceous understory, especially the grass component, is relatively abundant for a Wyoming big sagebrush type. Bluebunch wheatgrass and Sandberg bluegrass are both present in moderately high numbers. In 2003, bluebunch wheatgrass remained at stable in frequency and cover values, while Sandberg bluegrass significantly increased in nested frequency and increased in average cover. Cheatgrass was fairly abundant in 1998, but significantly declined by 2003. The forb component is minimal at this site. Sego lily was the most abundant forb in 2003 being sampled in 21% of the quadrats.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable with erosion being localized and good ground cover over most of the area. Soil loss could be accelerated by an increase in junipers which tend to exclude other more desirable species. The vegetative trend appears stable to slightly declining. The key species, Wyoming big sagebrush and cliffrose, have little reproduction and only fair vigor. Junipers, prickly phlox, broom snakeweed, and rock goldenrod all appear to be increasing.

1991 TREND ASSESSMENT

Soil trend is slightly downward at this time. Pavement and litter cover values are decreasing while rock and bare ground cover values have doubled. This trend should be closely monitored. The Wyoming big sagebrush population has increased by 6%, with an accompanying increase for decadence which should turn around with the end to the extended drought. Stansbury cliffrose density remains unchanged, but percent decadence has increased from 0% to 20%. This should also turn around with normal precipitation. Browse trend is stable. The herbaceous understory has a slightly upward trend. Both perennial grass species have remained at stable nested frequencies since 1985, while nested frequency values for perennial forbs more than doubled.

TREND ASSESSMENT

soil - slightly downward (2)

browse - stable for key species (3)

herbaceous understory - up slightly (4)

1998 TREND ASSESSMENT

Trend for soil appears to be stable. Percent bare ground has declined slightly from 15% to 10%, but litter cover has also declined. Erosion does not currently present a serious problem. Trend for the key browse species is stable. Density estimates have remained similar since 1985 with mostly light use. Percent decadence has increased since 1991. However, reproduction is evident this year as seedling and young plants were encountered in adequate densities to maintain the population. Mature cliffrose are becoming increasingly less available due to height. Density of Wyoming big sagebrush has declined 84%, due mostly to the much larger sample size giving more accurate density estimates. The original frequency baseline sampled a northwest facing slope which supported a greater density of juniper and few sagebrush plants. The old density plots were placed along the top of the ridge which had a greater density of big sagebrush. The new sample estimates sagebrush density along a 400 ft baseline which includes the original 100 foot frequency baseline and extends to the top of the ridge where the old density plots were located. In addition, dead sagebrush are rare and percent decadence is moderately low at only 22%. The whole study should have been placed on the more open ridge top in 1985. Trend for the herbaceous understory appears stable. Sum of nested frequency values for perennial grasses remained stable between 1991 and 1998. Grasses account for 85% of the herbaceous cover. Sum of nested frequency of forbs declined since 1991, but some of the change is likely due to the larger sample used in 1998.

TREND ASSESSMENT

soil - stable (3)

browse - stable for key species (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Soil trend is stable. With drier than normal conditions for several years preceding the 2003 reading, bare ground increased and litter cover decreased. However, an erosion condition class assessment showed soils to be stable in 2003. The herbaceous vegetation, primarily perennial grasses, retained stable frequency and cover values in 2003. Trend for browse is slightly down. The key species, cliffrose and Wyoming big sagebrush, both show increases in poor vigor and decadence. Reproduction for both species is absent in 2003. These trends should improve with higher precipitation in the future. Trend for the herbaceous understory is stable. Sandberg bluegrass significantly increased in nested frequency while bluebunch wheatgrass remained stable. Sum of nested frequency for perennial forbs slightly declined with forbs remaining a minor component at this site.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	-	-	3	-	.03	.00
G	Agropyron spicatum	181	169	173	187	4.38	4.59
G	Bromus tectorum (a)	-	-	_b 95	_a 19	4.27	.05
G	Poa secunda	_a 218	_{ab} 265	_a 247	_b 286	6.96	8.81
Total for Annual Grasses		0	0	95	19	4.27	0.05
Total for Perennial Grasses		399	434	423	473	11.38	13.41
Total for Grasses		399	434	518	492	15.66	13.46
F	Antennaria rosea	-	-	-	1	-	.00
F	Arabis spp.	_b 11	_b 13	_{ab} 10	_a -	.02	-
F	Arenaria fendleri	_a -	_b 12	_{ab} 6	_a -	.06	-
F	Astragalus spp.	_a 6	_b 42	_a 2	_a 3	.00	.00
F	Calochortus nuttallii	_a 5	_a -	_a -	_b 51	-	.13
F	Collinsia parviflora (a)	-	-	1	-	.00	-
F	Cryptantha spp.	-	4	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	2	-	.01
F	Draba spp. (a)	-	-	_b 15	_a -	.03	-

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Eriogonum spp.	-	1	-	-	-	-
F	Gilia spp. (a)	-	-	a-	b19	-	.03
F	Lactuca serriola	-	3	-	-	-	-
F	Petradoria pumila	bc47	c69	ab25	a22	.91	.25
F	Physaria chambersii	b19	b15	a-	a-	-	-
F	Phlox hoodii	a4	c99	b68	a16	1.31	.09
F	Phlox longifolia	4	-	-	-	-	-
F	Ranunculus testiculatus (a)	-	-	2	-	.00	-
F	Streptanthus cordatus	a11	b41	ab24	a17	.30	.03
Total for Annual Forbs		0	0	18	21	0.03	0.04
Total for Perennial Forbs		107	299	135	110	2.62	0.52
Total for Forbs		107	299	153	131	2.66	0.57

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

BROWSE TRENDS --

Management unit 21 , Study no: 1

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	2	2	-	-
B	Artemisia tridentata wyomingensis	7	7	.57	.68
B	Cercocarpus montanus	0	0	-	.15
B	Chrysothamnus viscidiflorus stenophyllus	24	26	1.11	1.04
B	Cowania mexicana stansburiana	16	16	4.29	4.45
B	Gutierrezia sarothrae	22	4	.45	.03
B	Juniperus osteosperma	10	11	4.38	10.31
B	Leptodactylon pungens	13	12	.47	.04
B	Mahonia repens	1	0	-	-
B	Purshia tridentata	0	1	-	-
Total for Browse		95	79	11.28	16.72

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 1

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	1.36
Chrysothamnus viscidiflorus stenophyllus	-	.65
Cowania mexicana stansburiana	-	6.40
Juniperus osteosperma	4.59	2.91

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 1

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.0
Cowania mexicana stansburiana	1.6

POINT-QUARTER TREE DATA --

Management unit 21 , Study no: 1

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	260	225

Average diameter (in)	
'98	'03
5.1	5.9

BASIC COVER --

Management unit 21 , Study no: 1

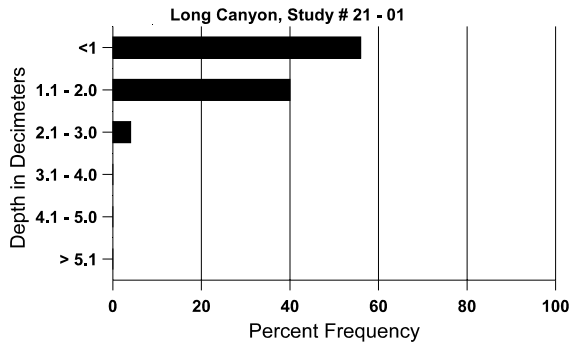
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	7.25	6.50	34.20	29.28
Rock	5.50	13.00	6.01	7.22
Pavement	27.75	18.00	26.99	26.06
Litter	51.50	45.50	39.52	32.47
Cryptogams	1.00	2.50	5.43	4.02
Bare Ground	7.00	14.50	10.39	19.72

SOIL ANALYSIS DATA --

Management unit 21, Study no: 1, Study Name: Long Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
10.6	55.4 (13.0)	7.0	45.3	29.4	25.3	3.0	3.2	99.2	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 21, Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	27	24	-	-
Elk	-	1	-	-
Deer	6	4	10 (25)	2 (17)
Cattle	5	3	24 (59)	3 (7)

BROWSE CHARACTERISTICS --

Management unit 21, Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	100	0	-	0	14/21
98	40	-	-	40	-	-	0	0	-	0	29/37
03	40	-	-	40	-	-	0	0	-	0	15/23

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	1065	-	66	933	66	-	38	0	6	13	32/27
91	1132	-	266	600	266	-	65	0	23	12	31/32
98	180	-	-	140	40	80	33	0	22	11	25/35
03	200	-	-	100	100	120	10	0	50	30	27/40
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	933	-	-	133	800	-	0	0	86	21	8/13
91	1799	-	-	533	1266	-	4	4	70	41	15/18
98	640	-	-	580	60	100	0	0	9	0	14/17
03	600	-	-	240	360	340	0	0	60	53	12/19
<i>Cowania mexicana stansburiana</i>											
85	333	-	-	333	-	-	0	0	0	0	55/37
91	332	-	-	266	66	-	20	0	20	0	63/59
98	360	20	40	200	120	-	11	0	33	6	73/78
03	440	-	-	240	200	40	9	5	45	41	73/76
<i>Gutierrezia sarothrae</i>											
85	799	200	266	400	133	-	0	0	17	0	9/7
91	999	-	66	733	200	-	0	0	20	7	10/9
98	740	-	20	720	-	-	0	0	0	0	12/15
03	80	-	-	40	40	220	0	0	50	50	6/7
<i>Juniperus osteosperma</i>											
85	133	-	-	133	-	-	0	0	-	0	64/41
91	133	-	-	133	-	-	0	0	-	0	90/64
98	200	40	80	120	-	20	0	0	-	0	-/-
03	220	-	20	200	-	-	0	0	-	0	-/-
<i>Leptodactylon pungens</i>											
85	6665	666	1733	3466	1466	-	4	4	22	2	3/5
91	199	-	-	133	66	-	0	0	33	67	10/14
98	560	-	40	340	180	180	0	0	32	21	7/9
03	640	-	80	280	280	300	3	0	44	34	6/7
<i>Mahonia repens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	100	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Purshia tridentata</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	100	-	0	9/10

Trend Study 21-2-03

Study site name: Lovell Hollow.

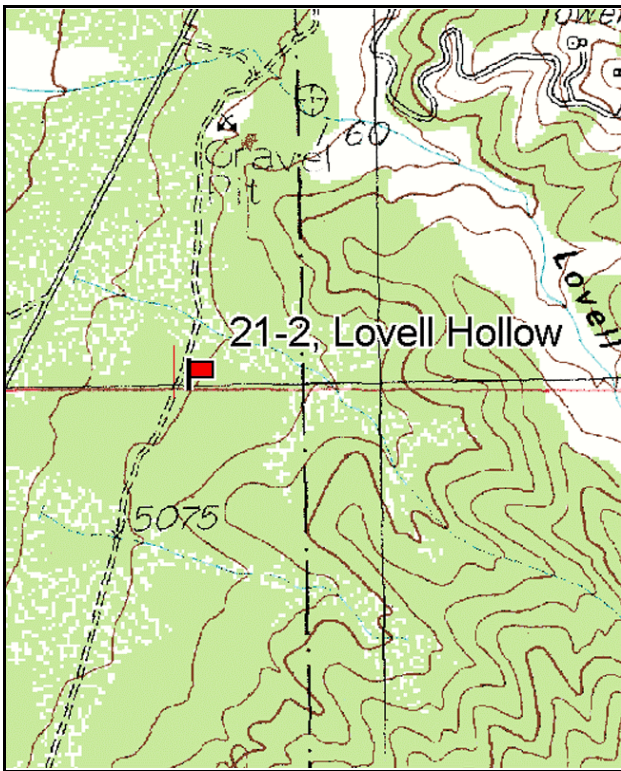
Vegetation type: Chained, seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

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

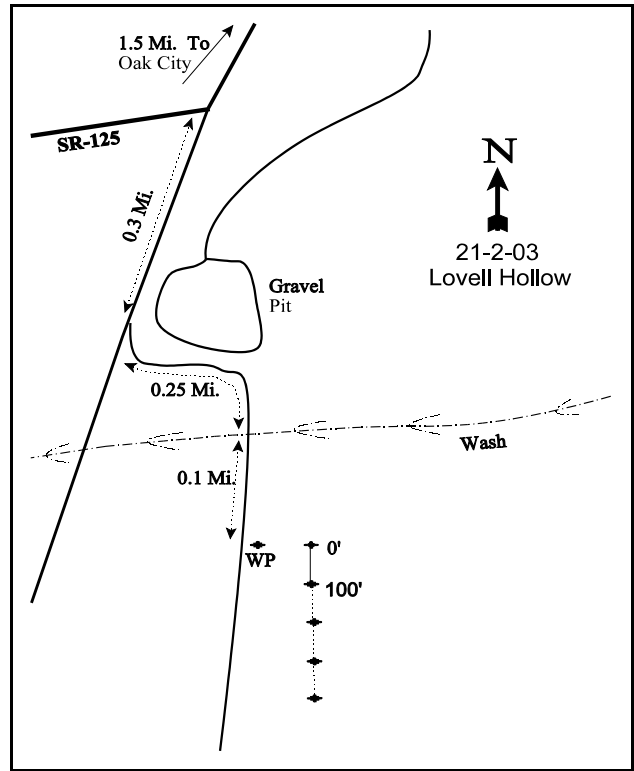
LOCATION DESCRIPTION

From the southern limit of Oak City, proceed 1.5 miles southwest on SR 125. Turn left on an improved road and go 0.3 miles. Turn left, then turn right at the south end of the gravel pit. Proceed 0.25 miles to a fork in the bottom of a wash. Continue south 0.1 miles (550 feet) to a full high green fencepost 5 feet off the left side of the road. The baseline starts 100 feet east of the witness post. The 0' stake is a green fencepost marked by browse tag #7115.



Map Name: Oak City South

Township 17S, Range 5W, Section 12



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4355987 N, 382595 E

DISCUSSION

Lovell Hollow - Trend Study No. 21-2

This study samples severe winter range on the juniper-big sagebrush foothills of the Canyon Mountains. Located at the base of the hills, this study slopes at 7-10% to the west at an elevation of 5,200 feet. The site was burned in 1981, when wildfires consumed several thousand acres of winter range to the east. Another fire burned this area prior to the 1991 reading which eliminated all of the sagebrush on the site. The site was seeded after the fire with crested wheatgrass, intermediate wheatgrass, smooth brome, and fourwing saltbush. Pellet group transect data indicate light deer use in 1998 and 2003 at 8 deer days use/acre (20 ddu/ha) and 7 deer days use/acre (17 ddu/ha) respectively. Cattle use on the site was high at 30 cow days use/acre (74 cdu/ha) in 1998 but low at only 7 days use/acre (17 cdu/ha) in 2003.

The soil is very deep and well-drained with no rocks in the profile. Effective rooting depth was estimated at almost 31 inches in 1998. Soil texture is a loamy sand, and soil reactivity is neutral (pH of 7.2). Organic matter is very limited at less than 1%. Phosphorus may also be limiting at 2.2 ppm as 10 ppm are thought necessary for normal plant growth and development. In 1998, the soil profile appeared dry on the surface down to a depth of 8 to 10 inches, but then moist beyond 10 inches. There may be a clay horizon lower down which helps hold moisture in the soil. Average soil temperature was measured at 76°F in August of 1998 and 58.2°F in May of 2003. Both temperatures were measured at a depth of 18 inches. The difference in soil temperature between years is primarily due to the time of sampling and soil moisture. Soil moisture would be much higher in May compared to August on a low elevation site such as Lovell Hollow that has deep, well-drained soils. Although percent bare ground averages about 43% on the site, the potential for water erosion on this site is slight with moderately rapid permeability, slow runoff, and the gentle terrain. Most soil movement appears to be by the wind, with some soil pedestalling occurring around shrubs and bunchgrasses. An erosion condition class assessment documented very little evidence of erosion on the site in 2003.

Prior to wildfire, the browse component on this site consisted mainly of basin big sagebrush with scattered bitterbrush. Following the wildfire, both sagebrush and bitterbrush were effectively eliminated from the site. The area was apparently chained and seeded following the burn with crested, and intermediate wheatgrasses, smooth brome, and fourwing saltbush. The only important browse species to be sampled in the density strips in 1998 and 2003 was fourwing saltbush. However, density was estimated at only 20 plants/acre on both sampling dates. Fourwing saltbush plants were heavily hedged in 2003, but remain healthy and vigorous. Mature fourwing plants averaged just over 4 feet in height in 1998 and 2003. Neither basin big sagebrush or bitterbrush have been sampled in the density strips since the site burned, but a few individuals of both species are scattered around the site. Annual leader growth averaged 2.7 inches on fourwing saltbush and 1.4 inches on bitterbrush in 2003. Two increasers, stickyleaf low rabbitbrush and broom snakeweed, had increased densities in 2003, but both species still occur in low numbers. Some of the rubber rabbitbrush encountered in 1998 were totally stripped of leaves, apparently due to crickets or grasshoppers. Although there were no crickets on site during the reading on 8/25/98, there were signs of crickets on other sites in the unit in 1998. No crickets were seen on site in 2003.

The herbaceous understory is moderately abundant but dominated by annual species. In 1998, cheatgrass and Russian thistle made up 77% of the herbaceous ground cover. Cheatgrass and most other annual species were not included in the previous sampling dates (1985 and 1991), but photos showed abundant cheatgrass and other annual weeds on the site in 1991. In 2003, cheatgrass declined in nested frequency but still remains the most abundant herbaceous species on the site. Seeded grasses are sparsely scattered throughout the site, including crested and intermediate wheatgrass, and smooth brome. Two native species, western wheatgrass and Indian ricegrass, have the highest nested frequency values of all the perennial grasses. Western wheatgrass significantly increased in 2003 whereas Indian ricegrass remained stable. The forb component is

insignificant on this site.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable to possibly improving. The continued development of cryptogamic soil is very desirable, but it is fragile and care should be taken to avoid off-road vehicle use and trampling by livestock and firewood gatherers. The lack of desirable herbaceous species combined with inadequate reproduction in sagebrush, the key species, indicates a slow downward trend for the vegetation component. However, the bitterbrush may be slowly increasing, and if weather conditions favor sagebrush seedling establishment in the near future, the trend may be reversed.

1991 TREND ASSESSMENT

Basal vegetation cover is very low at only 2%, but shows improvement since 1985 due to the increase in grasses and forbs. Litter cover has also increased due to the increase in herbaceous vegetation, but percent bare ground has slightly increased. Soil trend is stable. Due to the fire, there are no key browse species, so trend for browse is down. Herbaceous trend has improved with the seeding of desirable grasses, although the site is still dominated by cheatgrass and weedy forbs.

TREND ASSESSMENT

soil - stable (3)

browse - down due to fire (1)

herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

Trend for soil is stable. Litter cover has declined partly due to the decomposition of churning debris. However, percent bare soil has declined slightly from 45% to 42%. Water erosion is minimal due to the sandy nature of the soil, yet some wind erosion does occur. The browse trend is up slightly due to the appearance of some seeded fourwing saltbush. These plants occur in low densities but they are large, vigorous, and producing abundant seed. Small numbers of coin buckwheat were also encountered this year. Trend for the herbaceous understory is up slightly for perennial grasses but down for forbs. Cheatgrass still dominates the site by producing 79% of the grass cover. Forb composition is dominated by Russian thistle which grows in dense patches. Overall, trend for the herbaceous understory is stable.

TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - stable (3), but still dominated by cheatgrass and other annuals

2003 TREND ASSESSMENT

Trend for soil is stable. With drier conditions preceding the 2003 reading, vegetation and litter cover have slightly declined, and percent bare soil has slightly increased since 1998. However, trend is stable with a slight increase in cryptogamic cover and nested frequency for perennial grasses which are important at holding soils in place. There was little evidence of erosion. Trend for browse is stable, but limited due to continued low abundance of preferred species. Fourwing saltbush is the key species, but is present at only 20 plants/acre. Fourwing plants are heavily utilized, but show normal vigor. Basin big sagebrush and bitterbrush, the key species prior to the burn, are scattered throughout the site but were not sampled in the transect. The herbaceous understory trend is stable. Cheatgrass remains the dominant herbaceous species,

even with a slight decrease in nested frequency in 2003. Perennial grasses increased in sum of nested frequency, with two natives, Indian ricegrass and western wheatgrass being the most abundant. Forbs remain insignificant on the site.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 2

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	a-	b14	ab1	b12	.03	.89
G	Agropyron intermedium	a-	b17	bc17	c38	.99	2.26
G	Agropyron smithii	a-	b18	b26	c78	.36	.96
G	Agropyron spicatum	3	-	4	-	.00	-
G	Bromus inermis	-	2	-	4	-	.18
G	Bromus tectorum (a)	-	-	b365	a337	18.14	24.34
G	Oryzopsis hymenoides	a3	a9	b52	b43	3.13	1.37
G	Stipa comata	-	-	7	5	.30	.30
G	Vulpia octoflora (a)	-	-	-	5	-	.03
Total for Annual Grasses		0	0	365	342	18.14	24.38
Total for Perennial Grasses		6	60	107	180	4.83	5.98
Total for Grasses		6	60	472	522	22.97	30.36
F	Arabis spp.	-	-	3	-	.00	-
F	Comandra pallida	-	-	-	3	-	.00
F	Epilobium brachycarpum (a)	-	-	-	1	-	.00
F	Eriogonum cernuum (a)	19	-	-	-	-	-
F	Gilia spp. (a)	-	-	a-	b70	-	.23
F	Lactuca serriola	-	1	7	-	.04	-
F	Lygodesmia grandiflora	-	1	-	5	-	.01
F	Machaeranthera canescens	b19	c189	a-	ab7	-	.02
F	Oenothera pallida	a-	a-	c71	b14	.93	.21
F	Phlox longifolia	a-	b36	a-	a3	-	.00
F	Salsola iberica (a)	-	-	b32	a-	2.26	-
F	Sisymbrium altissimum (a)	-	-	3	9	.01	.19
F	Sphaeralcea grossulariaefolia	-	-	-	3	-	.00
F	Stephanomeria exigua (a)	a-	b14	a-	a-	-	-
F	Unknown forb-perennial	-	-	5	4	.18	.03

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
	Total for Annual Forbs	19	14	35	80	2.28	0.43
	Total for Perennial Forbs	19	227	86	39	1.15	0.30
	Total for Forbs	38	241	121	119	3.44	0.73

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

BROWSE TRENDS --

Management unit 21 , Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Atriplex canescens	1	1	2.24	.56
B	Chrysothamnus viscidiflorus viscidiflorus	4	6	.41	1.68
B	Eriogonum nummulare	1	0	-	-
B	Gutierrezia sarothrae	0	2	-	.15
	Total for Browse	6	9	2.65	2.40

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 2

Species	Percent Cover
	'03
Atriplex canescens	.05
Atriplex confertifolia	.68
Chrysothamnus viscidiflorus viscidiflorus	2.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 2

Species	Average leader growth (in)
	'03
Atriplex canescens	2.7
Purshia tridentata	1.4

BASIC COVER --

Management unit 21 , Study no: 2

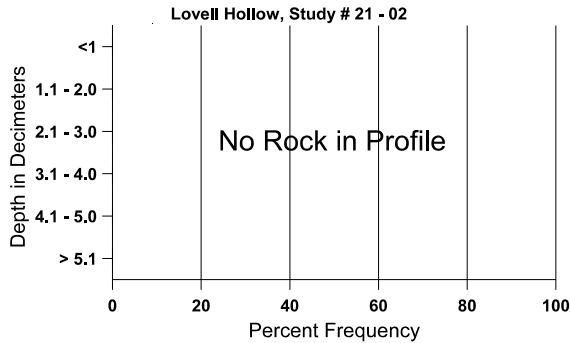
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	.50	2.00	33.58	32.51
Rock	0	0	0	0
Pavement	.50	.25	.44	.20
Litter	48.50	52.50	38.68	32.02
Cryptogams	9.25	0	.79	1.92
Bare Ground	41.25	45.25	41.95	45.95

SOIL ANALYSIS DATA --

Management unit 21, Study no: 2, Study Name: Lovell Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
30.9	58.2 (18.1)	7.2	85.3	6.4	8.3	0.6	2.2	137.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	12	18	-	-
Deer	11	-	8 (20)	3 (7)
Cattle	10	9	30 (74)	3 (7)
Antelope	2	-	-	-

BROWSE CHARACTERISTICS --
Management unit 21 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata tridentata</i>											
85	1465	-	66	866	533	-	0	0	36	14	33/32
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	600	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	42/91
<i>Atriplex canescens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	51/76
03	20	-	-	20	-	-	0	100	-	0	54/78
<i>Atriplex confertifolia</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	40/79
<i>Chrysothamnus nauseosus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	21/54
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	80	-	-	40	40	-	0	50	50	25	25/40
03	140	-	-	140	-	40	0	0	0	0	24/41
<i>Eriogonum nummularie</i>											
85	865	-	266	533	66	-	0	0	8	8	13/15
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	-	0	0	100	100	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	11/19
03	40	-	-	40	-	-	0	0	-	0	8/18
Juniperus osteosperma											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	29/103
Tetradymia canescens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	25/46

Trend Study 21-3-03

Study site name: Cascade Spring.

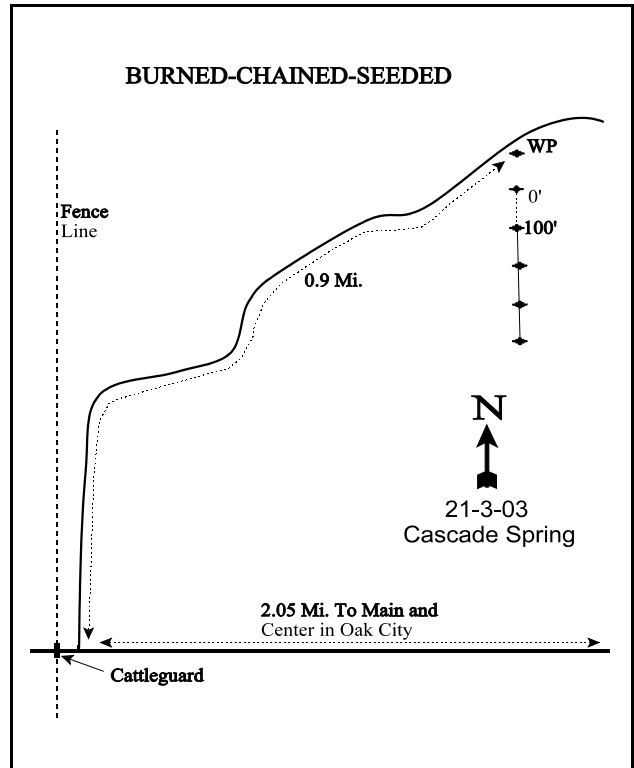
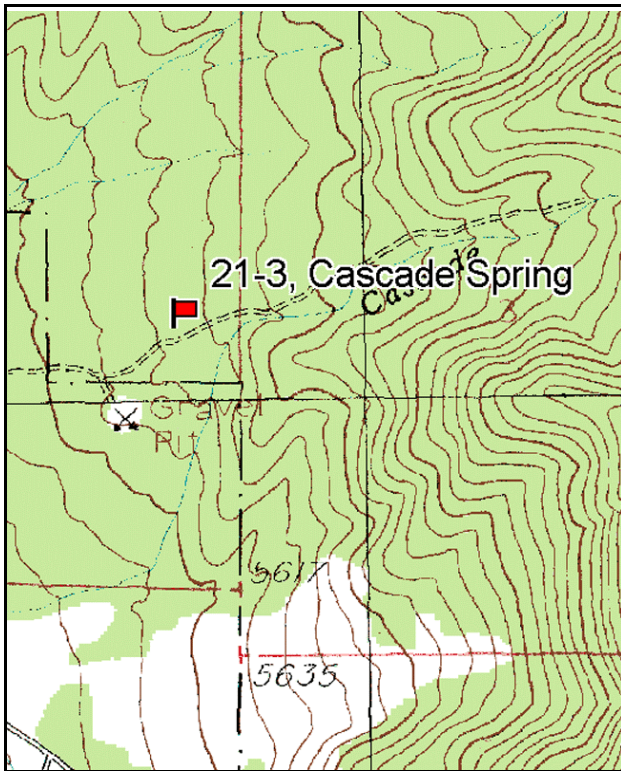
Vegetation type: Burn-perennial grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From Main Street and Center in Oak City, go east on Center 0.35 miles around an "S" bend to an intersection. Stay left and continue 1.7 miles to a cattleguard. Just beyond the cattleguard, turn left up the road to Cascade Spring. Follow this road around several bends for 0.9 miles to a 5/8" rebar 10 feet off the right side of the road. The baseline starts 55 feet true south of this witness post. The 0-foot baseline stake is tagged #7114. The 100-foot end of the baseline is marked by a rebar that is actually only 99 feet south of the 0-foot baseline stake.



Map Name: Oak City South

Diagrammatic Sketch

Township 17S, Range 4W, Section 4

GPS: NAD 27, UTM 12S 4358164 N, 388570 E

DISCUSSION

Cascade Spring - Trend Study No. 21-3

This study is located near the Cascade Spring pellet group transect, 2 miles east of Oak City. The study lies on a southwest facing slope at an elevation of 5,700 feet. The area was burned by wildfire in 1981 and the lower slopes were seeded and chained the following year. The vegetative composition is now dominated by annuals and seeded grasses. As far as the Forest Service is concerned, the project was successful in establishing range suited for cattle. However, this area has limited value for wintering deer due to the lack of browse and thermal cover. Deer use on a nearby DWR pellet group transect averaged 14 days use/acre (35 ddu/ha) between 1985 and 1991 (Jense et al 1991). However between 1993 and 1996, an average of only 3 deer use days/acre (7 ddu/ha) was estimated (Evans et al. 1996). A pellet group transect read parallel to the sampling baseline estimated 12 deer days use/acre (30 ddu/ha) in 1998 and only 3 deer days use/acre (8 ddu/ha) in 2003. Cattle use was high in 1998 at an estimated 62 cow day use/acre (153 cdu/ha), declining to 13 days use/acre (32 cdu/ha) in 2003. A few elk pellets were also sampled on the site in 2003. Identification of grass species was difficult in 1998 due to use by livestock.

The soil is very rocky on the surface and throughout the profile. In some places, it is only 10 to 20 inches to solid limestone bedrock. Effective rooting depth was estimated at just under 11 inches in 1998. Soil texture is a loam with a neutral pH (6.8). Rock and pavement cover are abundant on the soil surface. Soil temperature at 13 inches in depth averaged 73°F in August 1998 and 57.2°F in May 2003. The difference in soil temperature between years is primarily due to the time of sampling and soil moisture. Soil moisture would be much higher in May compared to August on a low elevation site such as Cascade Spring. Erosion was a severe problem on these slopes in the early 1900's, but the wide gully through the study area now supports perennial vegetation. Although erosion increased after the fire, vegetation cover and litter buildup have increased and now give the soil adequate protection. Soils received a stable rating from an erosion condition class assessment done on site in 2003.

No browse was sampled on the transect during the initial reading in 1985. The only browse species encountered in 1991 was a few broom snakeweed (200 plants/acre). Broom snakeweed density increased to 740 plants/acre in 1998 with the entire population being classified as mature. Snakeweed density declined to an estimated 280 plants/acre in 2003 which is expected during drought. Echinocereus and prickly pear cactus are present on the site at an estimated 20 plants/acre in 2003. According to the Forest Service revegetation report, bitterbrush and fourwing saltbush were included in the seed mix, but after more than 20 years post-burn, there are still no preferred browse species on the site. In many places, the herbaceous vegetation appears dense enough to successfully out-compete browse seedlings. In addition, high soil temperatures in late summer months may make it difficult for young shrub seedlings to survive without significant amounts of precipitation. Since there are no seed sources nearby, natural establishment of browse species will take a long time.

Perennial grasses dominate the vegetative community. Seeded grasses including crested (both standard and fairway varieties) and intermediate wheatgrass are established over the whole area. Smooth brome was fairly common initially, but was not sampled on the site in 2003. This is not surprising due to several years of below normal precipitation. This site is marginal for smooth brome anyway. Crested wheatgrass significantly decreased in nested frequency in 2003, while intermediate wheatgrass remained stable. Sandberg bluegrass and bulbous bluegrass are also common with both species significantly increasing in nested frequency in 2003. Cheatgrass is present on site, occurring in scattered thick patches. Cheatgrass has maintained stable frequency and cover values between 1998 and 2003. Forbs are nearly absent and are insignificant on this site. Alfalfa and storksbill were the most common forbs during the initial reading in 1985, but by 2003, forbs were nearly absent. Most of the alfalfa plants were small and almost entirely eaten by grasshoppers in 1985.

1985 APPARENT TREND ASSESSMENT

After the fire and seeding, the area appears to be quickly changing. The percentage of annuals should decrease through time as the perennials become better established. Before the fire, this was an important deer winter range and the lack of browse is a very real problem. Interseeding with browse species should be considered. The soil has stabilized and trend appears to be improving.

1991 TREND ASSESSMENT

Overall, the soil trend is improving. Vegetation and litter cover are increasing while rock, pavement, and bare ground are all slightly decreasing. Browse trend here is not applicable because there are no browse on the site except for broom snakeweed. Herbaceous understory trend is mixed with the grasses doing well and the forbs being nearly absent. The grasses are stabilizing, with some species increasing, while others are decreasing. Overall, they have slightly increased in sum of nested frequency. The major seeded forb, alfalfa, has decreased greatly due to the extended drought. The overall trend for herbaceous understory is stable.

TREND ASSESSMENT

soil - slightly up (4)

browse - no trend, no browse after fire (n/a)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1991. There are still no browse species on the site with the exception of broom snakeweed. Trend for the herbaceous understory is up for grasses with a major increase in the sum of nested frequency for perennial grasses. Nested frequency of intermediate wheatgrass nearly tripled. Forbs are represented by only a few Louisiana sagebrush. Livestock utilization of the grasses in 1998 was very heavy (75-85%) making identification difficult.

TREND ASSESSMENT

soil - stable (3)

browse - no trend, no browse after fire (n/a)

herbaceous understory - up for grasses (5)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics show some changes, although they are not significant. Vegetation cover slightly increased between 1998 and 2003, while litter declined. Bare ground only slightly increased between 1998 and 2003. The frequency of perennial grasses also slightly increased in 2003 which is important as herbaceous perennials are a key factor to soil stability. As in previous years, the browse component has no trend. This site has very little use for wintering big game as preferred browse species have been non-existent for more than two decades since the site was rehabilitated following wildfire. The herbaceous understory has a stable trend. Perennial grasses maintained a stable sum of nested frequency value overall, although some species increased and others decreased. Crested wheatgrass significantly decreased in frequency in 2003, while intermediate wheatgrass remained stable. Sandberg bluegrass and bulbous bluegrass both had significantly higher nested frequency values in 2003 compared to the 1998 reading. Cheatgrass brome is moderately abundant on the site, but hasn't increased since the last reading and it appears that the perennials are keeping it in check. Forbs are nearly absent from the site now and will likely never be important on this site.

TREND ASSESSMENT

soil - stable (3)

browse - no trend (n/a)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 3

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	_b 111	_b 76	_b 88	_a 36	4.55	1.60
G	Agropyron intermedium	_a 33	_b 73	_c 202	_c 205	11.82	11.61
G	Agropyron spicatum	1	4	-	6	-	.78
G	Bromus inermis	_b 34	_b 32	_b 26	_a -	.73	-
G	Bromus tectorum (a)	-	-	191	184	5.32	5.44
G	Poa bulbosa	-	8	77	119	4.05	9.20
G	Poa secunda	_a 31	_{ab} 86	_c 122	_d 182	4.02	7.24
G	Vulpia octoflora (a)	-	-	1	-	.00	-
Total for Annual Grasses		0	0	192	184	5.32	5.44
Total for Perennial Grasses		210	279	515	548	25.18	30.45
Total for Grasses		210	279	707	732	30.51	35.89
F	Artemisia ludoviciana	-	-	4	-	.06	-
F	Convolvulus arvensis	-	-	-	5	-	.06
F	Cymopterus spp.	-	-	-	1	-	.00
F	Erodium cicutarium (a)	54	-	-	-	-	.38
F	Erigeron spp.	_b 13	_a -	_a -	_a -	-	-
F	Lactuca serriola	_a -	_b 10	_a -	_a -	.03	-
F	Medicago sativa	_b 76	_a 4	_a -	_a -	-	-
F	Stephanomeria exigua (a)	_b 11	_a -	_a -	_a -	-	-
F	Taraxacum officinale	-	-	-	2	-	.00
F	Tragopogon dubius	-	1	-	-	-	-
F	Unknown forb-annual (a)	-	3	-	-	-	-
F	Unknown forb-perennial	-	4	-	-	-	-
Total for Annual Forbs		65	3	0	0	0	0.37
Total for Perennial Forbs		89	19	4	8	0.09	0.07
Total for Forbs		154	22	4	8	0.09	0.45

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

BROWSE TRENDS --

Management unit 21 , Study no: 3

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
		B	Echinocereus spp.	1	1
B	Gutierrezia sarothrae	11	6	.69	.15
B	Opuntia spp.	0	1	-	.03
Total for Browse		12	8	0.69	0.18

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 3

Species	Percent Cover
	'03
Echinocereus spp.	.05

BASIC COVER --

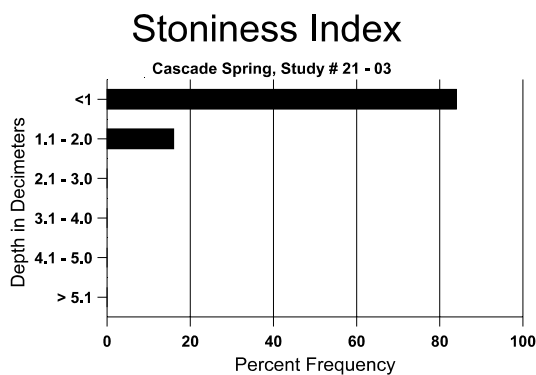
Management unit 21 , Study no: 3

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	7.25	10.75	35.95	38.94
Rock	24.25	22.00	14.15	21.33
Pavement	9.00	6.25	3.32	5.62
Litter	40.75	44.00	41.01	29.78
Cryptogams	.75	1.00	.14	.02
Bare Ground	18.00	16.00	16.66	17.68

SOIL ANALYSIS DATA --

Management unit 21, Study no: 3, Study Name: Cascade Spring

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.5	57.2 (13.1)	6.8	50.9	29.8	19.3	2.2	13.8	140.8	0.7



PELLET GROUP DATA --
 Management unit 21 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	5	4	-	-
Elk	-	-	1 (2)	1 (3)
Deer	7	3	12 (30)	3 (8)
Cattle	26	-	62 (153)	13 (32)

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 3

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Echinocereus spp.											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	20	-	-	0	0	0	0	-/-
03	20	-	-	-	20	-	0	0	100	100	-/-
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	200	-	-	200	-	-	0	0	0	0	10/15
98	740	-	-	740	-	100	0	0	0	0	8/15
03	280	-	20	180	80	20	0	0	29	29	4/9
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	4/5

Trend Study 21-4-03

Study site name: Horse Hollow.

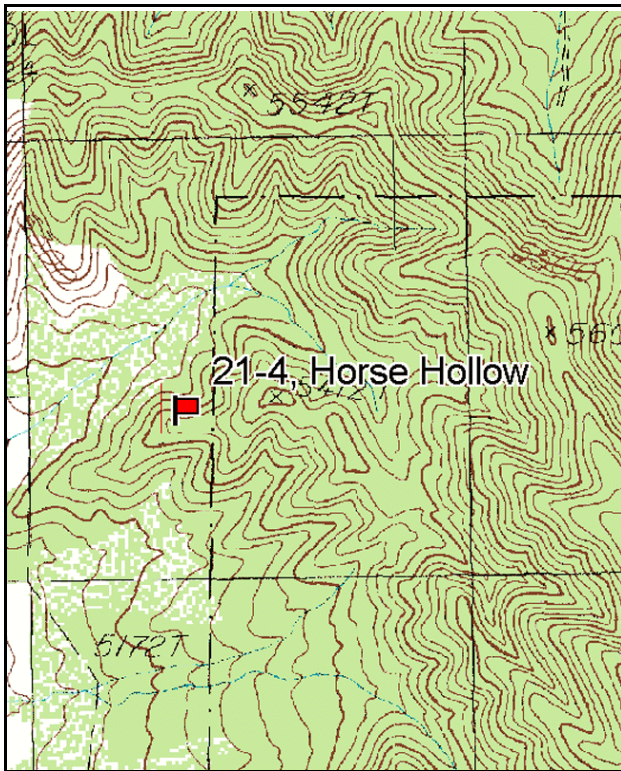
Vegetation type: Juniper.

Compass bearing: frequency baseline 180 degrees magnetic.

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

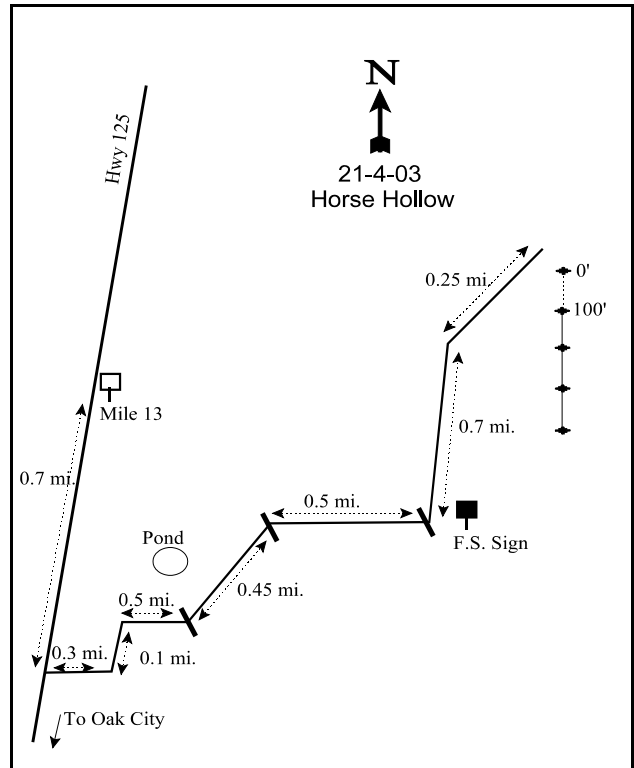
LOCATION DESCRIPTION

Proceed north from Oak City on SR 125. At 0.7 miles south of mile marker 13, turn left (east). Drive 0.3 miles, turn left, and drive 0.1 miles parallel to a fence. Turn right and drive 0.5 miles to a gate. Stay left at the gate and drive 0.45 miles to another gate. Go through the gate and drive 0.5 miles to another gate. On the other side of the gate is a Forest Service sign. The road will turn left (north), drive 0.7 miles up the hill to a ridge. At the top of the hill turn right and drive 0.25 miles on a faint road up the ridge line. Look for a green and white fencepost 18 feet off the right side of the road. The fencepost marks the 0-foot end of the frequency baseline. All stakes are full high fence post.



Map Name: Oak City

Township 16S, Range 4W, Section Unsurveyed



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4365352 N, 388333 E

DISCUSSION

Horse Hollow - Trend Study No. 21-4

This study is located on juniper-sagebrush winter range in the foothills above privately owned wheatfields. The transect runs down the south side of a rocky ridge and across a small wash. The slope is 20% with a south-southwest aspect and an elevation of 5,300 feet. Adjacent areas to the north and south were burned, seeded, then chained prior to study establishment in 1985. The land is managed by the Forest Service and is grazed by cattle. The lack of a nearby water source may effect livestock distribution in the area. Big game use is light as pellet groups are relatively few and the browse shows only light to moderate hedging. Pellet group transect data from 1998 and 2003 estimated only 7 deer use days/acre (17 ddu/ha) and just under 3 deer days use/acre (7 ddu/ha) respectively. Cattle use was estimated at only 2 days use/acre (5 cdu/ha) in 1998, with no cattle pats being sampled in 2003. Although not recorded in the pellet group transect data, rabbit pellets were moderately abundant in the quadrat counts in both 1998 and 2003.

Soil on the site is moderately shallow and very rocky. Gravel and rock are abundant on the surface and throughout the profile. Pavement and rock combine to produce between 40-50% average cover on the soil surface in all readings. Effective rooting depth was estimated at just over 11 inches in 1998, with rock concentrated in the upper 8 inches of the profile. A thin hardpan is located at a depth of 6 to 8 inches, but it does not appear to be a barrier to roots. Soil texture is a sandy loam with a neutral pH (7.1). Phosphorus is low at only 3.3 ppm which may be limiting to plant growth as 10 ppm is considered a minimal value. Average soil temperature averaged 74°F in 1998 (12 inches in depth) and 57.2°F in 2003 (13 inches in depth). The difference in soil temperature between years is primarily due to the time of sampling and soil moisture. Soil moisture would be much higher in May compared to August on a low elevation site with shallow, rocky soils such as those found at Horse Hollow. Soil erosion is not a serious problem on the site, although a small wash at the bottom of the hill shows some sedimentation. Soils received a stable rating in 2003 from an erosion condition class assessment.

The overstory is dominated by large Utah juniper. Nearly half of the juniper trees on the site are greater than 12 feet in height. Young trees were noted as being few in 1998, but made up about 25% of the population in 2003. Point quarter data from 1998 and 2003 estimated total juniper density at 82 trees/acre. Juniper canopy cover averaged about 8% in 2003.

The key browse species is Wyoming big sagebrush which had a stable density of between 800 and 900 plants/acre between 1985 and 1998. Density declined by 30% in 2003 to an estimated 640 plants/acre. Reproduction has been very limited for all readings. It has had moderately high decadence (39% - 50%) as the population of Wyoming big sagebrush appears to be slowly declining on the site. Several years of drier than normal weather prior to and including the 2003 sampling is likely the main reason for decreasing sagebrush. Use on sagebrush has been light to moderate in all readings. Annual leaders averaged 1.6 inches of growth in May 2003. Broom snakeweed was the most numerous shrub on the site in 1998, but declined to 600 plants/acre in 2003. Other browse species sampled on this site include Stansbury cliffrose, Nevada ephedra, and narrowleaf low rabbitbrush, which all occur in low densities. In 1998, grasshoppers were numerous on the site and Mormon crickets had been on the site earlier in the season. Some coyote scat found on the site contained numerous cricket remains. In addition, the rabbitbrush had been stripped of all leaves by insects.

The herbaceous understory has been sparse in all readings. Cheatgrass dominated the understory in 1998 as it provided 81% of the grass cover and nearly one-half of the total vegetation cover. In 2003, cheatgrass significantly decreased in nested frequency and average cover declined by nearly 75%. Several native perennial grasses occur on the site, but only bluebunch wheatgrass and Sandberg bluegrass are fairly common.

Both species showed slight increases in nested frequency in 2003. The forb component has been poor since the site was established in 1985. A handful of species persist on the site but were only sampled once or twice each in 2003.

1985 APPARENT TREND ASSESSMENT

Overall, vegetation trend appears to be declining. The population of Wyoming big sagebrush (the key species) is composed mainly of older plants and there is little sign of reproduction. The increasing prevalence of broom snakeweed in the community is also a warning sign that range condition is deteriorating. Soil is appears to be eroding faster than it is being formed, leaving an unstable rocky surface.

1991 TREND ASSESSMENT

Soil condition is continuing on a slightly downward trend, largely due to a loss of vegetative cover, and a substantial increase in rock cover. The key browse, Wyoming big sagebrush, has a fairly stable population, although percent decadence increased from 42 to 50%. Broom snakeweed has increased slightly during this same period. Trend for browse would be slightly downward. The herbaceous understory is going in two different directions, the grasses are increasing and the forbs are decreasing. The grasses make up the majority of the understory with high quadrat frequencies. The forbs are basically nonexistent with poor vigor. Trend here is slightly upward because of the increase in grasses.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

Trend for soil appears to be stable with similar ground cover characteristics compared to 1991. Trend for the key browse species, Wyoming big sagebrush appears to be slightly down at the moment, with a lack of adequate reproduction and a high number of dead plants (45%). Percent decadence is down from 50% to 39% and vigor has improved slightly. However, it appears that more of the population will continue to be lost in the future. Utilization is mostly light to moderate. Another cause for concern is the continued increase in broom snakeweed. The current population is mostly mature (93%), and it appears stable. The herbaceous understory is depleted of perennial grasses and forbs. Cheatgrass currently dominates the site by providing 80% of the herbaceous cover. Trend is considered down with all perennial grasses declining in nested frequency since 1991.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - down (1)

2003 TREND ASSESSMENT

Bare ground has increased, while vegetation and litter cover have both slightly declined. These changes are the result of the dry conditions which have effected the amount of protective cover on the soil surface. However, even with these changes in ground cover characteristics, erosion remains minimal as evidenced by a stable erosion condition class rating in 2003. Thus, trend for soil is stable. The key browse, Wyoming big sagebrush, has a downward trend. Density, vigor, and reproduction have all declined since 1998, and percent

decadence has increased. A large portion of the remaining decadent population was classified as dying which more than likely will result in further population losses by the next reading. The herbaceous component remains sparse on this site, but does show slight improvements since 1998. The forb component remains insignificant, but perennial grasses slightly increased in sum of nested frequency, and cheatgrass significantly decreased in nested frequency. Trend is slightly up for the herbaceous understory.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 4

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	_b 73	_b 77	_a 19	_a 35	.65	1.21
G	Bromus tectorum (a)	-	-	_b 337	_a 239	12.65	3.47
G	Hilaria jamesii	_a 8	_b 34	_a 6	_a 9	.10	.04
G	Oryzopsis hymenoides	_{ab} 29	_b 31	_a 12	_{ab} 20	.12	.56
G	Poa secunda	_a 54	_a 47	_{ab} 75	_b 101	2.06	3.41
G	Secale cereale (a)	-	-	5	-	.02	-
G	Sitanion hystrix	-	5	2	-	.06	-
Total for Annual Grasses		0	0	342	239	12.67	3.47
Total for Perennial Grasses		164	194	114	165	3.00	5.24
Total for Grasses		164	194	456	404	15.67	8.71
F	Arabis drummondi	1	-	-	2	-	.00
F	Astragalus spp.	_b 19	_{ab} 8	_a 4	_a -	.01	-
F	Astragalus utahensis	-	-	-	3	-	.00
F	Calochortus nuttallii	-	-	-	3	-	.00
F	Cirsium spp.	-	-	7	1	.04	.00
F	Cryptantha spp.	5	1	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	2	-	.00
F	Eriogonum cernuum (a)	-	-	-	5	-	.01
F	Erigeron eatonii	-	4	-	-	-	-
F	Eriogonum ovalifolium	-	2	-	-	-	-
F	Gilia spp. (a)	-	-	-	5	-	.01
F	Hymenopappus filifolius	-	-	-	5	-	.01
F	Lomatium spp.	-	-	-	1	-	.00
F	Phlox austromontana	_b 15	_a -	_a -	_a -	-	-
F	Phlox longifolia	2	-	3	3	.00	.00

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Unknown forb-perennial	3	-	-	-	-	-
F	Zigadenus paniculatus	-	1	-	1	-	.01
Total for Annual Forbs		0	0	0	12	0	0.03
Total for Perennial Forbs		45	16	14	19	0.05	0.05
Total for Forbs		45	16	14	31	0.05	0.09

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

BROWSE TRENDS --

Management unit 21 , Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	34	26	2.07	3.79
B	Chrysothamnus viscidiflorus stenophyllus	22	9	.21	.30
B	Cowania mexicana stansburiana	1	2	-	.53
B	Ephedra nevadensis	3	4	.94	.68
B	Gutierrezia sarothrae	41	18	1.49	.58
B	Juniperus osteosperma	4	5	6.22	8.57
B	Opuntia spp.	1	1	-	-
Total for Browse		106	65	10.94	14.46

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 4

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	3.86
Chrysothamnus viscidiflorus stenophyllus	-	.23
Cowania mexicana stansburiana	-	.76
Ephedra nevadensis	-	.71
Gutierrezia sarothrae	-	.06
Juniperus osteosperma	13.80	7.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 21 , Study no: 4

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 4

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	81	82

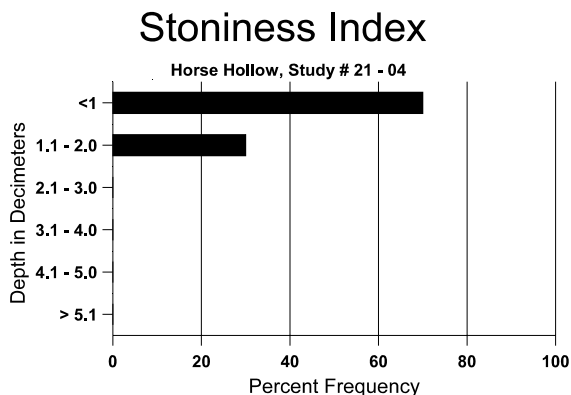
Average diameter (in)	
'98	'03
8.3	7.8

BASIC COVER --
Management unit 21 , Study no: 4

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.25	1.00	25.25	22.73
Rock	7.00	18.00	12.65	14.71
Pavement	37.50	31.00	30.39	26.12
Litter	33.25	30.50	34.54	28.22
Cryptogams	2.75	3.25	3.94	6.81
Bare Ground	16.25	16.25	14.71	20.10

SOIL ANALYSIS DATA --
Management unit 21, Study no: 4, Study Name: Horse Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.4	74.0 (12.6)	7.1	54.9	25.8	19.3	1.3	3.3	105.6	0.5



PELLET GROUP DATA --
 Management unit 21 , Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	25	34	-	-
Deer	19	6	7 (17)	3 (7)
Cattle	-	-	2 (5)	-

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	799	66	66	400	333	-	58	0	42	17	15/18
91	800	-	-	400	400	-	0	0	50	33	15/28
98	920	-	40	520	360	800	43	4	39	13	22/35
03	640	-	-	340	300	500	3	3	47	19	24/38
<i>Chrysothamnus nauseosus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	18/33
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	333	-	-	-	333	-	0	0	100	100	-/-
91	266	-	-	266	-	-	0	0	0	0	9/14
98	560	-	-	500	60	140	25	75	11	29	10/17
03	280	-	-	160	120	260	0	0	43	14	7/12
<i>Cowania mexicana stansburiana</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	20	-	-	0	0	0	0	17/20
03	40	-	-	20	20	-	50	50	50	0	22/20
<i>Ephedra nevadensis</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	100	-	-	100	-	-	100	0	0	0	17/41
03	420	-	-	120	300	20	29	19	71	19	14/20

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
85	1266	-	400	733	133	-	0	0	11	21	6/9
91	1398	-	66	1266	66	-	0	0	5	5	9/13
98	2500	-	80	2320	100	200	7	3	4	98	8/10
03	600	-	20	540	40	340	0	0	7	7	6/9
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	80	40	40	40	-	-	0	0	-	0	-/-
03	120	-	20	100	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	11/26
03	20	-	-	20	-	-	0	0	-	0	4/19
<i>Tetradymia spinosa</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	18/37

Trend Study 21-6-03

Study site name: 'M' Hill.

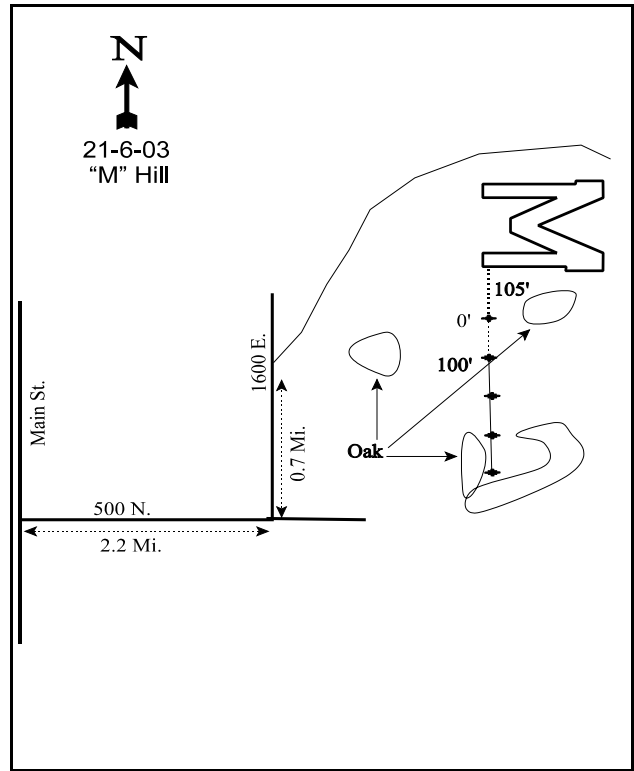
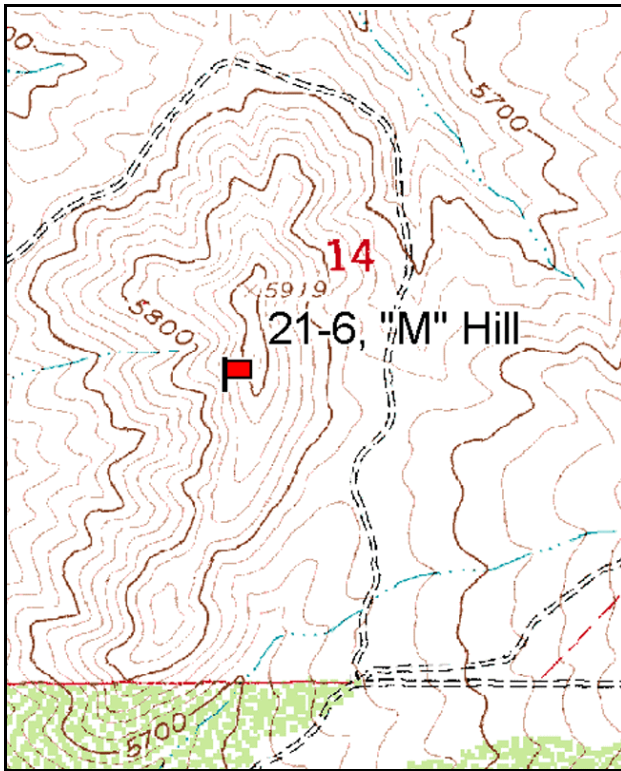
Vegetation type: Mtn. Brush Chaining.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

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 27, UTM 12S 4315603 N, 389878 E

DISCUSSION

'M' Hill - Trend Study No. 21-6

This trend study is located on DWR land on the first large hill east of Fillmore. Further east, there is about 2 miles of rolling juniper-covered foothills below the 7,000 foot winter range limit. There is some development of homes on private land in the foothills above the transect. Elevation of the study site is 5,800 feet on a moderately steep (30-35%) west facing slope. The site was chained more than 30 years ago and is now dominated by a mixture of shrubs. Cattle grazing was heavy in the past, but is only light at the present time. Deer use appeared to be moderate to heavy when the site was established, but has lessened since. Pellet group data from 1998 estimated 23 deer, 6 elk, and 6 cow use days/acre (57 ddu/ha, 15 edu/ha, and 15 cdu/ha). Use was estimated at 50 deer (122 ddu/ha) and 7 elk days use/acre (17 edu/ha) in 2003. There is ample thermal cover available in the area from juniper.

Soil on the site has moderate depth estimated at almost 14 inches. Texture is a loam with a neutral pH (6.9). Phosphorus is 8.4 ppm, which is slightly below the 10 ppm thought necessary for normal plant development. Rock and pavement are abundant on the surface with cover values ranging from 29% in 1985 to 22% in 2003. Rock and gravel are also common throughout the profile. There is some soil movement down slope as evidenced by pedestalling around the base of shrubs and bunchgrasses, but erosion is not severe. An erosion condition class assessment rated soils as stable in 2003. The ratio of protective cover to bare soil declined by nearly half between 1998 and 2003 due to the increase in bare ground and resultant decreases in vegetation and litter.

The browse community at "M" Hill is diverse. Gambel oak and Utah juniper are the dominant types with lower amounts of preferred species including true mountain mahogany, Stansbury cliffrose, serviceberry, and mountain big sagebrush also being present. Gambel oak occurs in dense, scattered patches and had an estimated density of about 3,000 stems/acre in both 1998 and 2003. The young age class has been abundant in all years with decadence being low. Mature oak stems have averaged between 3 and 5 feet in height, and use on oak is mostly light. A portion of the oak population was noted as being severely defoliated by grasshoppers in 1985. Herbaceous understory species and mountain mahogany were also heavily impacted by grasshoppers that year. Point quarter data from 2003 estimated an average juniper density of 132 trees/acre. Canopy cover of oak and juniper averaged 12% and 8% in 2003 respectively.

Preferred browse species all occur in low densities. True mountain mahogany is the most abundant of the preferred types with an estimated density of about 300 plants/acre in all years. Use on mahogany was light to moderate from 1985 to 1998, and moderate to heavy in 2003. Mature mahogany plants averaged over 6 feet in height in 2003, and are becoming more unavailable to browsing deer. The mahogany population has displayed normal vigor since 1991 and percent decadence has always been low in all readings. The young age class has been moderate in most years with 20% of the population being classified as such in 2003. Mahogany leaders had an average annual growth of 2.6 inches in June 2003. Cliffrose had an estimated density of 160 plants/acre in 1998, decreasing to 120 plants/acre in 2003. The cliffrose population has become increasingly decadent in 1998 and 2003 at 38% and 83% respectively. With no young plants sampled in any reading, this population looks to be slowly dying off. Serviceberry was not sampled in the density strips but was measured for average height and crown in 2003. Two less preferred species, prickly phlox and broom snakeweed, both showed large decreases in density between 1998 and 2003.

The herbaceous understory is diverse and moderately abundant. Bluebunch wheatgrass dominates the grass component providing 72% and 88% of the grass cover in 1998 and 2003 respectively. Sandberg bluegrass was the second most abundant grass in 2003. Cheatgrass, which was moderately abundant in 1998, significantly decreased in frequency in 2003. Cheatgrass occurs mostly on the south aspects. Forbs were very

abundant in 1998 with 20 species being sampled. However, composition was dominated by poor forage species including pale alyssum, rock goldenrod, and desert phlox. In 2003, 15 forb species were sampled although most showed a decline in frequency and cover values compared to 1998. There are few desirable forbs present, although penstemon, lobeleaf groundsel, and heartleaf twistflower receive some use from wildlife.

1985 APPARENT TREND ASSESSMENT

Soil erosion is ongoing and there appears to be heavy losses from some open spots in the past. Presently, there is a variety of desirable browse species, but the spreading oak brush, lack of young plants, and increasing unavailability due to height of the key species indicates a downward trend in terms of deer winter range.

1991 TREND ASSESSMENT

None of the basic cover measurements have changed significantly since 1985. Vegetative basal cover has decreased slightly, down to 6%. Rock/pavement cover has decreased from 30% to 27%. Litter cover has increased to 47%, while percent bare ground has increased slightly from 20% to 21%. Soil trend for the site is considered stable, but percent bare ground should be monitored closely. Key browse for the area is Gambel oak and true mountain mahogany. Because of its high density (7,932 plants/acre), oak is the most important browse. Oak has decreased by 5% since 1985, while percent decadency has increased to 17%. The more highly preferred browse, mahogany, is in such low numbers (266 plants/acre) that it would be utilized well before winter has set in. Trend for browse is stable. There are not many grass species on the site. The most abundant species is bluebunch wheatgrass with a quadrat frequency of 75%. Of the 13 species of forbs, only five have quadrat frequencies that exceed 10%. Surprisingly, the forbs demonstrated an increase in sum of nested frequency values. Trend for herbaceous understory is slightly improving.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly improving (4)

1998 TREND ASSESSMENT

Trend for soil is up with a major decline in cover of bare ground from 21% to 9%. Rock and pavement cover also increased as did litter cover. Erosion does not appear to be a serious problem on this site at this time. Trend for browse is stable. The preferred species, true mountain mahogany and cliffrose have small but stable populations. Mahogany displays light use and low decadence while cliffrose is moderately utilized. Gambel oak is the dominant browse on the site. Density has declined since 1991, but most of the change is due to the much larger sample size used in 1998. Density of mature plants has remained similar (1,866 vs 1,600) but the number of young has declined by fourfold (5,600 in 1991 to 1,400 in 1998). Utilization is light to moderate, vigor good, and percent decadence low at only 1%. Trend for the herbaceous understory is stable with similar sum of nested frequency values for perennial grasses and forbs compared to 1991. However, forb cover is dominated by poor value species including rock goldenrod, desert phlox, and pale alyssum.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is slightly down. Decreasing vegetation and litter cover values and the resultant increase in bare ground has resulted in less protective cover on the soil surface. The ratio of protective cover to bare soil is only one-half of what it was in 1998. Erosion remains within acceptable levels. Trend for browse is stable. Although less preferred, Gambel oak is the most abundant browse on the site remaining at a stable density in 2003. The Gambel oak population has good reproduction, low decadence, and shows light use. The more preferred species remain in limited densities. True mountain mahogany remains the most abundant of the preferred species with a density of 300 plants/acre. Use on mahogany was moderate to heavy in 2003, although mature individuals are beginning to grow out of the reach of browsing deer with an average height of over 6 feet. In 2003, mahogany vigor was normal and decadence low. Cliffrose density slightly declined in 2003 to 120 plants/acre. Due to low density, cliffrose showed heavy use in 2003 as browsing animals key on this species. Decadence increased to 83% in 2003 which is a definite negative sign. This population will likely decline in the future as no young plants have been sampled in any reading. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses and forbs decreased as group, but the most abundant perennial species, bluebunch wheatgrass, remained stable. Other positive signs were the increases in Sandberg bluegrass frequency and the significant decrease in cheatgrass. Forb abundance was much lower than in 1998. However, this is expected with drier conditions compared to 1998 and should improve with better precipitation. The decrease in forbs was not large enough to warrant a downward trend.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 6

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	169	207	198	180	8.30	10.81
G	Bromus japonicus (a)	-	-	14	-	.19	-
G	Bromus tectorum (a)	-	-	_b 175	_a 28	1.99	.13
G	Oryzopsis hymenoides	-	1	2	2	.38	.18
G	Poa bulbosa	-	-	-	7	-	.04
G	Poa fendleriana	-	-	-	-	.00	-
G	Poa secunda	_{ab} 33	_a 17	_{ab} 37	_b 67	.52	1.03
G	Sitanion hystrix	-	5	7	1	.06	.01
Total for Annual Grasses		0	0	189	28	2.18	0.12
Total for Perennial Grasses		202	230	244	257	9.28	12.09
Total for Grasses		202	230	433	285	11.47	12.22
F	Agoseris glauca	-	-	7	-	.01	-
F	Alyssum alyssoides (a)	-	-	_b 234	_a 3	1.81	.03
F	Arabis spp.	-	3	1	-	.01	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Astragalus spp.	a-	b22	b19	a2	.16	.00
F	Cirsium spp.	-	-	3	1	.06	.00
F	Collinsia parviflora (a)	-	-	-	3	-	.00
F	Cryptantha spp.	ab12	b14	ab6	a3	.08	.03
F	Descurainia pinnata (a)	-	-	24	11	.07	.08
F	Draba spp. (a)	-	-	3	-	.00	-
F	Erodium cicutarium (a)	-	-	1	-	.01	-
F	Galium multiflorum	a-	a-	b44	a10	.50	.18
F	Gilia spp. (a)	-	-	-	3	-	.00
F	Lactuca serriola	a-	ab1	b11	a-	.05	-
F	Linum lewisii	-	5	4	-	.06	-
F	Machaeranthera canescens	a3	b24	a-	a-	.00	-
F	Microsteris gracilis (a)	-	-	26	-	.12	-
F	Penstemon spp.	9	5	9	4	.05	.01
F	Petroradia pumila	bc110	c119	b70	a39	2.92	1.22
F	Phlox austromontana	a13	b53	ab40	a28	1.94	.64
F	Physaria chambersii	-	-	4	-	.03	-
F	Phlox longifolia	a-	a-	b22	b15	.14	.17
F	Ranunculus testiculatus (a)	-	-	8	-	.01	-
F	Senecio multilobatus	b10	a-	a-	a5	-	.01
F	Streptanthus cordatus	6	9	14	3	.21	.01
F	Tragopogon dubius	-	2	-	3	.00	.03
F	Unknown forb-perennial	-	2	-	-	-	-
Total for Annual Forbs		0	0	296	20	2.03	0.11
Total for Perennial Forbs		163	259	254	113	6.26	2.32
Total for Forbs		163	259	550	133	8.29	2.44

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

BROWSE TRENDS --

Management unit 21 , Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	0	0	-	.38
B	Artemisia tridentata vaseyana	8	3	1.05	.03
B	Cercocarpus montanus	11	9	3.50	3.92
B	Cowania mexicana stansburiana	8	6	1.56	1.09
B	Gutierrezia sarothrae	23	11	1.33	.10
B	Juniperus osteosperma	8	12	6.07	3.24
B	Leptodactylon pungens	19	7	1.27	.21
B	Quercus gambelii	24	25	8.83	6.56
Total for Browse		101	73	23.63	15.53

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 6

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	.21
Cercocarpus montanus	.40	6.06
Cowania mexicana stansburiana	-	1.64
Gutierrezia sarothrae	-	.51
Juniperus osteosperma	10.60	8.33
Leptodactylon pungens	-	.01
Quercus gambelii	6.00	11.98

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 6

Species	Average leader growth (in)
	'03
Cercocarpus montanus	2.6
Cowania mexicana stansburiana	2.0

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 6

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	121	132

Average diameter (in)	
'98	'03
6.9	5.8

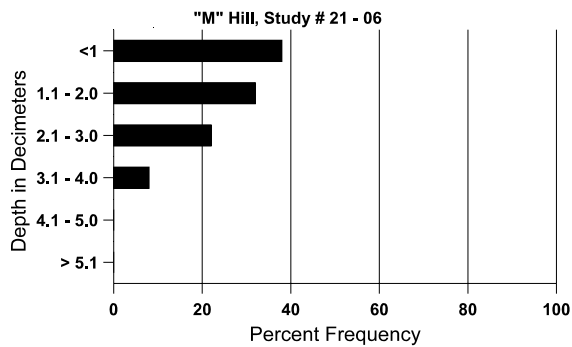
BASIC COVER --
Management unit 21 , Study no: 6

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	7.75	6.00	41.14	27.70
Rock	13.50	14.00	11.11	12.27
Pavement	15.75	12.75	22.61	9.53
Litter	43.50	46.75	53.05	46.26
Cryptogams	0	0	.10	.27
Bare Ground	19.50	20.50	9.09	18.38

SOIL ANALYSIS DATA --
Management unit 21, Study no: 6, Study Name: "M" Hill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.9	65.2 (15.4)	6.9	51.2	27.4	21.3	4.0	8.4	89.6	0.7

Stoniness Index



PELLET GROUP DATA --
 Management unit 21 , Study no: 6

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	16	15	-	-
Elk	3	1	4 (10)	7 (17)
Deer	16	24	23 (57)	50 (122)
Cattle	-	-	6 (15)	-

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	96/104
Artemisia tridentata vaseyana											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	220	-	-	180	40	60	9	0	18	0	31/38
03	80	-	-	60	20	-	0	0	25	0	25/39
Cercocarpus montanus											
85	266	66	66	200	-	-	25	0	0	25	69/35
91	266	-	66	200	-	-	75	0	0	0	87/70
98	260	80	140	100	20	-	0	0	8	0	56/55
03	300	-	60	220	20	20	27	27	7	0	77/89
Chrysothamnus nauseosus hololeucus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	12/15
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Cowania mexicana stansburiana</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	160	20	-	100	60	40	75	0	38	0	53/48
03	120	-	-	20	100	20	17	83	83	17	66/71
<i>Gutierrezia sarothrae</i>											
85	66	-	-	-	66	-	0	0	100	0	-/-
91	266	-	66	200	-	-	0	0	0	0	12/10
98	1740	80	220	1520	-	-	0	0	0	0	11/11
03	400	-	-	380	20	420	0	0	5	5	9/12
<i>Juniperus osteosperma</i>											
85	133	66	-	133	-	-	0	0	0	0	69/71
91	133	66	-	133	-	-	0	0	0	0	157/197
98	160	-	40	100	20	80	0	0	13	0	-/-
03	260	20	100	160	-	-	0	0	0	0	-/-
<i>Leptodactylon pungens</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	466	-	-	466	-	-	0	0	0	0	8/10
98	3400	20	280	2700	420	20	0	0	12	0	2/6
03	380	-	20	320	40	120	0	0	11	11	2/6
<i>Opuntia spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	7/15
03	0	-	-	-	-	-	0	0	-	0	6/20
<i>Quercus gambelii</i>											
85	8332	3800	5266	3066	-	-	0	0	0	0	35/17
91	7932	400	5600	1866	466	-	13	0	6	4	60/33
98	3020	60	1400	1600	20	660	19	0	1	0	51/41
03	3080	100	1160	1600	320	320	0	0	10	6	39/30

Trend Study 21-7-03

Study site name: Bennett Field.

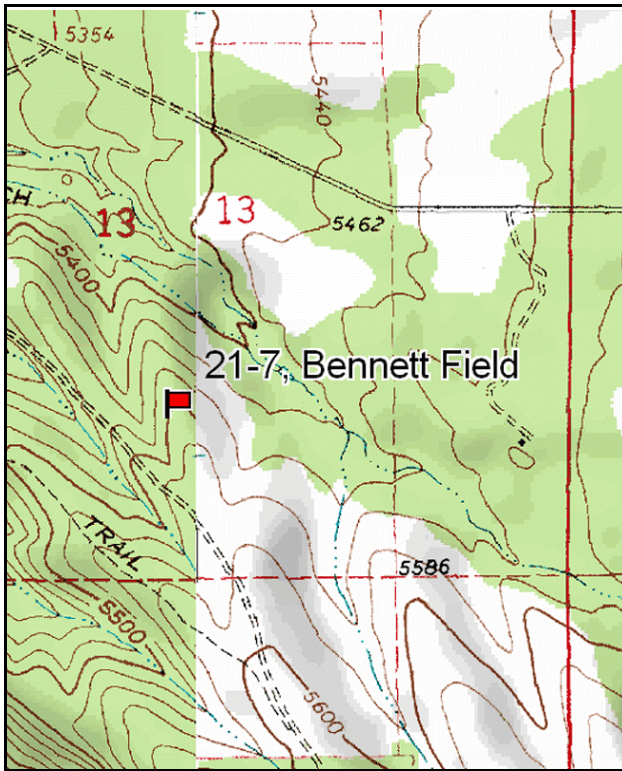
Vegetation type: Cliffrose chaining.

Compass bearing: frequency baseline 170 degrees magnetic.

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

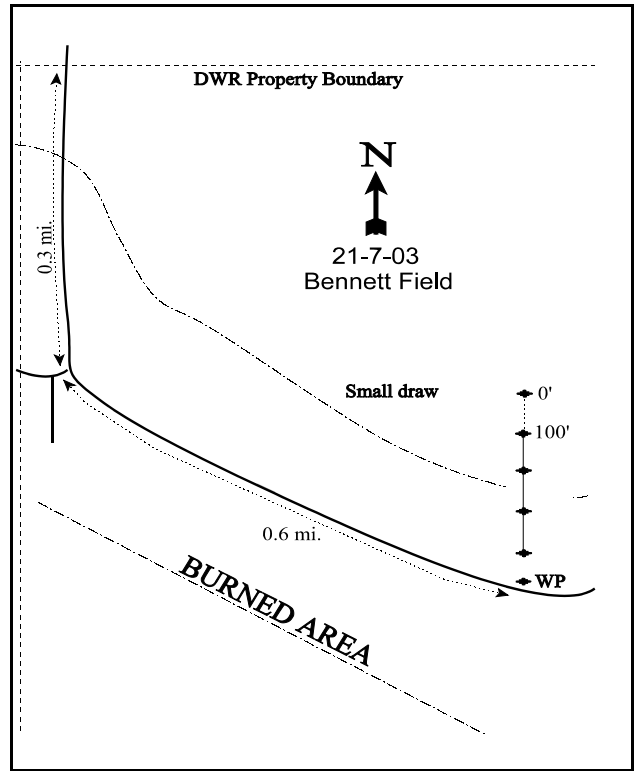
LOCATION DESCRIPTION

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

Township 20S, Range 4W, Section 13



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4325075 N, 391798 E

DISCUSSION

Bennett Field - Trend Study No 21-7

The Bennett Field study is located on Division land two miles southeast of Holden. The study is located on a moderate slope (10%) that drains to the west-southwest at an elevation of 5,500 feet. The area was chained in 1958 and is now dominated by basin big sagebrush, cliffrose, and scattered juniper. Much of the land to the south and west was burned by a wildfire. Cheatgrass was noted as becoming more dominant in the understory following the fire. Livestock grazing was heavy in the past, but forage for livestock is quite limited at present except for cheatgrass in the spring. This site receives heavy deer use in the winter and spring. Deer pellet groups are dense and literally cover the ground around the cliffrose plants. Pellet group transect data taken in 1998 and 2003 estimated deer use at 131 days use/acre (324 ddu/ha) and 162 days use/acre (400 ddu/ha) respectively. A few elk pellet groups were encountered in 1998, but there were no signs of cattle use on the site in either 1998 or 2003. A thick stand of juniper one-quarter mile to the northeast provides escape and thermal cover. On the site, point quarter data estimated juniper density at less than 25 trees/acre in both 1998 and 2003.

Soil on the site is moderately shallow with an effective rooting depth estimated at just over 10 inches. Due to the presence of basin big sagebrush, a deep rooted species, effective rooting depth estimates are most likely underestimated because of rock and a hardpan within the profile. It was reported in 1985 that a hard pan was present about 1½ feet from the surface. Although this layer obstructed soil penetrometer readings, it is not a barrier to rooting for sagebrush and cliffrose. Erosion is negligible due to the soil surface being nearly completely covered with herbaceous vegetation and litter. In 2003, the biggest changes for soils was a decrease in litter cover and corresponding increase in bare ground. Soils were given a stable rating from an erosion condition class assessment in 2003.

The browse component consists primarily of Stansbury cliffrose and Utah juniper in the overstory and a moderately dense stand of basin big sagebrush in the understory. Sagebrush density was estimated at around 3,000 plants/acre in 1985 and 1991, but closer to 2,000 plants/acre in 1998 and 2003. The change in density is partly due to the much larger sample size used after 1992. For the most part, sagebrush has been vigorous and has shown light to moderate use in all years. Individual sagebrush plants adjacent to cliffrose have sustained the heaviest use. Sagebrush reproduction has been low in all samples with very few young sagebrush and no seedlings being encountered. Percent decadence has slowly increased with each sampling to a high of 44% in 2003. In addition, nearly one-half of the decadent age class was classified as dying in 2003, which equates to 360 plants/acre. Annual sagebrush annual leaders averaged just over 2 inches of growth when the site was read in May 2003. Cliffrose is definitely the preferred forage species on this site. Most of the cliffrose on the site are tall, tree-like forms that have been highlined and are mostly unavailable to browsing animals. Any available branches are heavily utilized by wintering deer. Utilization was classified as extremely heavy in 1985 and 2003, but much lighter in 1991 and 1998. In 1985, grasshoppers did a lot of damage to the new growth on the cliffrose, completely stripping the twigs of leaves. Stickyleaf low rabbitbrush and broom snakeweed, both less desirable increasers, occurred in low densities in 2003.

The invasive cheatgrass is the predominant species in the understory. It maintained the highest nested frequency and average cover values of any herbaceous species in 1998 and 2003. Perennial herbaceous vegetation, both grasses and forbs, is limited. Sandberg bluegrass is the most abundant perennial grass but as the plants are very small, forage value is low. This species did increase in nested frequency and average cover in 2003. The forb component consists almost entirely of two annual species, pale alyssum and storksbill, which provided 93% of the total forb cover in both 1998 and 2003. No perennial forbs were sampled in 1985, although they remain in low abundance, few have been encountered since. Sum of nested frequency for perennial forbs has slowly increased since 1985 with sego lily, desert parsley, and longleaf phlox being the

most abundant species sampled in 2003. Grasshopper damage on the grasses was very heavy in 1985.

1985 APPARENT TREND ASSESSMENT

The soil is moderately deep and has a low water holding capacity because of its coarseness, but erosion is minimal. Soil is building under the junipers and other browse species. Overall, the soil trend appears stable. Vegetative trend appears to be declining. Basin big sagebrush is vigorous, but there is little reproduction. The cliffrose has sustained heavy hedging and insect damage. It is largely unavailable due to height and reproduction is low. Forage production by herbaceous species is negligible. The absence of productive grasses and forbs and the declining productivity of the browse species makes this site a leading candidate for revegetation work in the future.

1991 TREND ASSESSMENT

Basic cover characteristics have changed, but not all changes are improvements. Basal vegetative cover decreased substantially from 6% down to only about 2%. Rock and pavement cover decreased from 15% to 11%. Percent litter has increased from 62% to 74%, mostly from cheatgrass. Percent bare ground has decreased to 10%. Even though vegetative cover has decreased, this is more than compensated for by increases in litter cover and decreases in percent bare ground. Trend for soil is stable at this time, but a wildfire could change this dramatically in a very short time because of the high amounts of cheatgrass in the community. Browse trend would be considered slightly downward because both the sagebrush and cliffrose populations decreased through this period with accompanying increases in percent decadence. Broom snakeweed density has increased by 68% since 1985. There are not many species found in the understory and only two perennial grass species, bluebunch wheatgrass and Sandberg bluegrass, were encountered. Sandberg bluegrass is the only common species (91% quadrat frequency). Bluebunch wheatgrass was not found on this site until 1991. This situation has been noted in many other communities with bluebunch wheatgrass increasing on many sites during this extended drought. There were no perennial forbs sampled in 1985, but now there are six species on the site. Trend for herbaceous understory is slightly improving, but remains in poor condition because of the dominance of annuals, especially cheatgrass.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly improving (4)

1998 TREND ASSESSMENT

Trend for soil is stable. Percent cover for bare ground has declined from 10% to 6%, but litter cover has also decreased from 74% to 70%. Trend for browse is down slightly. Basin big sagebrush shows a steady increase in decadence and a lack of adequate reproduction. In addition, dead sagebrush which were first counted in 1998, are abundant at 660 plants/acre, or 25% are dead. The cliffrose is more stable but recruitment is limited and mature plants are becoming increasingly less available to browsing due to height. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses and forbs. Nested frequency of Sandberg bluegrass declined significantly. Cheatgrass and pale alyssum dominate the understory by providing 88% of the herbaceous cover. Perennial forbs are rare.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - down slightly (2)

2003 TREND ASSESSMENT

Trend for soil is stable. Although bare ground increased and litter cover decreased, the ratio of protective cover to bare soil remained almost the same. Vegetation cover remained stable while cryptogams increased in 2003. Perennial grasses and forbs showed increased nested frequency values which is important as herbaceous vegetation is a key factor to soil stability. Trend for browse is slightly down. The key species, basin big sagebrush and cliffrose, both show declines in density and increases for those classified as exhibiting poor vigor and higher decadence. Reproduction for both species is very low. These negative characteristics in the key browse populations are in large part due to drier conditions compared to 1998. Sustained use of these shrubs by wildlife may also be a causative factor for declining health of these populations. The herbaceous understory trend is slightly up. Even with below normal spring precipitation in the Fillmore area in 2003, nested frequency values of several perennial species significantly increased, most notably Sandberg bluegrass. Bulbous bluegrass, a low value perennial, also significantly increased. The forb component remains dominated by annuals, primarily pale alyssum and storksbill. However, the frequency of several perennials increased in 2003 including sego lily, desert parsley, and longleaf phlox.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 7

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	a-	b17	c39	bc34	.96	1.79
G	Bromus japonicus (a)	-	-	3	-	.00	-
G	Bromus tectorum (a)	-	-	b321	a305	27.62	13.06
G	Poa bulbosa	a-	a-	a4	b81	.04	2.94
G	Poa secunda	b241	b251	a165	b264	3.45	7.94
G	Secale cereale (a)	-	-	2	-	.00	-
G	Sitanion hystrix	-	-	9	-	.09	-
Total for Annual Grasses		0	0	326	305	27.63	13.06
Total for Perennial Grasses		241	268	217	379	4.55	12.67
Total for Grasses		241	268	543	684	32.19	25.73
F	Alyssum alyssoides (a)	-	-	b341	a305	12.89	8.22
F	Allium spp.	-	-	4	6	.15	.06
F	Astragalus spp.	-	-	-	-	-	.00
F	Calochortus nuttallii	a-	b17	a-	b18	-	.06
F	Castilleja spp.	-	-	2	-	.03	-
F	Cirsium spp.	-	2	-	2	-	.00
F	Collinsia parviflora (a)	-	-	a-	b9	-	.02

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Crepis acuminata</i>	-	3	-	2	-	.03
F	<i>Erodium cicutarium</i> (a)	-	-	_a 51	_b 121	.13	3.77
F	<i>Galium</i> spp.	-	-	-	3	-	.03
F	<i>Holosteum umbellatum</i> (a)	-	-	-	8	-	.01
F	<i>Lactuca serriola</i>	-	-	2	-	.00	-
F	<i>Linum lewisii</i>	-	1	6	3	.10	.00
F	<i>Lomatium</i> spp.	_a -	_a 5	_a -	_b 27	-	.16
F	<i>Petradoria pumila</i>	-	-	4	3	.41	.15
F	<i>Phlox longifolia</i>	_a -	_b 13	_a 1	_b 11	.01	.08
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	73	-	.21
F	<i>Tragopogon dubius</i>	-	-	6	4	.21	.00
F	<i>Zigadenus paniculatus</i>	-	-	-	4	-	.01
Total for Annual Forbs		0	0	392	516	13.02	12.25
Total for Perennial Forbs		0	41	25	83	0.91	0.60
Total for Forbs		0	41	417	599	13.93	12.85

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

BROWSE TRENDS --

Management unit 21 , Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia tridentata tridentata</i>	71	63	10.39	15.50
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1	0	-	-
B	<i>Cowania mexicana stansburiana</i>	14	16	4.11	2.66
B	<i>Gutierrezia sarothrae</i>	32	8	.81	.09
B	<i>Juniperus osteosperma</i>	2	1	.15	.68
Total for Browse		120	88	15.47	18.93

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 7

Species	Percent Cover	
	'98	'03
Artemisia tridentata tridentata	-	17.35
Cowania mexicana stansburiana	3.20	10.00
Juniperus osteosperma	1.00	1.78

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 7

Species	Average leader growth (in)
	'03
Artemisia tridentata tridentata	2.2

POINT-QUARTER TREE DATA --

Management unit 21 , Study no: 7

Species	Trees per Acre	
	'98	'03
Cowania mexicana stansburiana	N/A	169
Juniperus osteosperma	24	17

Average diameter (in)	
'98	'03
N/A	8.7
3.5	7.2

BASIC COVER --

Management unit 21 , Study no: 7

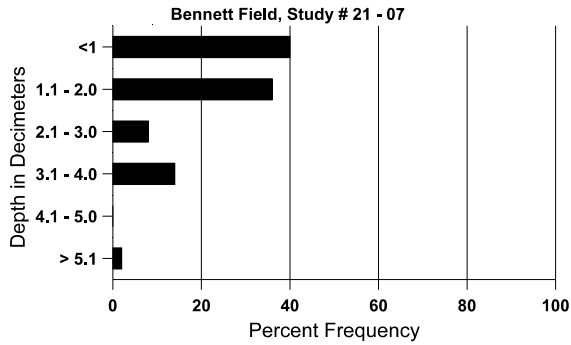
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	6.00	2.25	54.45	54.18
Rock	2.50	4.25	2.92	3.19
Pavement	11.75	7.25	5.23	1.27
Litter	62.00	74.25	70.33	39.44
Cryptogams	0	2.25	2.04	5.81
Bare Ground	17.75	9.75	5.70	14.69

SOIL ANALYSIS DATA --

Management unit 21, Study no: 7, Study Name: Bennett Field

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.6	56.4 (11.4)	6.9	48.7	27.7	23.6	3.2	7.5	140.8	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 7

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	20	16	-	-
Elk	1	2	2 (5)	-
Deer	57	55	131 (324)	162 (400)
Cattle	3	-	-	-

BROWSE CHARACTERISTICS --

Management unit 21 , Study no: 7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata tridentata											
85	3332	-	66	2533	733	-	44	4	22	2	33/32
91	2999	-	133	1933	933	-	33	2	31	9	28/27
98	1960	-	60	1100	800	660	26	3	41	12	35/42
03	1800	-	20	980	800	640	24	6	44	20	35/42
Chrysothamnus viscidiflorus viscidiflorus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	0	0	-	0	18/31
98	60	-	20	40	-	-	0	0	-	0	8/10
03	0	-	-	-	-	-	0	0	-	0	13/16

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Cowania mexicana stansburiana</i>											
85	466	-	-	200	266	-	14	86	57	29	60/46
91	399	66	-	133	266	-	0	17	67	0	26/21
98	480	20	60	360	60	40	21	0	13	0	77/69
03	360	-	-	200	160	100	11	67	44	17	84/72
<i>Gutierrezia sarothrae</i>											
85	533	-	-	133	400	-	0	0	75	0	9/7
91	1666	-	333	1333	-	-	0	0	0	0	10/9
98	1080	40	240	820	20	20	0	0	2	2	10/10
03	220	-	20	180	20	180	0	0	9	9	5/6
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	40	-	-	20	20	-	0	0	50	0	-/-
03	20	-	-	-	20	-	0	0	100	100	-/-

Trend Study 21-8-03

Study site name: Smiths Ridge.

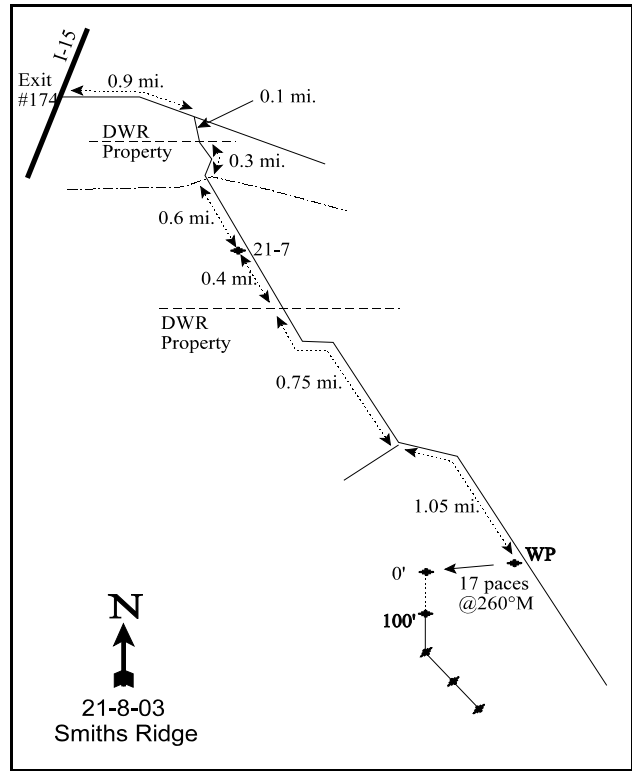
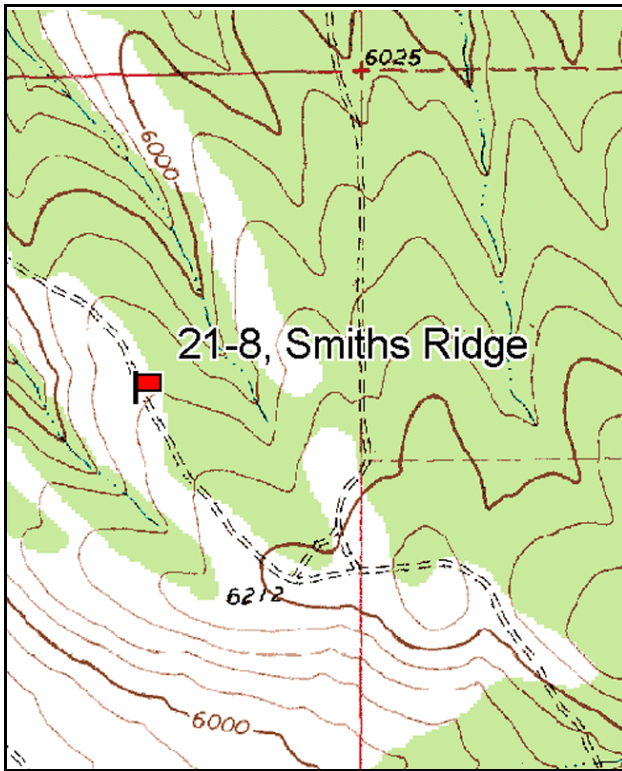
Vegetation type: Mtn. Brush Burn.

Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From 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 27, UTM 12S 4322425 N, 393869 E

DISCUSSION

Smiths Ridge - Trend Study No. 21-8

This study is located on the foothills of the Pahvant Range. The site slopes gently (8-10%) to the west at an elevation of 6,100 feet. This area is part of the extensive chainings completed by the Division in the late 1950's and early 1960's. A large area surrounding the site also burned in August of 2000 as part of the Swain fire. The burned areas were later seeded and chained, although most of the transect itself was not chained. The chaining treatment went around patches of unburned juniper trees that happened to be in the immediate vicinity of the transect. Most of the sampling belts were within the burned area. In the past, herbaceous vegetation was often depleted by heavy early season cattle grazing. AUMs were reduced from 143 in 1977 to 124 in 1984. Livestock use on the site was minimal in both 1998 and 2003, although winter deer use has been moderate in both years. The DWR Upper Smith pellet transect, which is located nearby, showed a fairly consistent trend with an average of 63 deer days use/acre (156 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Between 1986 and 1991, average deer days use/acre decreased to 43 (106 ddu/ha) (Jense et al 1991). Pellet group data taken on the study site in 1998 estimated 70 deer and 28 elk days use/acre (173 ddu/ha and 69 edu/ha). In 2003, deer use was estimated at 90 days use/acre (222 ddu/ha) while elk use was estimated at only 12 days use/acre (30 edu/ha) on the site.

Soil on the site is relatively shallow with an estimated effective rooting depth of only 9 inches. Soils are sandy loam in texture and have a moderately acidic pH (5.7). The soil is very rocky throughout the profile. Prior to the fire, the shrub interspaces contained areas of exposed rock and soil. Following the fire, litter cover decreased, while bare ground increased. Due to the rocky nature of the soil, combined with the high sand content and west aspect, the average soil temperature was relatively high at 74°F in 1998. Dry, hot soils give a competitive advantage to winter annuals like cheatgrass and pale alyssum which start growing earlier in the spring than cool season perennial species. Due to gentle terrain and sandy soils which have high infiltration rates, erosion has been minimal on this site both before and after the fire in 2000. Soils were given a stable rating from an erosion condition class assessment in 2003.

Prior to the burn in 2000, the key browse species included mountain big sagebrush, bitterbrush, and cliffrose. Sagebrush density numbered about 2,000 plants/acre in 1998, with moderate recruitment by the young age class (14%) and low decadence. The cliffrose and bitterbrush were reported to be hybridizing in 1985 which is commonly observed in the Holden area. In 1998, the bitterbrush and cliffrose populations had estimated population densities 600 and 220 plants/acre respectively. Both species displayed normal vigor and moderate to heavy use. The cliffrose population also had a moderate number of young (18%). Prior to the Swain fire, the key species had stable to slightly increasing populations that overall appeared to be healthy and vigorous. Following the burn, the browse component is quite different. Mountain big sagebrush density decreased to 1,440 plants/acre in 2003. The compositional structure of the population is quite different from the pre-burn one. In 2003, young plants made up 61% of the population, decadence was low (8%), and vigor mostly normal. The high number of young sagebrush is mostly due to the fire rehabilitation which included chaining and seeding of the area. Big sagebrush was one of the species that was seeded onto the site. Use on sagebrush remained mostly light to moderate as in previous years. Even with a population decline due to the burn, big sagebrush on the site is healthy and the population should increase with the high recruitment. Bitterbrush and cliffrose were both negatively impacted by the burn. Both species have post-burn densities estimated at 60 plants/acre, while use on both remains moderate to heavy. There were no young plants sampled for either species in 2003, but vigor was normal for both.

Other notable changes in the browse community following the burn is the abundance of prostrate kochia in 2003. This species was seeded following the fire and doing very well on the site at an estimated 4,020 plants/acre in 2003. Nearly one-half (46%) of the population consists of young plants so the population will

likely increase in the future if there are open sites to become established on. Kochia displayed normal vigor in 2003 and use was mostly moderate. Broom snakeweed was abundant before and after the burn on this site. Density was estimated at 3,160 plants/acre in 1998, and 2,740 plants/acre in 2003. This species does well with disturbance and has persisted on the site following the burn.

The herbaceous understory on the immediate transect shows little change before and after the burn. As discussed above, most of the area immediately surrounding and including the transect was not chained so few seeded perennials became established on the site in 2003. Perennial grasses include Sandberg bluegrass, bluebunch wheatgrass, bottlebrush squirreltail, and bulbous bluegrass. Bulbous bluegrass is a low value perennial and was the only species that showed a significant increase in 2003. Perennial grasses were noted as being heavily utilized by cattle in the past. Cheatgrass decreased in nested frequency between 1998 and 2003, but remained the most abundant species in both frequency and average cover in 2003. The forb component has been sparse in all years. Storksbill, an annual, was the most abundant forb in 2003. Several seeded forbs were sampled on the site but in low numbers. These included alfalfa, Lewis flax, northern sweetvetch, and small burnet. However, these species were noted as being more abundant in the surrounding areas that were chained.

1985 APPARENT TREND ASSESSMENT

In spite of poor vegetative cover, the soil appears to have minimal erosion and is basically stable. Because of the low density of plants and because few were sampled, it is difficult to assess trend for browse from the data. However, the site appears stable at present but is leaning toward a downward trend unless reproduction of the browse species improves. Browsing pressure from big game is moderate and sustainable, but a deferment or rest from cattle grazing would be very beneficial to the site. It is good winter range, with adequate browse and cover, but it has a definite lack of herbaceous vegetation for spring green-up and erosion control.

1991 TREND ASSESSMENT

Basic cover features have shown positive improvements since 1985. Basal vegetative cover has gone from a low of 1% up to 5%. Rock-pavement cover has remained about the same at 10% with litter cover increasing to 75%. Percent bare ground is half what it was in 1985 (22% to 11%). Trend for soil is up. Key browse species in order of abundance are: mountain big sagebrush, antelope bitterbrush, and cliffrose. Mountain big sagebrush has actually increased in density with a decrease in number of decadent plants, while both cliffrose and bitterbrush demonstrated lower densities and increased rates of decadency. Trend for browse is slightly downward even with the increases for sagebrush. The herbaceous understory is mostly made up of grass species. Bluebunch wheatgrass has gone from 10% to 24% quadrat frequency. Sandberg bluegrass and bottlebrush squirreltail also demonstrated increases in their quadrat frequencies. There are few perennial forb species and all occur infrequently. Trend for the herbaceous understory is slightly improving.

TREND ASSESSMENT

soil - up (5)

browse - slightly downward (2)

herbaceous understory - slightly improving (4)

1998 TREND ASSESSMENT

Trend for soil is stable. Percent bare ground has remained similar to 1991 estimates. Litter cover shows a significant decline, but this appears to be due to dried up cheatgrass being classified as litter instead of vegetation in 1991. Erosion is not a serious problem on the site. Overall, trend for browse is slightly up.

Mountain big sagebrush is receiving heavier use, but vigor is normal on most plants and percent decadence declined from 30% in 1991 to 14% in 1998. Dead plants, first sampled in 1998, are numerous at 600 plants/acre and it appears that the reduction in decadence is due to a die-off of decadent plants since 1985. Recruitment is currently good with enough young plants to replace decadent/dying plants. Bitterbrush are more heavily utilized in 1998, yet vigor has improved and percent decadence has declined from 50% to 0%. Cliffrose appears to have a relatively steady population with mostly moderate use and good vigor. Percent decadence has also declined from 50% in 1991 to 0% in 1998. Recruitment is currently adequate. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses. All perennial grasses found on the site increased in nested frequency since 1991. Cheatgrass is still abundant however, making up 51% of the grass cover. Forbs are still limited and consist mostly of annuals.

TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - slightly improving (4)

2003 TREND ASSESSMENT

Trend for soil is slightly down. Due to fire and drier conditions compared to 1998, litter cover drastically declined and percent bare soil increased. Although erosion was not severe in 2003, there were signs of litter and soil movement on the surface. Herbaceous vegetation cover remains high, although annual species provide a high proportion of it. Trend for browse is stable. Mountain big sagebrush remains the most abundant key browse following the burn. Although density declined from 2,040 plants/acre in 1998 to 1,440 plants/acre in 2003, the big sagebrush population is healthy and vigorous with low decadence and over half of the population consisting of young plants. Bitterbrush and cliffrose both declined in density in 2003 and neither population has any reproduction. Use on both species remains moderate to heavy, although vigor was normal. The current low densities of bitterbrush and cliffrose will likely result in these species being singled out by animals. Prostrate kochia, a species that was seeded throughout the area as part of fire rehabilitation efforts, has an estimated density of about 4,000 plants/acre in 2003. This species will likely increase in the future as young plants make up 46% of the population. It will spread into areas where cheatgrass is dominant. Kochia is a good forage source for wildlife as evidenced by the moderate use on this species in 2003. Trend for the herbaceous understory is stable, but composition is poor. Cheatgrass remains the dominant grass although it significantly declined in nested frequency. Storksbill, an annual, is the most abundant forb. Although the surrounding area was seeded and chained following the Swain fire, the transect itself was not chained so the presence of some seeded species is lower on the transect compared to surrounding areas. Northern sweetvetch, small burnet, and alfalfa were noted as being abundant in patches, although they were rarely sampled in the transect. Perennial grasses slightly declined in sum of nested frequency overall, but perennial forbs showed a slight increase.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 21 , Study no: 8

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron intermedium	-	-	-	6	-	.24
G	Agropyron spicatum	_a 21	_{ab} 61	_b 97	_{ab} 56	4.71	3.84
G	Bromus japonicus (a)	-	-	-	3	-	.60
G	Bromus tectorum (a)	-	-	_b 304	_a 262	9.32	11.38
G	Festuca ovina	-	-	-	2	-	.03
G	Poa bulbosa	_a -	_a 1	_a 14	_b 50	.48	2.43
G	Poa secunda	_a 72	_b 119	_b 138	_{ab} 105	2.62	1.77
G	Sitanion hystrix	_a 13	_a 23	_b 57	_b 59	1.20	1.81
Total for Annual Grasses		0	0	304	265	9.32	11.98
Total for Perennial Grasses		106	204	306	278	9.02	10.14
Total for Grasses		106	204	610	543	18.35	22.13
F	Achillea millefolium	-	-	-	3	-	.06
F	Agoseris glauca	_a -	_b 16	_a -	_{ab} 6	-	.04
F	Alyssum alyssoides (a)	-	-	_b 60	_a 1	.28	.00
F	Arabis spp.	-	9	7	-	.09	-
F	Astragalus spp.	-	-	3	-	.00	-
F	Calochortus nuttallii	-	4	2	1	.00	.00
F	Chaenactis douglasii	24	-	-	-	-	-
F	Cirsium spp.	-	-	-	-	-	.00
F	Erodium cicutarium (a)	-	-	_a 4	_b 163	.06	9.48
F	Hedysarum boreale	-	-	-	2	-	.03
F	Helianthus annuus (a)	-	-	-	1	-	.03
F	Lactuca serriola	-	9	-	3	-	.00
F	Linum lewisii	-	-	8	3	.04	.01
F	Lomatium spp.	_a -	_b 13	_a -	_b 14	-	.10
F	Medicago sativa	_a -	_a -	_a -	_b 15	-	1.37
F	Microsteris gracilis (a)	-	-	-	1	-	.00
F	Ranunculus testiculatus (a)	-	-	12	-	.04	-
F	Sanguisorba minor	-	-	-	3	-	.09
F	Tragopogon dubius	-	-	3	-	.00	-
F	Zigadenus paniculatus	4	2	-	-	-	.00
Total for Annual Forbs		0	0	76	166	0.39	9.52
Total for Perennial Forbs		28	53	23	50	0.14	1.74
Total for Forbs		28	53	99	216	0.54	11.26

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

BROWSE TRENDS --

Management unit 21 , Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia tridentata vaseyana</i>	55	38	6.17	1.01
B	<i>Chrysothamnus nauseosus hololeucus</i>	0	3	-	-
B	<i>Cowania mexicana stansburiana</i>	8	3	5.19	1.16
B	<i>Gutierrezia sarothrae</i>	41	41	1.73	1.54
B	<i>Juniperus osteosperma</i>	5	4	5.94	5.33
B	<i>Kochia prostrata</i>	0	45	-	2.04
B	<i>Opuntia spp.</i>	1	3	-	.03
B	<i>Purshia tridentata</i>	18	2	8.60	1.29
B	<i>Quercus gambelii</i>	0	1	.53	-
B	<i>Rhus glabra cismontana</i>	3	0	-	-
B	<i>Ribes spp.</i>	1	0	-	-
Total for Browse		132	140	28.19	12.42

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 8

Species	Percent Cover	
	'98	'03
<i>Artemisia tridentata vaseyana</i>	-	.83
<i>Cowania mexicana stansburiana</i>	.80	1.41
<i>Gutierrezia sarothrae</i>	-	3.21
<i>Juniperus osteosperma</i>	15.00	8.50
<i>Kochia prostrata</i>	-	1.83
<i>Opuntia spp.</i>	-	.01
<i>Purshia tridentata</i>	-	1.13
<i>Quercus gambelii</i>	-	.05

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 21 , Study no: 8

Species	Average leader growth (in)
	'03
Cowania mexicana stansburiana	2.6

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 8

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	46	26

Average diameter (in)	
'98	'03
6.9	12.3

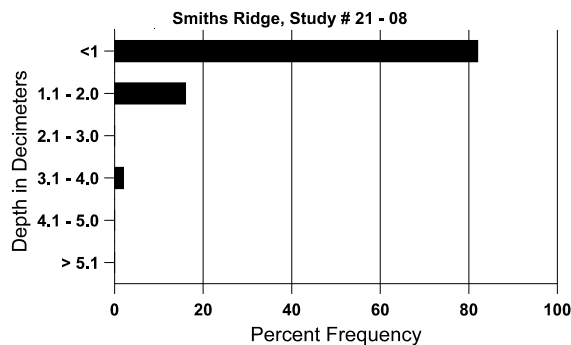
BASIC COVER --
Management unit 21 , Study no: 8

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	1.00	4.75	45.84	47.30
Rock	5.25	6.75	5.48	9.83
Pavement	5.25	3.00	7.62	6.87
Litter	66.75	74.50	52.99	35.81
Cryptogams	.25	0	4.07	.09
Bare Ground	21.50	11.00	11.92	17.36

SOIL ANALYSIS DATA --
Management unit 21, Study no: 8, Study Name: Smiths Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
8.9	66.2 (6.3)	5.7	62.0	19.4	18.6	3.5	12.0	76.8	0.4

Stoniness Index



PELLET GROUP DATA --
 Management unit 21 , Study no: 8

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	8	10	-	-
Elk	11	3	28 (69)	12 (30)
Deer	15	41	70 (173)	90 (222)
Cattle	-	3	-	2 (4)

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	1333	-	133	400	800	-	25	0	60	10	28/25
91	1532	266	600	466	466	-	13	4	30	13	16/17
98	2040	-	280	1480	280	600	48	.98	14	12	20/27
03	1440	40	880	440	120	60	31	8	8	3	14/18
<i>Chrysothamnus nauseosus hololeucus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	80	-	-	80	-	-	0	0	-	0	12/13
<i>Cowania mexicana stansburiana</i>											
85	332	-	-	266	66	-	80	0	20	0	68/81
91	266	133	-	133	133	-	75	0	50	0	142/53
98	220	-	40	180	-	20	64	0	0	0	56/106
03	60	-	-	40	20	-	67	33	33	0	57/94
<i>Gutierrezia sarothrae</i>											
85	2466	-	66	2000	400	-	0	0	16	30	13/12
91	2666	133	400	2266	-	-	0	0	0	0	12/11
98	3160	-	620	2540	-	-	0	0	0	0	10/13
03	2740	-	60	2520	160	-	3	0	6	5	10/12
<i>Juniperus osteosperma</i>											
85	133	-	-	133	-	-	0	0	-	0	69/109
91	133	-	-	133	-	-	0	0	-	0	144/111
98	100	20	-	100	-	20	0	0	-	0	-/-
03	80	-	-	80	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Kochia prostrata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	4020	100	1860	2160	-	-	57	2	-	0	9/14
Opuntia spp.											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	-	0	0	100	100	8/17
03	80	-	40	40	-	-	0	0	0	0	6/9
Purshia tridentata											
85	532	-	133	333	66	-	75	0	12	0	25/23
91	266	-	-	133	133	-	75	0	50	25	30/51
98	600	-	20	580	-	20	67	20	0	0	42/90
03	60	-	-	60	-	-	67	33	0	0	46/88
Quercus gambelii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	83/69
03	20	-	-	20	-	-	0	0	-	0	16/12
Rhus glabra cismontana											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	60	-	-	-	60	-	100	0	100	67	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Ribes spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	200	-	-	200	-	-	0	0	-	0	11/14
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 21-9-03

Study site name: Wide Canyon BLM.

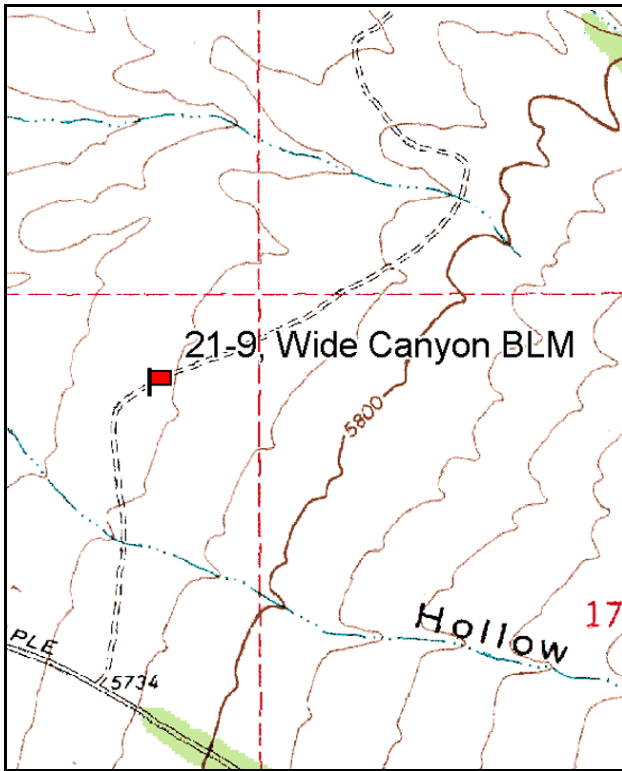
Vegetation type: Cliffrose Chaining.

Compass bearing: frequency baseline 180 degrees magnetic.

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

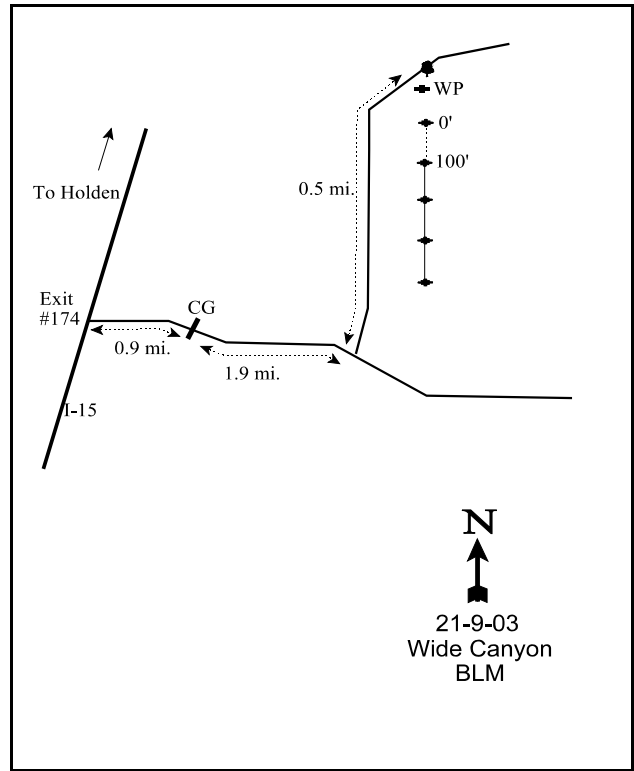
LOCATION DESCRIPTION

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

Township 20S, Range 3W, Section 18



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4326073 N, 394091 E

DISCUSSION

Wide Canyon BLM - Trend Study No. 21-9

This study samples important deer winter range managed by the BLM in the Maple Hollow and Wide Canyon area. The study slopes slightly (2-5%) to the west at an elevation of 5,700 feet. An extensive area of this relatively flat bench was chained in the 1960's and is now dominated by Wyoming big sagebrush and Stansbury cliffrose. Wildlife use, primarily by wintering mule deer, has been moderate to heavy over the years. An old DWR pellet group transect near this site estimated 87 deer days use/acre (215 ddu/ha) from 1981-85 (Jense et al. 1985). Between 1986 and 1991, deer use increased to 95 days use/acre (235 ddu/ha) (Jense et al 1991). A pellet group transect read along the study site baseline estimated 155 deer days use/acre (383 ddu/ha) in 1998 and 167 deer days use/acre (413 ddu/ha) in 2003. Cattle use has been light at an estimated 12 cow days use/acre (30 cdu/ha) in 1998 and 2 cow days use/acre (5 cdu/ha) in 2003. Cattle pats in both years were from the previous grazing season. Although not documented in the pellet group transect in 1998 or 2003, livestock use appeared very heavy on this BLM land when compared to Division land during earlier readings.

Soils on the site are very rocky, sandy, and shallow. There appears to be a hardpan at a depth of about 12 inches. Effective rooting depth was estimated at only about 6 inches. The hardpan is likely not a rooting barrier due to the presence of deeper rooted shrubs like cliffrose. Soils are sandy loam in texture and have a neutral pH (6.9). Soil temperature was extremely high in 1998 averaging 89.6°F at a depth of almost 7 inches. Average temperature was much lower in 2003 at 55.2°F. The difference in soil temperature between years is primarily due to the time of sampling and soil moisture. This study was read earlier in the season in 2003 compared to 1998. Soil moisture would be much higher earlier in the season on this lower elevation site with shallow, rocky soils resulting in lower soil temperatures. In 1985 and 1991, a good amount of litter was found under the vegetation. However, soil cover was disjointed between shrubs resulting in 24% and 32% of the surface being bare soil in 1985 and 1991. Bare ground cover was lower in 1998 and 2003 primarily due to increased cheatgrass cover in the shrub interspaces. Several years of below normal spring precipitation in the Fillmore area also resulted in less litter cover on this site in 2003. Soil movement has occurred on trails and shrub interspaces, but is minimized because of the level terrain. An erosion condition class assessment gave soils a stable rating in 2003.

The key browse species are Wyoming big sagebrush and Stansbury cliffrose. Sagebrush is the most abundant shrub with an estimated density of 2,400 plants/acre in 1998 and 1,900 plants/acre in 2003. The population decline in 2003 was due to the decrease in the number of young plants. Young plants were abundant in 1998 (620 plants/acre) but few in 2003 (60 plants/acre). Big sagebrush displayed light to moderate use from 1985-1998, with utilization increasing to a moderate-heavy level in 2003. Percent decadence remained about the same in 1998 and 2003. Vigor has been mostly normal throughout the population during all readings. Annual sagebrush leaders averaged 2 inches of growth when the site was read in May 2003.

Cliffrose is important on this site because of its preference displayed by deer. However, it only contributed to 30% of the browse cover in 2003. Cliffrose displayed light to moderate hedging from 1985-1998, with heavy use increasing to 50% in 2003. The cliffrose are vigorous and healthy with no decadent plants being sampled since 1991. Density estimates were much lower in 1998 and 2003 compared to the first 2 readings due to the larger, more representative sample used post-1992. Young recruitment of cliffrose was good in 1985 with 20% of the population consisting of young plants. However, no young were sampled in either 1998 or 2003. The cliffrose population is starting to become unavailable to animals as mature plants average almost 7 feet in height. Cliffrose had moderate flowering in 2003. Low reproduction in the Wyoming big sagebrush and cliffrose populations is not surprising due to the abundance of cheatgrass in 1998 and 2003. Drier than normal spring precipitation in the Fillmore area for several years preceding the 2003 reading is also a

contributing factor.

Juniper density was estimated at 22 trees/acre in 2003. Juniper does not seem to be increasing on the site as 1998 density estimates were slightly higher. Juniper overhead canopy cover averaged 6% in 1998 and 2003. Broom snakeweed was very abundant in 1998, but the population decreased by 96% in 2003 with the drier conditions.

The herbaceous understory is in poor condition with weedy annuals being the dominant forms. The frequency of perennial grasses is low and perennial forbs are almost nonexistent. Sandberg bluegrass has been the only abundant perennial species in any year. Sandberg bluegrass showed significant increases in nested frequency and average cover in 2003 which is a positive sign. Cheatgrass was the dominant species in both 1998 and 2003. Storksbill, an annual forb, was also abundant in 2003. Cheatgrass showed a significant decline in nested frequency in 2003, but it increased in average cover and was still sampled in 98% of the quadrats. With the exception of Sandberg bluegrass, most of the herbaceous perennial plants on this site occur under the protection of shrubs. During past readings, most of the grasses appeared to have been heavily utilized and vigor was very poor except for those individuals under the protection of sagebrush crowns.

1985 APPARENT TREND ASSESSMENT

Soil trend appears essentially stable with low levels of erosion. Vegetative trend appears stable to declining as the key species compete with increasers. As far as deer winter range is concerned, the site provides good browse. However, herbaceous vegetation is severely depleted. An increase in perennial grasses and forbs would be desirable in terms of ground cover and soil protection, as well as diversity and total production of forage for livestock use. It probably will not improve significantly without reductions in grazing and/or seeding.

1991 TREND ASSESSMENT

Basic cover features have experienced two major downward trends: a decrease in litter cover and an increase in percent bare ground. Vegetative basal cover remains low and basically unchanged at 2%. These changes can most likely be attributed to the extended drought we have been experiencing since 1985. Trend for soil is slightly down. The key browse species, Wyoming big sagebrush and cliffrose show a stable trend with the exception of poor recruitment for cliffrose, which is not as critical because of its characteristics of a long life. Broom snakeweed is increasing. The trend for browse is stable. The herbaceous understory trend is stable, but still in poor condition because of poor species diversity and abundance of the annuals, cheatgrass and bur buttercup.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up with a decline in percent bare ground from 32% to 9%. The negative aspect to the decline in bare soil is that it results from an increase in cheatgrass cover. Litter cover has remained at similar levels while rock/pavement cover have doubled from 6% to 12%. Erosion is not currently a problem. Trend for browse is mixed. Wyoming big sagebrush appears to have a slightly upward trend due to improved recruitment, good vigor, light to moderate use, and relatively low decadence. Stansbury cliffrose appears to have a slightly downward trend due to the increasing height of mature plants and lack of recruitment. Due to

the lack of large numbers of dead plants, the dramatic change in density since 1991 (865 plants/acre to 180) is mostly due to the much larger sample used in 1998 which better estimates shrub populations. Trend for browse is considered stable since sagebrush provides 45% of the browse cover (73% of the preferred browse) on the site and cliffrose only 17%. Trend for the herbaceous understory is stable but remains in very poor condition. Cheatgrass and annual forbs dominate the site by providing 85% of the total herbaceous cover. Perennial grasses are depleted and growing mostly within the protection of shrub crowns.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable even with a large decrease in litter cover. Vegetation cover increased and bare soil only slightly increased with the large reduction of litter cover. Soils show little evidence of erosion. Trend for browse is slightly down. Wyoming big sagebrush decreased in density due to the loss of most of the young age class from the population in 2003. Vigor remains normal for most of the population and percent decadence is stable. Use on big sagebrush increased to a heavier level compared to 1998. Cliffrose density remains stable, but low. Use on cliffrose increased in 2003, but vigor is normal throughout the population and no decadent plants were sampled. The abundance of highly competitive annuals in the understory will make reproduction of sagebrush and cliffrose difficult in the future. Trend for the herbaceous understory is stable, although composition remains weedy and annuals are dominant, primarily cheatgrass. Sandberg bluegrass significantly increased in nested frequency in 2003, but crested wheatgrass and bottlebrush squirreltail both significantly declined. Perennial forbs remain sparse.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 9

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	ab19	b36	ab24	a8	.90	.26
G	Bromus tectorum (a)	-	-	b370	a329	15.22	19.06
G	Carex spp.	-	-	-	3	-	.15
G	Poa bulbosa	a-	a-	a3	b29	.00	.83
G	Poa secunda	a130	a114	a102	b198	1.32	7.09
G	Sitanion hystrix	b11	bc15	c34	a-	.39	-
Total for Annual Grasses		0	0	370	329	15.22	19.06
Total for Perennial Grasses		160	165	163	238	2.63	8.34
Total for Grasses		160	165	533	567	17.85	27.40

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Agoseris glauca	-	8	-	5	-	.03
F	Alyssum alyssoides (a)	-	-	-	5	-	.18
F	Astragalus spp.	-	-	3	-	.15	-
F	Calochortus nuttallii	-	4	-	5	-	.01
F	Chenopodium spp. (a)	-	-	2	-	.00	-
F	Collinsia parviflora (a)	-	-	34	31	.18	.14
F	Descurainia pinnata (a)	-	-	-	1	-	.00
F	Erodium cicutarium (a)	-	-	_a 25	_b 217	.12	11.55
F	Lactuca serriola	_a -	_b 10	_a -	_{ab} 3	-	.03
F	Lepidium spp. (a)	-	-	_b 218	_a -	1.14	-
F	Microsteris gracilis (a)	-	-	_b 18	_a 5	.07	.01
F	Montia perfoliata (a)	-	-	_a -	_b 19	-	.07
F	Phacelia spp.	-	-	-	8	-	.04
F	Phlox longifolia	-	1	-	3	-	.00
F	Ranunculus testiculatus (a)	-	-	_b 26	_a 9	.06	.02
F	Tragopogon dubius	-	1	2	-	.00	-
F	Zigadenus paniculatus	-	-	-	1	.00	.00
Total for Annual Forbs		0	0	323	287	1.59	11.98
Total for Perennial Forbs		0	24	5	25	0.16	0.12
Total for Forbs		0	24	328	312	1.75	12.10

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

BROWSE TRENDS --

Management unit 21 , Study no: 9

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	68	63	9.60	13.78
B	Chrysothamnus nauseosus hololeucus	6	4	.56	.00
B	Cowania mexicana stansburiana	8	8	3.72	6.86
B	Gutierrezia sarothrae	60	8	6.02	.06
B	Juniperus osteosperma	3	3	1.54	2.34
B	Opuntia spp.	1	1	.00	-
B	Purshia tridentata	0	0	.03	-
Total for Browse		146	87	21.49	23.06

CANOPY COVER, LINE INTERCEPT --
 Management unit 21 , Study no: 9

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	10.00
Chrysothamnus nauseosus hololeucus	-	.35
Cowania mexicana stansburiana	-	11.53
Juniperus osteosperma	6.00	5.86
Opuntia spp.	-	.13

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 21 , Study no: 9

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	2.0

POINT-QUARTER TREE DATA --
 Management unit 21 , Study no: 9

Species	Trees per Acre	
	'98	'03
Cowania mexicana stansburiana	N/A	152
Juniperus osteosperma	33	22

Average diameter (in)	
'98	'03
N/A	4.1
7.4	6.2

BASIC COVER --
 Management unit 21 , Study no: 9

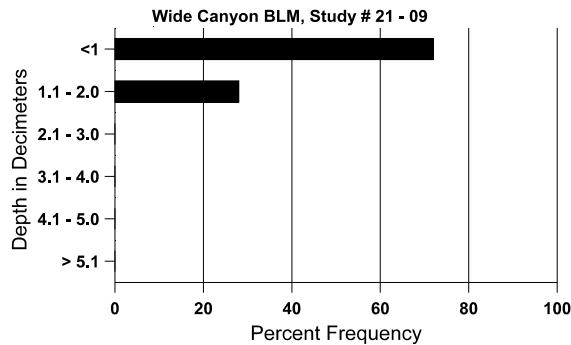
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	2.50	2.00	48.18	58.09
Rock	4.75	5.50	10.57	10.47
Pavement	.50	.25	1.12	.21
Litter	68.00	59.25	56.50	34.65
Cryptogams	.25	.75	2.17	1.46
Bare Ground	24.00	32.25	9.02	16.09

SOIL ANALYSIS DATA --

Management unit 21, Study no: 9, Study Name: Wide Canyon BLM

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
5.8	55.2 (13.1)	6.9	56.7	25.7	17.6	2.9	18.4	163.2	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 21, Study no: 9

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	22	22	-	-
Elk	-	1	-	-
Deer	60	58	155 (383)	167 (413)
Cattle	1	5	12 (30)	2 (5)

BROWSE CHARACTERISTICS --

Management unit 21, Study no: 9

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	1400	-	400	800	200	-	5	0	14	0	30/33
91	1399	-	266	1000	133	-	38	0	10	5	29/50
98	2400	60	620	1240	540	540	23	0	23	6	31/39
03	1900	-	60	1360	480	460	35	25	25	13	28/36

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	140	-	-	120	20	-	14	0	14	0	29/43
03	80	-	-	60	20	40	0	75	25	0	20/26
Cowania mexicana stansburiana											
85	999	-	200	666	133	-	73	7	13	0	48/49
91	865	-	66	666	133	-	54	0	15	0	56/58
98	180	-	-	180	-	40	33	0	0	0	83/91
03	160	-	-	160	-	-	25	50	0	0	82/89
Gutierrezia sarothrae											
85	1332	-	666	600	66	-	0	5	5	5	10/13
91	2266	-	600	1666	-	-	0	0	0	0	13/16
98	5720	-	100	5620	-	-	0	0	0	0	13/17
03	220	-	20	200	-	-	0	0	0	0	5/5
Juniperus osteosperma											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	-	60	-	20	0	0	-	0	-/-
03	60	-	-	60	-	20	0	0	-	0	-/-
Opuntia spp.											
85	200	-	-	200	-	-	0	0	0	0	6/8
91	132	-	-	66	66	-	0	0	50	0	8/15
98	20	20	-	20	-	-	0	0	0	0	6/12
03	20	-	-	20	-	-	0	0	0	0	6/14
Purshia tridentata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	91/93
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 21-10-03

Study site name: Wide Canyon DWR.

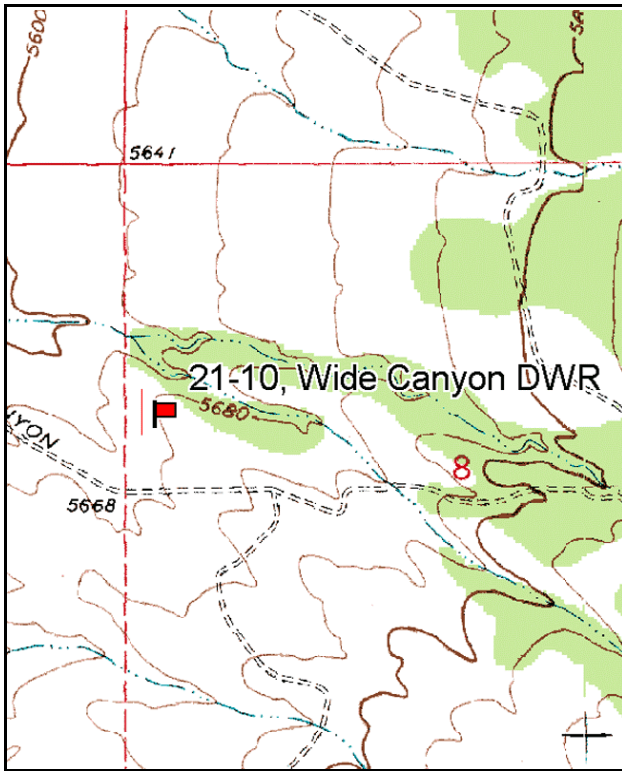
Vegetation type: Cliffrose Chaining.

Compass bearing: frequency baseline 180 degrees magnetic.

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

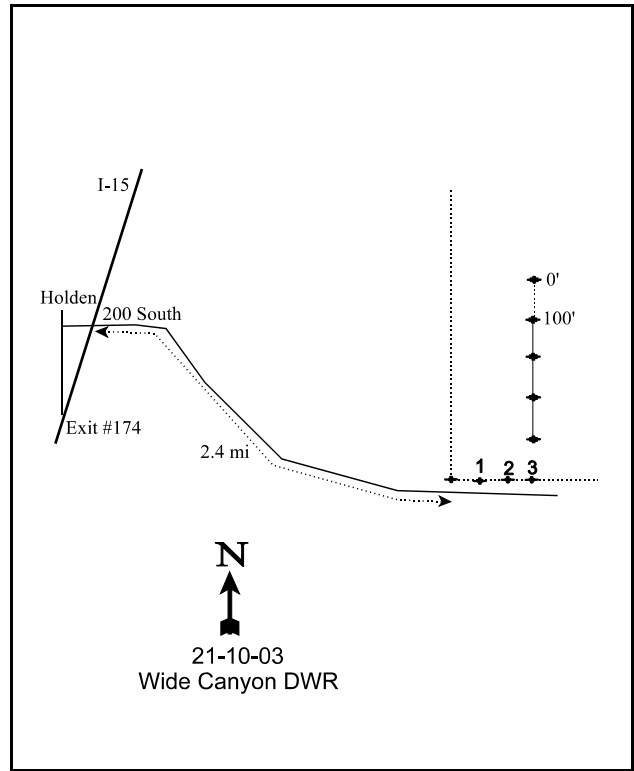
LOCATION DESCRIPTION

From the south 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

Township 20S, Range 3W, Section 8



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4327282 N, 394437 E

DISCUSSION

Wide Canyon DWR - Trend Study No. 21-10

This study samples important deer winter range on land owned and managed by the Utah Division of Wildlife Resources. This site, like much of the area along the west side of the Pahvant Range, was cabled, chained and/or hula dozed in the late 1950's. The range type is currently an association of Utah juniper, Wyoming big sagebrush, cliffrose, and a perennial grass understory. The site slopes to the west at 5-10%, and elevation is 5,640 feet. This site is an important wintering area for big game, primarily mule deer. The DWR Wide Canyon deer pellet group transect, located approximately 1 mile to the east of the trend study, showed a 5 year average of 56 deer days use/acre (138 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Between 1985 and 1991, the average went down slightly to 52 deer days use/acre (128 ddu/ha) (Jense et al 1991). Pellet group data taken along the study site baseline estimated 122 deer, 5 elk, and 9 cow days use/acre (301 ddu/ha, 12 edu/ha, and 22 cdu/ha) in 1998. In 2003, deer use was estimated at 165 days use/acre (407 ddu/ha) while cattle use was estimated at less than 2 days use/acre (4 cdu/ha). No elk pellets were sampled in the transect in 2003. The cattle use in 2003 was recent, with deer use being from the preceding winter and spring.

The soil is sandy, shallow, and rocky with a hardpan at a depth of about 12 inches. Effective rooting depth was estimated at just over 10 inches in 1998. Soil texture is classified as a loam with a neutral pH (7.0). Due to the rocky nature of the soil, average soil temperature averaged between 70-81°F in 1998 and 2003. This condition causes excessive dry soils during the summer, which gives winter annuals like cheatgrass a competitive advantage especially under a spring grazing system. It was noted that erosion and sedimentation were evident on areas with exposed soils or a sparse layer of litter cover. However in 2003, erosion was minimal and a condition class assessment rated soils as stable. This study has maintained higher perennial grass abundance and cover compared to the other range trend studies along the west side of the Pahvant Range.

Browse composition is similar to the other sites in the area, but Utah juniper is more prevalent. Point quarter data from 2003 estimated 54 juniper trees/acre on the site. Juniper canopy cover averaged about 3% in both 1998 and 2003. A hand cutting treatment on juniper was done sometime between 1998 and 2003. The key browse species are Wyoming big sagebrush and Stansbury cliffrose. Antelope bitterbrush has also been sampled in low numbers. These three species combine to provide over 80% of the total browse cover on the site in 1998 and 2003. A few of the sagebrush on the site fluoresced under a black light indicating some hybridizing between Wyoming big sagebrush and mountain big sagebrush. Wyoming big sagebrush is the most abundant of the key species having a stable density that averaged 2,400 plants/acre between 1985 and 1998. In 2003, sagebrush density decreased by 50% to just over 1,000 plants/acre. Decadent sagebrush were abundant in 1998, and the population decline in 2003 is due mainly to many of these individuals dying off. With low sagebrush reproduction in 1998 and 2003, the population has not been able to replace the decadent, dying individuals being lost. Utilization on big sagebrush has been mostly light to moderate in all readings. Heavy use occurs on a few individuals that display more characteristics of mountain big sagebrush which is more preferred. Beginning with the 1991 reading, about 20% of the population has been classified as having poor vigor. Percent decadence has been high in all years, but especially so in 1998 and 2003 when it was 57% and 52% respectively.

The cliffrose population has been stable since site establishment. Density was estimated at 200 plants/acre in 2003, a slight decrease from 260 in 1998. Cliffrose has been moderate to heavily utilized in all years, but has maintained normal vigor. Although the entire population was classified as decadent in 1991, percent decadence was much improved in 1998 (31%) and 2003 (10%). The cliffrose population has shown very little reproduction over the life of the transect. Bitterbrush density was estimated at 40 plants/acre in 1998, increasing to 140 plants/acre in 2003. With no young plants sampled in 1998, the increase in density may be

due more to identification differences with young cliffrose. In 2003, annual leaders averaged 1.3 inches for sagebrush, 2.8 inches for cliffrose, and 3.1 inches for bitterbrush.

As noted above, perennial grasses are more abundant on this site compared to the other range trend studies in the area. The common species include Sandberg bluegrass, bluebunch wheatgrass, intermediate wheatgrass, and bulbous bluegrass. Crested wheatgrass is also present but has slowly declined with each reading. Perennial grasses provided 21% total cover in 1998, increasing to 31% in 2003. Most of this increase was due to the significant increase in bulbous bluegrass between 1998 and 2003. This species is a low value perennial that provides little forage value, especially during summer months as it dries out early. In earlier readings, utilization was light to moderate on the majority of the grasses, with the exception of Sandberg bluegrass which was heavily utilized in 1985 and vigor was depressed on 70% of the plants. Use on grasses was light in 2003. Due to the abundance of perennial grasses, annual cheatgrass is conspicuously lacking in the understory. This is somewhat surprising since cheatgrass dominates the understory of a nearby transect, Wide Canyon BLM (21-9). The major difference between these two sites is that the DWR site has a very healthy and robust population of perennial grasses that is very competitive and keeps cheatgrass in check at very low numbers. Similar to the Wide Canyon BLM study, perennial forbs are deficient. All forbs combined to produce less than 1% total cover in both 1998 and 2003.

1985 APPARENT TREND ASSESSMENT

General range trend may be downward. The soil, already shallow and low in fertility, is being slowly eroded away, especially where exposed and disturbed. Vegetative trend appears down because of the increasing dominance of junipers, high density and increase of snakeweed, high percentage of decadent key species, and lack of forbs. Chaining and seeding could be beneficial to this area.

1991 TREND ASSESSMENT

Pavement cover has decreased from 13% to 4%. Basal vegetative cover has also declined from 8% to 5%. Percent bare ground cover has increased substantially (14% to 22%). Litter cover increased slightly. Overall trend would have to be considered slightly down with the losses in vegetational basal cover and the increases in bare ground. The two key browse species, Wyoming big sagebrush and cliffrose, are showing downward trends. The sagebrush population has declined by 8% (down to 2,399 plants/acre) with an accompanying increase in percent decadency (33% to 36%). The young age class makes up only 6% of the population, down from 18%. The cliffrose population is basically stagnant with only 133 plants/acre, and percent decadence has doubled from 50% to 100%. There are no young cliffrose plants in the population. In 1985, it was thought that broom snakeweed appeared to be increasing. In 1991, the population actually decreased by 77%. The trend for key browse is slightly down, showing the effects of long-term drought. The herbaceous understory trend is up. The sum of nested frequency for grasses has increased by one and a half. There are not many forbs, but they too increased slightly since 1985.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - up (5)

1998 TREND ASSESSMENT

Trend for soil is up slightly with a two-fold decline in percent bare ground (22% to 11%) since 1991. However, litter cover also declined from 66% to 57%. Erosion is not currently a problem on this site. Trend for browse continues to be downward for Wyoming big sagebrush, but cliffrose displays an improving trend.

Sagebrush shows more moderate use, a higher proportion of plants in poor vigor, increasing decadence, and a lack of significant recruitment. The number of dead plants is also quite high at 900 plants/acre. Another indication of downward trend is that 34% (420 plants/acre) of the decadent sagebrush were classified as dying. Cliffrose on the other hand shows reduced decadence and lighter overall use. Vigor is good and there is some limited recruitment present. Since sagebrush accounts for 58% of the browse cover or 87% of the preferred browse cover, trend for browse is considered slightly down. This trend is likely caused primarily by competition with increasing juniper trees and a healthy perennial grass component. Trend for the herbaceous understory is slightly up due to an increase in the sum of nested frequency for perennial grasses. Unfortunately, much of the increase comes from a significant increase in the less desirable bulbous bluegrass. Intermediate wheatgrass also increased significantly in nested frequency. Forbs continue to be lacking.

TREND ASSESSMENT

soil - slightly up (4)

browse - slightly down (2)

herbaceous understory - slightly up (4)

2003 TREND ASSESSMENT

Trend for soil is stable. Overall, protective ground cover remains stable, and bare soil is only slightly higher than in 1998. Although litter cover declined from 57% to 48%, perennial grass cover increased by nearly 50% which will greatly aid soil stability. Trend for browse is down. Wyoming big sagebrush density decreased by 50%, percent decadence remains very high (52%), use is increasing, and there is no reproduction in the population. Nearly 40% of the decadent sagebrush were classified as dying. With no young plants being sampled in 2003, the sagebrush population will likely show further declines in the future. Cliffrose remains at a stable but low density. Cliffrose also had no reproduction in 2003. Use is increasing to higher levels. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses slightly increased overall, although composition is changing. Bulbous bluegrass significantly increased in nested frequency, while intermediate wheatgrass, Sandberg bluegrass, and crested wheatgrass all decreased. Bluebunch wheatgrass remained stable in 2003. The low abundance of annual species continues to be a positive sign for this site.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 21 , Study no: 10

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	_b 24	_b 24	_{ab} 18	_a 1	.29	.06
G	Agropyron intermedium	_{ab} 67	_a 66	_c 144	_b 92	5.27	4.63
G	Agropyron spicatum	140	181	172	188	6.10	9.59
G	Bromus tectorum (a)	-	-	40	52	.17	.82
G	Oryzopsis hymenoides	-	3	-	-	-	-
G	Poa bulbosa	_a -	_b 99	_c 158	_d 271	5.06	13.61
G	Poa secunda	_{ab} 135	_b 157	_{ab} 129	_a 106	4.01	2.42
G	Sitanion hystrix	6	2	10	5	.04	.03
Total for Annual Grasses		0	0	40	52	0.17	0.81
Total for Perennial Grasses		372	532	631	663	20.80	30.36
Total for Grasses		372	532	671	715	20.97	31.18
F	Alyssum alyssoides (a)	-	-	_b 47	_a 25	.20	.06
F	Astragalus calycosus	-	-	3	2	.03	.03
F	Astragalus spp.	-	6	-	2	-	.03
F	Castilleja chromosa	-	2	-	-	-	-
F	Calochortus nuttallii	_{ab} 2	_b 7	_a -	_a -	-	.00
F	Collinsia parviflora (a)	-	-	_a 10	_b 23	.02	.19
F	Crepis acuminata	3	-	-	-	-	-
F	Cryptantha spp.	2	2	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	5	-	.01
F	Holosteum umbellatum (a)	-	-	-	3	-	.01
F	Lactuca serriola	-	1	-	-	-	-
F	Microsteris gracilis (a)	-	-	3	11	.00	.02
F	Petradoria pumila	-	-	5	3	.18	.15
F	Ranunculus testiculatus (a)	-	-	_a 8	_b 27	.01	.10
F	Streptanthus cordatus	-	6	-	3	-	.00
F	Tragopogon dubius	-	1	-	-	.00	-
F	Zigadenus paniculatus	2	-	-	4	-	.01
Total for Annual Forbs		0	0	68	94	0.24	0.40
Total for Perennial Forbs		9	25	8	14	0.21	0.23
Total for Forbs		9	25	76	108	0.46	0.64

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

BROWSE TRENDS --

Management unit 21 , Study no: 10

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	71	44	9.01	4.99
B	Chrysothamnus nauseosus	1	0	-	-
B	Cowania mexicana stansburiana	13	10	1.46	2.71
B	Gutierrezia sarothrae	31	4	1.19	.00
B	Juniperus osteosperma	5	3	3.94	1.96
B	Leptodactylon pungens	3	2	.00	-
B	Opuntia spp.	1	1	-	.00
B	Purshia tridentata	2	6	-	2.54
B	Ribes spp.	1	0	-	-
Total for Browse		128	70	15.62	12.22

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 10

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	6.15
Cowania mexicana stansburiana	-	2.73
Juniperus osteosperma	2.79	3.31
Purshia tridentata	-	2.31

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 10

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.3
Cowania mexicana stansburiana	2.8
Purshia tridentata	3.1

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 10

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	76	54

Average diameter (in)	
'98	'03
4.7	4.0

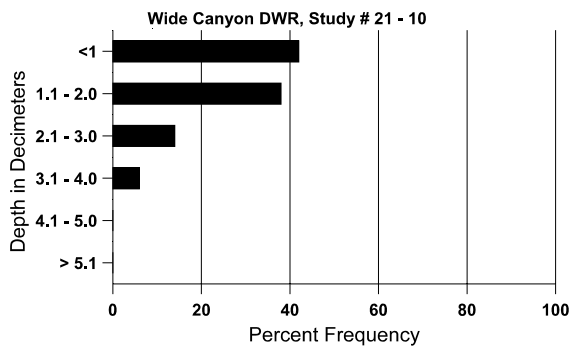
BASIC COVER --
Management unit 21 , Study no: 10

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	7.75	5.00	43.12	48.72
Rock	3.50	3.00	2.75	3.05
Pavement	12.50	3.75	2.53	4.41
Litter	62.00	66.25	57.06	48.25
Cryptogams	0	.25	1.15	1.19
Bare Ground	14.25	21.75	10.89	11.63

SOIL ANALYSIS DATA --
Management unit 21, Study no: 10, Study Name: Wide Canyon DWR

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.4	70.0 (14.6)	7.0	36.7	34.7	28.6	2.6	9.7	92.8	1.0

Stoniness Index



PELLET GROUP DATA --
 Management unit 21 , Study no: 10

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	52	23	-	-
Elk	1	1	3 (7)	-
Deer	53	45	122 (301)	165 (407)
Cattle	4	1	9 (22)	1 (4)

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Artemisia tridentata wyomingensis											
85	2598	-	466	1266	866	-	13	3	33	3	21/23
91	2399	-	133	1400	866	-	22	8	36	17	24/30
98	2180	-	20	920	1240	900	40	5	57	20	28/35
03	1080	-	-	520	560	800	41	15	52	20	30/34
Chrysothamnus nauseosus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	20	0	100	100	0	17/47
03	0	-	-	-	-	-	0	0	0	0	-/-
Chrysothamnus viscidiflorus stenophyllus											
85	66	-	-	66	-	-	0	0	-	0	11/12
91	266	-	133	133	-	-	25	0	-	0	12/14
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	23/22
Cowania mexicana stansburiana											
85	132	-	-	66	66	-	100	0	50	0	22/18
91	133	-	-	-	133	-	100	0	100	0	-/-
98	260	20	20	160	80	40	38	15	31	0	56/64
03	200	-	-	180	20	40	20	60	10	10	49/50

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
85	3466	-	800	2266	400	-	0	0	12	2	9/8
91	800	66	-	800	-	-	0	0	0	0	10/7
98	1960	20	120	1820	20	-	0	0	1	0	11/12
03	100	-	20	60	20	20	0	0	20	0	9/7
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	100	20	20	60	20	100	0	0	20	0	-/-
03	60	20	60	-	-	-	0	0	0	0	-/-
<i>Leptodactylon pungens</i>											
85	132	-	66	66	-	-	0	0	0	0	9/7
91	66	-	-	66	-	-	0	0	0	0	11/7
98	140	-	-	-	140	-	0	0	100	86	8/9
03	80	-	-	80	-	-	0	0	0	0	2/4
<i>Opuntia spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	6/9
03	20	-	-	20	-	-	0	0	-	0	8/13
<i>Purshia tridentata</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	40	-	-	-	40	-	50	50	100	0	30/41
03	140	-	20	120	-	-	29	43	0	0	34/57
<i>Ribes spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 21-11-03

Study site name: Dog Valley.

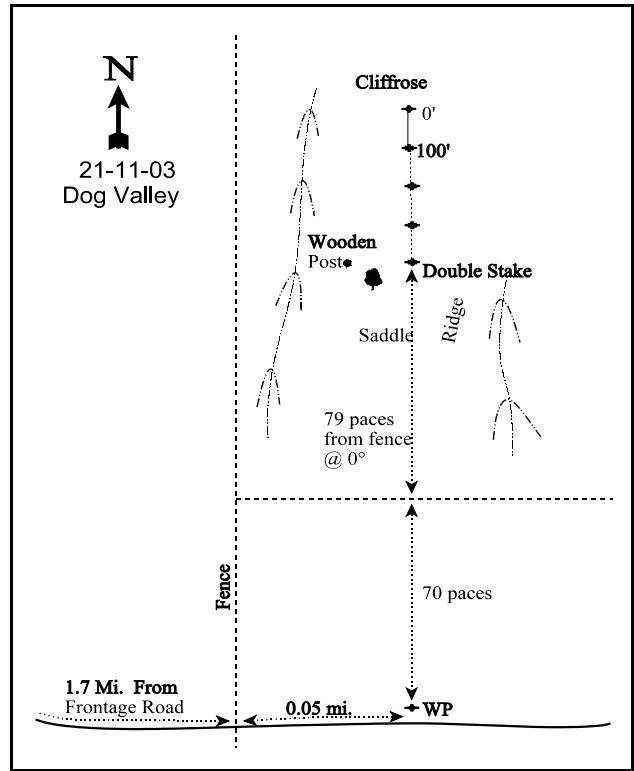
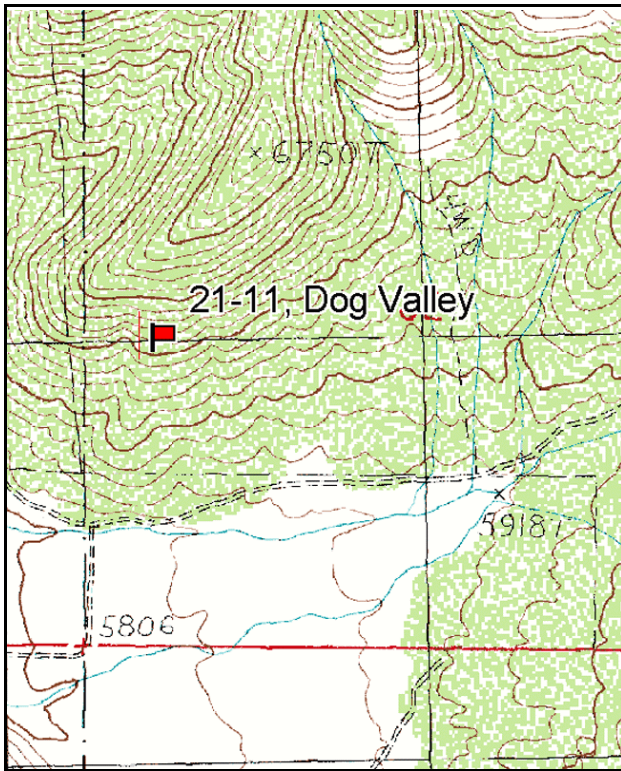
Vegetation type: Burned Cliffrose.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

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 27, UTM 12S 4281973 N, 364361 E

DISCUSSION

Dog Valley - Trend Study No. 21-11

This study was the first transect in the old Kanosh deer herd unit. It samples deer winter range above Dog Valley. The study is located in a Stansbury cliffrose community on a steep south facing slope (35%) overlooking sagebrush flats and cultivated fields. Elevation of the transect is 6,200 feet. The land is administered by the Forest Service and was grazed by cattle on a rest-rotation basis every other year for about a 10 year period (1975-1985). The site has been dominated by cheatgrass since 1985. A fire burned the entire area in 1996. In the past, before the rest-rotation program, the site had been severely overgrazed. The DWR Dog Valley pellet group transect measured deer use on the same slope that this study samples. Deer use varied between years, but generally there was moderately heavy use between 1985 and 1990 at an average of 66 deers day use/acre (163 ddu/ha) (Jense et al. 1990). Use has declined since the fire, but deer and elk are still using the site. Pellet group data taken in 1998 along the study site baseline estimated 47 deer and 4 elk use days/acre (116 ddu/ha and 10 edu/ha). In 2003, pellet group transect data estimated 116 deer days use/acre (286 ddu/ha) and 6 cow days use/acre (14 cdu/ha) on the site. Mormon crickets were very abundant on the site in June of 2003 when the study was read.

Soil on the site is shallow and rocky. Effective rooting depth was estimated at just over 8 inches in 1998. Soils are a clay loam in texture with a neutral pH (6.8). Surface rock and pavement are abundant ranging from a combined 20-25% average cover in all years. Litter cover was high from 1985 to 1998 at around 70% due to a thick layer of dead cheatgrass. In 2003, litter cover decreased to only 37% due to the decline in cheatgrass cover from 47% to 9%. Soil movement and erosion were common in the past but not severe. In 2003, an erosion condition class assessment rated soils on the site to be stable.

The dominant overstory before the fire was Stansbury cliffrose. Although the plants were large averaging 7 feet in height, much of each plant was still available to deer. Cliffrose were moderate to heavily hedged in 1985 and 1991 prior to the fire, yet all plants displayed good vigor. In 1998, it appeared that all of the cliffrose had been lost due to the burn as no live plants were sampled on the site. In 2003 however, range trend personnel were surprised to find a moderate number of sprouting cliffrose on the site. Density was estimated at 260 plants/acre in 2003, with most of the population classified as heavily hedged mature plants. Seedling and young plants have been few in all years, but 20 young plants/acre were estimated in 2003. Vigor was normal throughout the entire population in 2003, and no decadent plants were sampled. In 2003, annual leaders were abundant and growth was good averaging over 4 inches on cliffrose. Mountain big sagebrush was also an important species on the site prior to the burn. Density was estimated at nearly 400 plants/acre in 1985, but in 1998 and 2003, no live sagebrush plants were sampled on the transect. Junipers were common downslope of the transect prior to the burn, with only a few live trees being left following the burn. Juniper canopy cover was estimated at 4% in 2003.

The dominant understory species from 1985 to 1998 was cheatgrass. Cheatgrass accounted for 97% of the grass cover and 81% of the total herbaceous cover in 1998, and was sampled in 99% of the quadrats. In 2003, cheatgrass declined significantly in nested frequency and average cover, but still remains abundant on the site as it was sampled in 96 of the 100 quadrats. Storksbill, an annual forb, significantly increased in frequency and cover between 1998 and 2003, changing places with cheatgrass for understory dominance. Storksbill contributed 99% of the forb cover and 73% of the total vegetation cover on the site in 2003. Perennial herbaceous species are sparse. In 2003, perennial grasses and forbs were sampled in only 9 and 7 total quadrats respectively.

1985 APPARENT TREND ASSESSMENT

Sheet erosion is occurring, but loss is fairly slow and no active gullies are evident. The only way to improve the soil trend would be an increase in herbaceous cover. Perennial species give more watershed protection and grazing value than cheatgrass. A release from grazing pressure during the flower and seed formation stages of the desirable plants would favor bluebunch wheatgrass. The vegetative trend appears stable. The key species are doing well. Neither the juniper nor broom snakeweed appear to be increasing.

1991 TREND ASSESSMENT

Basal vegetative cover is still very low at only 2%. Rock and pavement cover have increased to 25%, while litter cover has decreased to 64% with the majority of the litter cover coming from dried up cheatgrass. Amount of bare soil has only risen to 9%. With what few changes that have taken place, soil trend is stable, but still in very poor condition with the dominance of cheatgrass on the site. The browse trend is mixed. Mountain big sagebrush density has decreased by 83% due to drought and competition with cheatgrass. However, this site is marginal for mountain big sagebrush due to shallow, rocky soils and a lower precipitation regime. Elevationally, the sagebrush on this site is a lower extension of mountain big sagebrush that typically occurs at higher elevations with better moisture. Cliffrose is fairing much better with a population increase of 11% and coincidentally, reproductive potential (number of seedlings) and recruitment by young plants are both at 11%. However, cliffrose plants are tall tree-like forms that are partly unavailable to deer. Percent decadence is only 22% which is generally low considering the length of the drought. Browse trend is slightly down overall due some losses for sagebrush. There are not many perennial species occurring in the herbaceous understory. Trend is stable, but the understory is in poor condition due to the continued dominance of cheatgrass on the site. The abundance of cheatgrass poses a serious fire hazard on this site.

TREND ASSESSMENT

soil - stable (3)

browse - slightly downward (2)

herbaceous understory - stable, but very poor (3)

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground is low and herbaceous vegetation and litter cover are abundant. No significant erosion is occurring on the site. The browse trend is down due to the 1996 fire which eliminated nearly all of the useful browse on the site, specifically cliffrose and mountain big sagebrush. The area is not an effective winter range at the present time due to the lack of useful browse. Trend for the herbaceous understory is up slightly especially for forbs, but condition is very poor due to the lack of perennial species and the abundance of cheatgrass. Cheatgrass currently provides 97% of the grass cover and 81% of the total herbaceous cover. Some type of fire rehabilitation should have been done on this site to provide some competition to reduce cheatgrass's dominance.

TREND ASSESSMENT

soil - stable (3)

browse - down due to fire (1)

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

2003 TREND ASSESSMENT

Trend for soil is stable even with a large decline in litter cover. Vegetation cover remains high at over 50%, and bare soil is low at only 5%. Erosion is minimal and soils were rated as stable by an erosion condition

class assessment in 2003. Trend for browse is up. It was thought that this site would no longer provide good winter range for mule deer because no live sagebrush or cliffrose plants were sampled in 1998 due to the wildfire that burned the site. Although typically fire intolerant, a moderate stand of sprouting cliffrose was sampled on the site in 2003. Density was estimated at 260 plants/acre in 2003, with most of the population being classified as mature. Unlike the pre-burn cliffrose population which were tall tree-like forms, the current population are smaller plants that are all available to deer. Young plants remain limited, but 20 young cliffrose/acre were sampled in 2003. Sagebrush was again not sampled in 2003. Trend for the herbaceous understory is slightly down. Perennial species have been sparse in all years, but further decreased in 2003. Although cheatgrass showed a significant decrease in frequency and cover, storksbill, an annual forb, significantly increased in both categories.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 11

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	16	16	20	9	.42	.22
G	Aristida purpurea	3	5	-	3	-	.15
G	Bromus tectorum (a)	-	-	_b 387	_a 290	46.88	8.72
G	Hilaria jamesii	-	-	4	-	.85	-
G	Poa secunda	_a 7	_b 17	_a 6	_a 4	.06	.04
G	Sitanion hystrix	-	5	4	2	.03	.03
Total for Annual Grasses		0	0	387	290	46.88	8.72
Total for Perennial Grasses		26	43	34	18	1.36	0.44
Total for Grasses		26	43	421	308	48.25	9.17
F	Alyssum alyssoides (a)	-	-	_b 253	_a 1	2.61	.00
F	Ambrosia psilostachya	-	-	-	2	-	.03
F	Antennaria rosea	-	-	4	-	.03	-
F	Astragalus calycosus	-	-	9	-	.06	-
F	Cirsium spp.	-	-	2	-	.24	-
F	Convolvulus arvensis	-	-	-	5	-	.01
F	Collinsia parviflora (a)	-	-	-	2	-	.00
F	Draba spp. (a)	-	-	11	5	.01	.01
F	Epilobium brachycarpum (a)	-	-	3	-	.01	-
F	Erodium cicutarium (a)	-	-	_a 176	_b 330	5.56	36.07
F	Lactuca serriola	-	-	_b 74	_a 7	.49	.02
F	Unknown forb-perennial	_a 3	_a -	_b 18	_a -	.28	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
	Total for Annual Forbs	0	0	443	338	8.20	36.10
	Total for Perennial Forbs	3	0	107	14	1.11	0.05
	Total for Forbs	3	0	550	352	9.32	36.16

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

BROWSE TRENDS --

Management unit 21 , Study no: 11

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Cowania mexicana stansburiana</i>	0	11	.01	.53
B	<i>Gutierrezia sarothrae</i>	1	0	-	-
B	<i>Juniperus osteosperma</i>	0	0	-	3.42
B	<i>Tetradymia canescens</i>	4	3	.15	-
	Total for Browse	5	14	0.16	3.95

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 11

Species	Percent Cover	
	'98	'03
<i>Cowania mexicana stansburiana</i>	-	.80
<i>Juniperus osteosperma</i>	2.79	4.00

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 11

Species	Average leader growth (in)
	'03
<i>Cowania mexicana stansburiana</i>	4.1

BASIC COVER --

Management unit 21 , Study no: 11

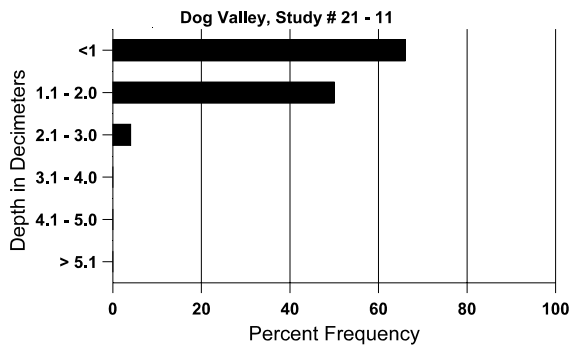
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	1.25	2.00	54.39	50.29
Rock	11.50	16.25	18.90	15.23
Pavement	8.25	9.25	6.03	7.13
Litter	72.25	63.75	66.49	36.77
Cryptogams	0	0	.04	0
Bare Ground	6.75	8.75	2.25	4.92

SOIL ANALYSIS DATA --

Management unit 21, Study no: 11, Study Name: Dog Valley

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
8.2	69.0 (9.1)	6.8	40.7	29.7	29.6	2.6	20.7	121.4	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 11

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	13	2	-	-
Elk	1	2	4 (10)	-
Deer	35	43	47 (116)	116 (286)
Cattle	-	1	-	6 (14)

BROWSE CHARACTERISTICS --
Management unit 21 , Study no: 11

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	399	-	133	200	66	-	33	0	17	0	20/26
91	66	-	-	66	-	-	0	100	0	0	12/21
98	0	-	-	-	-	100	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Cercocarpus montanus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	8/19
<i>Cowania mexicana stansburiana</i>											
85	533	-	-	533	-	-	63	0	0	0	69/75
91	599	66	66	400	133	-	44	56	22	0	82/70
98	0	40	-	-	-	600	0	0	0	0	-/-
03	260	-	20	240	-	20	23	69	0	0	21/23
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	0	0	-	0	6/4
98	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	12/25
<i>Sambucus cerulea</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	26/13
03	0	-	-	-	-	-	0	0	-	0	18/22
<i>Tetradymia canescens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	120	-	20	100	-	-	0	0	-	0	10/20
03	80	-	20	60	-	-	0	0	-	0	10/21

Trend Study 21-12-03

Study site name: Dameron Canyon.

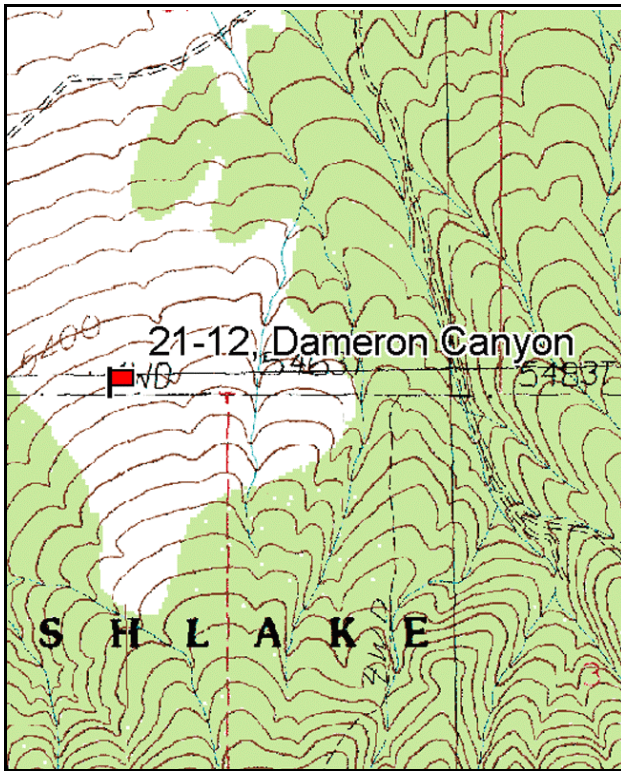
Vegetation type: Bitterbrush-Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

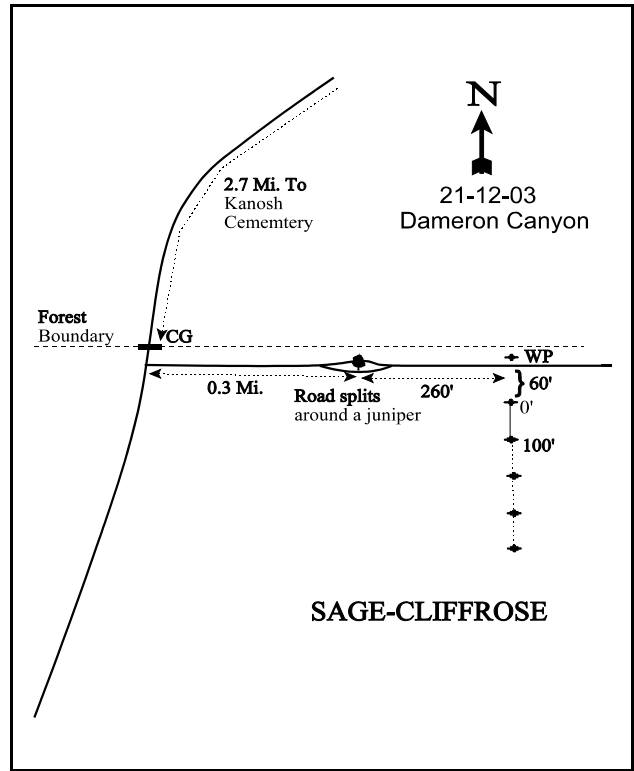
LOCATION DESCRIPTION

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 1/2 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

Township 24S, Range 5W, Section 4



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4290937 N, 373252 E

DISCUSSION

Dameron Canyon - Trend Study No. 21-12

The Dameron Canyon trend study samples a fairly flat area of sagebrush, cliffrose, and juniper south of Kanosh. The slope is very gradual (1-3%) and drains to the north at an elevation of 5,400 feet. The transect lies just inside the Forest Service boundary and may be effected by differential grazing pressure because of its proximity to the Forest Service fence. The range is supposedly used for early spring grazing by cattle, but no signs of early season use were found during any reading. The Forest Service has allowed free use firewood cutting here to help reduce juniper competition with the more desirable browse species. Surrounding areas dominated by juniper do not produce as much palatable browse, therefore receive little deer use. Deer use on the study site has been heavy, as evidenced by the past intense hedging on the cliffrose and bitterbrush. However, the DWR Dameron pellet group transect located about one mile to the west, averaged only 26 deer days use/acre (64 ddu/ha) between 1985 and 1990 (Jense et al. 1990). Pellet group data from the site in 1998 estimated 143 deer days use/acre (353 ddu/ha). Pellet group transect data from 2003 estimated 175 deer days use/acre (431 ddu/ha) and 5 cow days use/acre (12 cdu/ha). Most of the deer pellet groups in both years were from the winter use. Part of the baseline, including the first frequency belt, was chained following the 1985 reading.

Soil on this site is moderately shallow and rocky with an effective rooting depth estimated at just under 10 inches. Soils are loam in texture with a neutral pH (6.8). Bare ground was common during the 1985 and 1991 readings at 21% and 27% respectively. It has since declined to 10% in 1998 and 16% in 2003. In 2003, the interspaces were dominated by cheatgrass and Sandberg bluegrass which effectively minimize erosion. Soils were rated as stable by an erosion condition class assessment completed in 2003. Average soil temperature was relatively high at 68°F in 2003 indicating a dry soil profile.

Key browse species found on the site include mountain big sagebrush, bitterbrush, and a few cliffrose. Mountain big sagebrush provided 44% of the browse cover in 1998, increasing to 63% in 2003. Density was estimated at 2,840 plants/acre in 1998 and 2,560 in 2003. Density estimates were much higher in 1985 and 1991 with the smaller sample size used in those years. The big sagebrush population has steadily become more mature over the years. Recruitment from the young age class was moderately high in 1985 and 1991 at 26% and 22% respectively. Young plants made up 12% of the population in 1998, but only 2% in 2003. Percent decadence has remained within an acceptable range in all years (14%-24%), and vigor has generally been good. Annual sagebrush leaders had averaged 1.6 inches of growth in June 2003.

Antelope bitterbrush provided 18% of the browse cover in 1998, increasing to 27% in 2003. Density was estimated at 400 and 360 plants/acre in 1998 and 2003 respectively. The population consisted entirely of heavily hedged mature and decadent plants in 2003. Although classified as vigorous in past years, bitterbrush was noted as producing minimal leader growth. Reproduction from seed has been poor with no young plants sampled during any of the readings. Only a few seedlings were encountered in 1998. There may be some reproduction occurring by the layering of stems. Bitterbrush annual leaders averaged just over 3 inches of growth in June of 2003. Stansbury cliffrose provides some additional forage on the site but these shrubs occur in small numbers. Cliffrose and bitterbrush are hybridizing on the site which has made identification difficult. Cliffrose plants are taller than bitterbrush and show high-lining. Most of the new growth is partly unavailable to browsing.

Broom snakeweed was the most abundant shrub on the site in 1991 and 1998 in terms of numbers. It contributed 28% of the total browse cover in 1998, decreasing to only 6% in 2003. Snakeweed density was estimated at 10,540 plants/acre in 1998, but only 1,320 in 2003. The decline in population is due mostly to drier conditions since the 1998 reading.

The herbaceous understory was totally dominated by annual grasses and forbs in 1998. Cheatgrass was by far the dominant understory species in 1998 as it provided 79% of the grass cover. Significant decreases in cheatgrass cover and nested frequency in 2003 have reduced its dominance, but it still remains abundant. With the exception of Sandberg bluegrass, perennial herbaceous vegetation is lacking. Sandberg bluegrass accounted for 18% of the grass cover in 1998, increasing to 59% in 2003. Sandberg bluegrass significantly increased in nested frequency in 2003 and cover tripled. Perennial forbs were rare from 1985 to 1998, and none were sampled in 2003.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable and the vegetative trend appears downward. With the heavy utilization and lack of reproduction of the cliffrose and bitterbrush, these populations appear to be slowly declining. Any practices that encourage growth and reproduction of the cliffrose and bitterbrush would be advocated. Chaining openings within the dense pinyon-juniper stands nearby could relieve some of the pressure on this area.

1991 TREND ASSESSMENT

Soil trend is slightly downward. Basal vegetation cover has gone up slightly to 3.5%, but this is still too low. Percent rock and pavement cover have increased to 17%. Litter cover has decreased to 53% with bare soil increasing to 27%. Browse trend is also slightly downward at this time. The most abundant browse species is mountain big sagebrush. Percent decadence has increased to 24%. At the next survey, it will be of interest to determine what percentage of the seedlings have survived as the reproductive potential is very high at 76% (3,666 seedlings/acre). The few cliffrose that were on the site before are no longer present. Bitterbrush has decreased by 40% (332 plants/acre to 200 plants/acre). The broom snakeweed has increased by almost fivefold to 7,198 plants/acre. As with most of the other sites in management unit 21, the herbaceous understory is poor. The most common perennial species is a very small Sandberg bluegrass. Trend is stable, but the understory is in poor condition with the composition consisting mostly of weedy increasers and annuals.

TREND ASSESSMENT

soil - slightly downward (2)

browse - slightly downward (2)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up with a substantial decline in percent bare ground from 27% in 1991 to 10% in 1998. Rock and pavement cover have declined, while percent litter cover has increased. Unfortunately, most of these positive changes are due to a vigorous stand of annual cheatgrass. Photo point comparisons show cheatgrass on the site since 1985, but it has become more dense and vigorous since then and currently poses a fire hazard. Trend for browse is stable. Sagebrush provides 71% of the preferred browse cover. The sagebrush shows a 40% decline in density since 1991. However, some of this change is due to the much larger sample used in 1998. In addition, density of mature plants has remained fairly stable since the last reading, although the number of plants in the other age classes has declined substantially. Utilization of the sagebrush is mostly light. Vigor has improved slightly while percent decadence has declined from 24% to 18%. Young plants have declined but still remain adequate to maintain the population. The bitterbrush population is mostly mature with little apparent reproduction. However, vigor is good, utilization mostly moderate, and percent decadence very low at only 5%. Trend for the herbaceous understory is stable, but still in poor condition due to the dominance of annual grasses and forbs.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. There have been changes in ground cover characteristics, but none of them are severe. Litter cover declined while bare ground increased, but vegetation cover remains high at nearly 52%. The decline in litter cover and corresponding increase in bare soil is due to the decline of cheatgrass. Soil erosion remains low. Trend for browse is stable. Mountain big sagebrush and bitterbrush show slight declines in density, but maintain low decadence and generally good vigor. Reproduction is low for both species, but this is expected with the abundance of weedy annuals in the understory and drier weather since 1998. Trend for the herbaceous understory is slightly up. Cheatgrass remains abundant in the understory, but did decline in nested frequency and cover. Sandberg bluegrass showed a significant increase in nested frequency in 2003 and average cover tripled. Perennial forbs have been sparse, with none being sampled in 2003.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 12

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	-	-	3	-	.03	-
G	Agropyron spicatum	_a -	_a 3	_{ab} 11	_b 12	.21	.39
G	Bromus japonicus (a)	-	-	11	6	.21	.07
G	Bromus tectorum (a)	-	-	_b 349	_a 264	19.84	8.28
G	Poa bulbosa	-	-	-	7	-	.18
G	Poa secunda	_a 193	_a 189	_a 168	_b 299	4.42	13.53
G	Secale montanum	-	-	2	-	.00	-
G	Sitanion hystrix	_b 26	_a 2	_a 14	_b 26	.29	.58
Total for Annual Grasses		0	0	360	270	20.04	8.35
Total for Perennial Grasses		219	194	198	344	4.97	14.69
Total for Grasses		219	194	558	614	25.02	23.04
F	Alyssum alyssoides (a)	-	-	_b 48	_a 22	.48	.05
F	Allium spp.	-	-	1	-	.00	-
F	Arabis spp.	-	-	7	-	.01	-
F	Astragalus calycosus	-	-	3	-	.00	-
F	Calochortus nuttallii	-	-	8	-	.02	-

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Collinsia parviflora</i> (a)	-	-	-	4	-	.01
F	<i>Draba</i> spp. (a)	-	-	_b 55	_a 9	.19	.01
F	<i>Epilobium brachycarpum</i> (a)	-	-	6	-	.01	-
F	<i>Erodium cicutarium</i> (a)	-	-	-	8	-	.21
F	<i>Holosteum umbellatum</i> (a)	-	-	_b 223	_a 32	2.42	.17
F	<i>Lactuca serriola</i>	_a -	_b 55	_a 1	_a -	.00	-
F	<i>Lomatium</i> spp.	-	-	3	-	.03	-
F	<i>Machaeranthera canescens</i>	-	-	8	-	.01	-
F	<i>Microsteris gracilis</i> (a)	-	-	16	6	.03	.02
F	<i>Phlox longifolia</i>	4	-	5	-	.01	-
F	<i>Polygonum douglasii</i> (a)	-	-	3	-	.01	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	39	19	.12	.08
F	<i>Tragopogon dubius</i>	-	-	15	-	.19	-
F	Unknown forb-perennial	4	-	-	-	-	-
F	<i>Zigadenus paniculatus</i>	-	1	-	-	-	-
Total for Annual Forbs		0	0	390	100	3.26	0.56
Total for Perennial Forbs		8	56	51	0	0.29	0
Total for Forbs		8	56	441	100	3.56	0.56

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

BROWSE TRENDS --

Management unit 21 , Study no: 12

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia tridentata vaseyana</i>	74	73	13.55	16.64
B	<i>Chrysothamnus nauseosus</i>	1	0	1.00	-
B	<i>Cowania mexicana stansburiana</i>	2	1	.33	.15
B	<i>Gutierrezia sarothrae</i>	77	31	8.80	1.67
B	<i>Juniperus osteosperma</i>	1	2	1.63	.78
B	<i>Purshia tridentata</i>	17	14	5.50	6.99
B	<i>Ribes cereum cereum</i>	1	0	.15	-
B	<i>Sambucus cerulea</i>	1	0	-	-
Total for Browse		174	121	30.98	26.23

CANOPY COVER, LINE INTERCEPT --
Management unit 21 , Study no: 12

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	19.43
Gutierrezia sarothrae	1.11
Juniperus osteosperma	2.43
Purshia tridentata	10.19

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 21 , Study no: 12

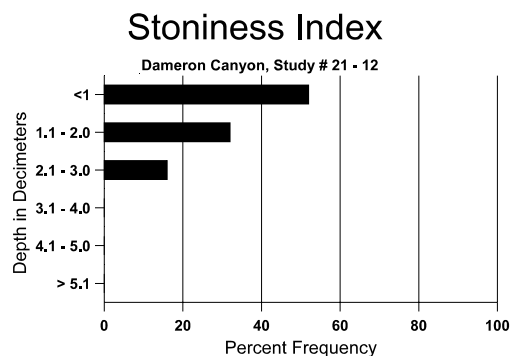
Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.6
Purshia tridentata	3.1

BASIC COVER --
Management unit 21 , Study no: 12

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.00	3.50	49.84	51.87
Rock	4.50	5.25	5.39	4.44
Pavement	7.50	12.00	6.49	6.28
Litter	64.25	52.50	61.09	40.47
Cryptogams	0	.25	1.30	.00
Bare Ground	20.75	26.50	9.62	15.61

SOIL ANALYSIS DATA --
Management unit 21, Study no: 12, Study Name: Dameron Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.6	68.0 (13.1)	6.8	44.7	30.7	24.6	3.7	11.9	163.2	0.9



PELLET GROUP DATA --
 Management unit 21 , Study no: 12

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	8	1	-	-
Elk	2	-	1 (2)	-
Deer	50	37	143 (353)	175 (431)
Cattle	1	1	-	5 (13)

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 12

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	5199	66	1333	3133	733	-	12	0	14	4	28/29
91	4799	3666	1066	2600	1133	-	43	6	24	13	24/26
98	2840	60	340	2000	500	400	17	.70	18	2	26/31
03	2560	-	40	1900	620	320	30	9	24	9	30/36
<i>Chrysothamnus nauseosus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	80	-	60	20	-	-	0	0	-	0	34/48
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Cowania mexicana stansburiana</i>											
85	66	-	-	-	66	-	0	100	100	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	80	-	20	60	-	20	100	0	0	0	78/107
03	20	-	20	-	-	-	0	0	0	0	62/82
<i>Gutierrezia sarothrae</i>											
85	1532	266	533	933	66	-	0	0	4	0	9/13
91	7198	600	2066	5066	66	-	0	0	1	0	10/9
98	10540	320	940	9520	80	20	0	0	1	.18	9/9
03	1320	80	20	1160	140	140	0	0	11	8	9/10
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Purshia tridentata											
85	332	-	-	266	66	-	0	100	20	20	46/43
91	200	-	-	200	-	-	33	33	0	0	43/66
98	400	40	-	380	20	20	50	25	5	0	51/67
03	360	-	-	300	60	20	11	67	17	6	57/72
Rhus trilobata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	72/96
03	0	-	-	-	-	-	0	0	-	0	58/60
Ribes cereum cereum											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	-	0	0	100	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Sambucus cerulea											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	100	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 21-13-03

Study site name: Walker Creek.

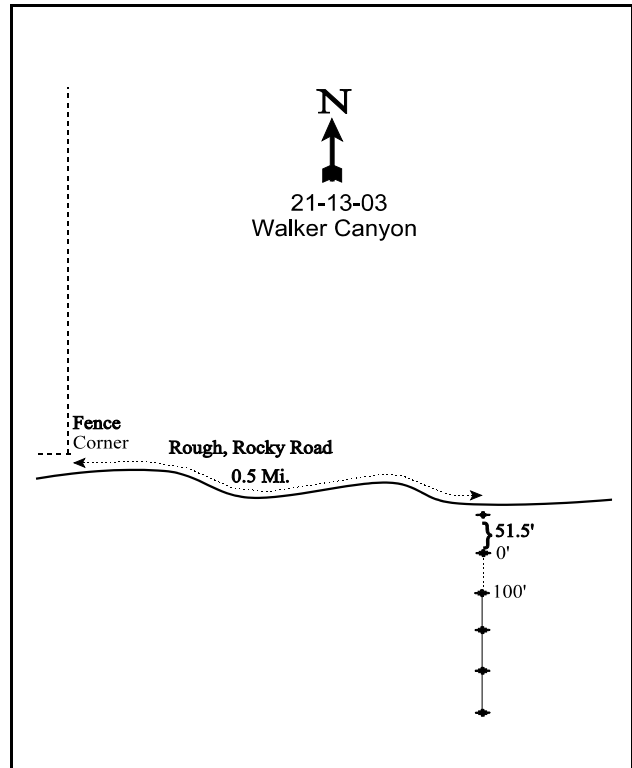
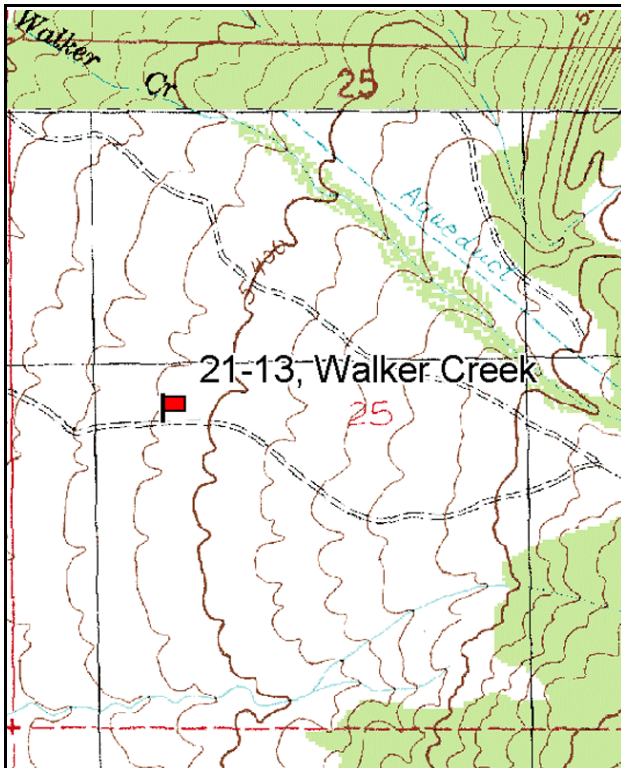
Vegetation type: Chained P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 3ft, belt 3 on 6ft, belt 4 on 1ft, and belt 5 on 6ft.

LOCATION DESCRIPTION

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. Go east 0.8 miles to a junction. Turn right and follow this road 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 27, UTM 12S 4302863 N, 381152 E

DISCUSSION

Walker Creek - Trend Study No. 21-13

The Walker Creek trend study is located on the gentle slopes below the Pahvant Range southeast of Meadow. The area is rather flat (0-3% slope to the west) at an elevation of 5,400 feet. Small intermittent draws in this area drain to the west. In 1966, about 270 acres in the Walker Creek area (BLM) were treated by dozing out individual junipers and leaving all other desirable browse species. The project was done primarily to benefit wildlife. Grazing was permitted in the past, but the area received very little cattle use. There was no evidence of livestock use in either 1998 or 2003 on this study. Wildlife pellet groups were abundant and well distributed throughout the area in 1985. Pellet group data from 1991 indicated a moderately high level of use at 100 deer days use/acre (247 ddu/ha). In addition, 2 deer carcasses were found on the site. A pellet group transect read parallel to the sampling baseline estimated 94 deer days use/acre (232 ddu/ha) and 124 deer days use/acre (306 ddu/ha) in 1998 and 2003 respectively. Most of the pellet groups in both years were from winter use. Resting and escape cover is widely available. Water is available in Meadow Creek about one-half mile to the north.

Soils have moderate depth with an effective rooting depth of almost 12 inches. Soil depth measurements were restricted by numerous rocks within the profile. Parent material is primarily from sandstone but some granite was found on the site. Soils are slightly acidic (pH of 6.4) and sandy clay loam in texture. Vegetation and litter cover are abundant, with bare soil understandably low. Erosion is minimal even in the small gullies around the area due to the abundant vegetation and litter cover. Unfortunately, most of this protective cover comes from cheatgrass. A soil condition class assessment completed in 2003 rated soils as stable. In 2003, average soil temperature was rather high at 80°F indicating a very dry soil profile.

The key browse species are basin big sagebrush and Stansbury cliffrose. Although all the big sagebrush on the site was classified as basin big sagebrush, some of the plants are hybrids with mountain big sagebrush as determined from a black light test. Big sagebrush density was estimated at 2,560 plants/acre in 1998 and 2,060 in 2003. Basin big sagebrush contributed 55% and 64% of the total browse cover on the site in 1998 and 2003 respectively. Percent decadence was estimated at 32% in 2003, up from 22% in 1998. Use increased to a more moderate level in 2003, but very few plants were heavily hedged. The majority of big sagebrush plants have displayed normal vigor in all surveys. Young plants were moderately abundant in 1985 and 1991, but have since declined to make up only 2% of the population in 1998 and none were sampled in 2003. Low reproduction is primarily the result of cheatgrass abundance in the understory which provides intense competition for seedling and young sagebrush to establish. This condition is exacerbated by extended bouts of low precipitation. Basin big sagebrush annual leaders averaged 1.3 inches of growth when the site was sampled in June 2003.

The Stansbury cliffrose population is stable averaging about 500 plants/acre since 1985. The cliffrose population had low decadence, normal vigor, and good recruitment in 1985 and 1991. Use in those years was mostly moderate. In 1998, cliffrose had reduced recruitment and the population was mostly mature. In 2003, percent decadence rose sharply to 46%, and half of the population showed heavy use. The cliffrose population has steadily increased in size with mature plants averaging 5 feet in height and 6 feet in width in 1998 and 2003. Plants are becoming less available to browsing animals due to height. The cliffrose is quite bushy, which could indicate some crossing with bitterbrush on the site. Cliffrose leaders averaged 3.4 inches of growth in June 2003.

Point quarter data from 2003 estimated 95 juniper trees/acre with an average trunk diameter of over 4 inches. Data from the old density plots estimated a much higher density of juniper at 800 plants/acre in 1985 and 999 in 1991. These estimates were made with 3, small .01 acre circular plots which do not adequately sample shrub or tree populations.

The herbaceous understory, like many of the sites within the Fillmore unit, is dominated by cheatgrass and annual forbs. Cheatgrass contributed 89% of the grass cover in 1998, but only 49% in 2003. A significant decline in cheatgrass cover and nested frequency in 2003 also occurred on most of the other sites within the unit, likely the result of drier than normal spring precipitation. However, cheatgrass remains abundant enough to pose a serious fire hazard to this area. Perennial grasses are uncommon with the exception of Sandberg bluegrass which has steadily increased over the years. Sandberg bluegrass significantly increased in nested frequency in 2003, while average cover for this species quadrupled. Although Sandberg bluegrass plants are relatively small, this increase is positive for the understory. Other perennial grasses sampled on the site include crested wheatgrass, bluebunch wheatgrass, and bottlebrush squirreltail. The forb component is sparse and has poor composition as annuals are the most abundant.

1985 APPARENT TREND ASSESSMENT

Soils appear to be stable with low levels of erosion. The key browse species, big sagebrush and cliffrose, appear to be stable. However, the lack of desirable grasses and forbs and the encroachment of junipers and broom snakeweed would indicate a slow downward trend. Another juniper treatment followed by seeding with a mix of perennial grasses and forbs may be warranted in the future.

1991 TREND ASSESSMENT

Soil trend appears stable but in poor condition because of very low value for basal vegetation cover. Bare ground is only moderate at 18%. Key browse for the site are basin big sagebrush and Stansbury cliffrose. The sagebrush population has a stable density, a slight decline in percent decadence, and use decreased somewhat. The cliffrose population is stable with slight increases in percent decadence and utilization. Broom snakeweed has increased in density by 30%. Trend for browse is stable. The herbaceous understory is very similar to the other sites in unit 21, having very few perennial species. Sandberg bluegrass is the only common species and it is a small plant which provides little amounts of useful forage. Trend is stable, but poor because of the overabundance of increaser species.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up due to a decline in percent bare soil from 18% to 4%. Litter cover has also increased. This change is primarily due to the vigorous stand of cheatgrass in the understory which provides half of the vegetation cover on the site and poses a significant fire hazard. Trend for the key browse species, basin big sagebrush and cliffrose is stable. Population densities are up slightly, but some of the difference may be due to the much larger sample used in 1998. Both populations are becoming increasingly mature, but vigor is currently good and percent decadence has declined. Heavy use has also declined since 1991. However, this stable trend is precarious due to the decline in the proportion of young plants in the population for both sagebrush and cliffrose. Some seedlings were found for cliffrose in 1998, however no sagebrush seedlings have been sampled since 1985. This is mostly due to the vigorous stand of cheatgrass which provides intense competition to the establishment of sagebrush seedlings. Without more recruitment in the future, these shrub populations will eventually decline. Another factor is the fire hazard posed by the abundant cheatgrass understory. It is not a question of if a fire will occur on this site but when. A fire would devastate the sagebrush and cliffrose on the site and eliminate this area as important deer winter range for many, many years. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses and forbs. However, they are both still deficient and cheatgrass continues to dominate.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Soils have a stable trend. Bare soil remains very low (6%), and vegetation and litter cover are abundant and effectively limit erosion. Trend for browse is slightly down. Basin big sagebrush and cliffrose both show slight declines in density, increases in decadence, and increased use. There are no young sagebrush in the population, and due to the abundance of cheatgrass and other annuals in the understory, sagebrush will have a difficult time increasing in population density in the future. Trend for the herbaceous understory is slightly up due to a significant increase in Sandberg bluegrass frequency. Cheatgrass also significantly declined in nested frequency, but this species remains abundant and still poses a fire hazard on the site.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 13

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	a1	a2	b17	ab10	.80	.22
G	Agropyron spicatum	-	-	1	4	.00	.15
G	Aristida purpurea	4	1	1	10	.15	.83
G	Bromus tectorum (a)	-	-	b374	a287	32.18	10.02
G	Poa secunda	a74	ab101	b111	c229	2.03	8.33
G	Sitanion hystrix	a3	a7	b42	b40	.72	.89
G	Vulpia octoflora (a)	-	-	b29	a1	.46	.00
Total for Annual Grasses		0	0	403	288	32.64	10.03
Total for Perennial Grasses		82	111	172	293	3.71	10.43
Total for Grasses		82	111	575	581	36.36	20.47
F	Alyssum alyssoides (a)	-	-	2	2	.00	.00
F	Asclepias asperula	2	-	-	-	-	-
F	Collinsia parviflora (a)	-	-	24	44	.08	1.52
F	Draba spp. (a)	-	-	14	-	.03	-
F	Eriogonum cernuum (a)	-	-	-	3	-	.15
F	Erodium cicutarium (a)	-	-	a1	b34	.03	.94
F	Eriogonum racemosum	2	-	-	-	-	-
F	Helianthus annuus (a)	2	-	-	-	-	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Holosteum umbellatum (a)	-	-	19	30	.06	.07
F	Lactuca serriola	-	-	2	-	.00	-
F	Microsteris gracilis (a)	-	-	_b 38	_a 5	.14	.01
F	Phlox longifolia	-	-	8	-	.07	-
F	Ranunculus testiculatus (a)	-	-	18	10	.08	.02
F	Zigadenus paniculatus	6	1	7	5	.07	.02
Total for Annual Forbs		2	0	116	128	0.44	2.74
Total for Perennial Forbs		10	1	17	5	0.14	0.01
Total for Forbs		12	1	133	133	0.58	2.75

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

BROWSE TRENDS --

Management unit 21 , Study no: 13

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata tridentata	78	63	15.96	18.90
B	Cowania mexicana stansburiana	27	24	7.35	3.42
B	Gutierrezia sarothrae	35	7	1.35	.30
B	Juniperus osteosperma	4	5	4.09	6.76
B	Opuntia spp.	2	0	.30	-
B	Purshia tridentata	0	1	-	-
Total for Browse		146	100	29.06	29.39

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 13

Species	Percent Cover	
	'98	'03
Artemisia tridentata tridentata	-	19.63
Cowania mexicana stansburiana	-	5.98
Gutierrezia sarothrae	-	.65
Juniperus osteosperma	4.19	8.46
Purshia tridentata	-	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 21 , Study no: 13

Species	Average leader growth (in)
	'03
Artemisia tridentata tridentata	1.3
Cowania mexicana stansburiana	3.4

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 13

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	145	95

Average diameter (in)	
'98	'03
2.9	4.2

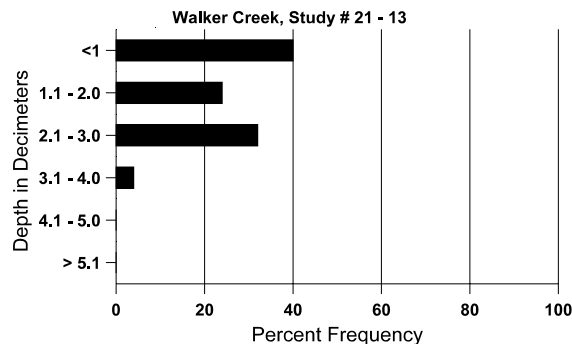
BASIC COVER --
Management unit 21 , Study no: 13

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	1.75	1.00	58.23	54.36
Rock	7.50	12.25	13.37	15.63
Pavement	3.75	4.25	3.85	2.12
Litter	65.50	64.50	70.77	46.40
Cryptogams	0	0	.69	.00
Bare Ground	21.50	18.00	3.53	5.86

SOIL ANALYSIS DATA --
Management unit 21, Study no: 13, Study Name: Walker Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.5	80.5 (7.0)	6.4	60.0	17.4	22.6	2.5	9.0	108.8	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 13

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	20	7	-	-
Deer	44	39	94 (232)	124 (306)

BROWSE CHARACTERISTICS --

Management unit 21 , Study no: 13

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata tridentata</i>											
85	1866	133	266	1000	600	-	39	14	32	4	23/29
91	1732	-	266	1000	466	-	12	4	27	12	25/32
98	2560	-	40	1960	560	580	2	0	22	7	29/38
03	2060	-	-	1400	660	440	36	5	32	11	30/40
<i>Cowania mexicana stansburiana</i>											
85	466	-	133	333	-	-	57	0	0	0	43/42
91	465	-	66	333	66	-	57	29	14	0	49/45
98	580	40	40	520	20	40	69	0	3	0	62/66
03	520	20	40	240	240	20	19	50	46	4	61/72
<i>Gutierrezia sarothrae</i>											
85	1999	600	266	1733	-	-	0	0	0	0	9/10
91	2866	266	400	2266	200	-	0	0	7	19	11/12
98	2080	80	340	1700	40	120	0	0	2	2	8/11
03	260	-	-	260	-	-	0	0	0	0	8/10
<i>Juniperus osteosperma</i>											
85	800	133	400	400	-	-	0	0	-	8	69/56
91	999	-	666	333	-	-	33	0	-	0	75/49
98	80	-	40	40	-	100	0	0	-	0	-/-
03	100	-	40	60	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	7/17
03	0	-	-	-	-	-	0	0	-	0	6/18

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Purshia tridentata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	100	-	0	8/12
Quercus gambelii											
85	0	66	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Rhus trilobata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	55/98

Trend Study 21-14-03

Study site name: Meadow Creek.

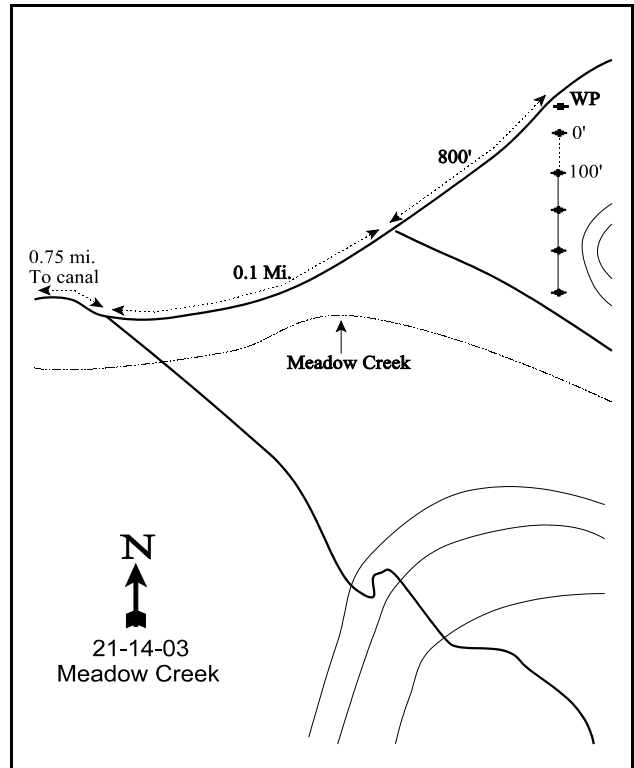
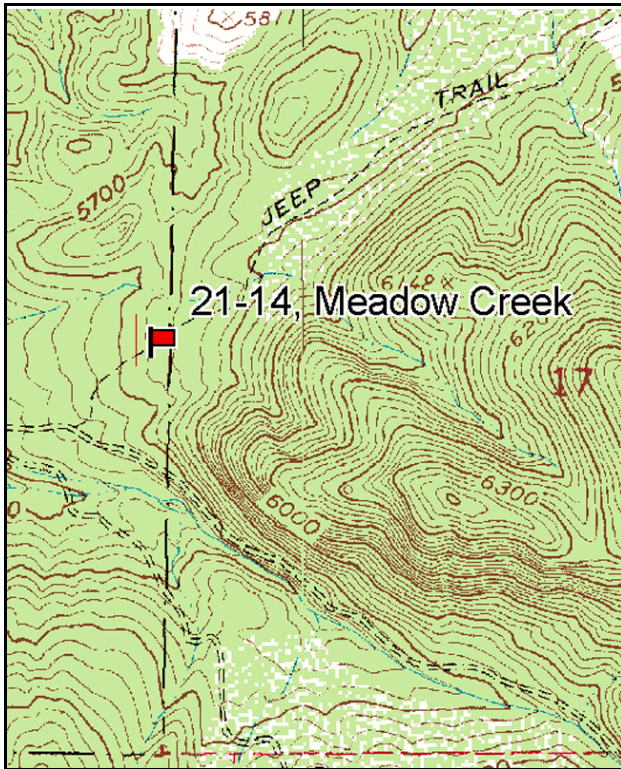
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the 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 27, UTM 12S 4306160 N, 384045 E

DISCUSSION

Meadow Creek - Trend Study No. 21-14

This study samples critical deer winter range on the foothills at the mouth of Meadow Canyon. The transect and surrounding BLM land is an important winter concentration area for big game. Slope varies from 4-8% and drains to the west. Elevation of the site is about 5,900 feet. The area was two-way chained and seeded in 1966, but juniper again dominates the overstory. A variety of preferred browse are found on the site including mountain big sagebrush, cliffrose, and bitterbrush. Deer use throughout the area has been moderate to heavy for decades. This is documented by pellet group counts at the DWR Meadow Creek pellet group transect which has an annual average of 61 deer days use/acre (151 ddu/ha) between 1980 and 1985 (Jense et al. 1985). This trend continued with average deer days use/acre increasing to 67 (165 ddu/ha) between 1985 and 1991 (Jense et al. 1990). Two deer carcasses were found on the site during the 1985 reading. Pellet group data taken along the study site baseline in 1998 and 2003 estimated 56 deer and 8 cow days use/acre (138 ddu/ha and 20 cdu/ha) and 71 deer and 4 cow days use/acre (175 ddu/ha and 9 cdu/ha) respectively. In 2003, deer use appeared to be evenly split between winter and spring.

Soils are derived from sandstone parent material which is found in the profile and scattered over the surface. Effective rooting depth was estimated at just over 13 inches. The upper layers of the profile are also very rocky as shown by penetrometer readings along the baseline. Soils are sandy clay loam in texture and slightly acidic (pH of 6.3). Phosphorus may be limiting to plant development at 7.6 ppm where 10 ppm is thought to be the minimum necessary for normal plant development. An erosion condition class assessment rated soils as stable in 2003. Cover from vegetation and litter is sufficient to slow erosion. Average soil temperature was measured at 73°F in 2003 indicating a dry soil profile.

A good variety of browse is growing on the site, but only mountain big sagebrush is abundant enough to be considered a key species. The chaining has become dominated by juniper and needs to be retreated to increase productivity. Point quarter data estimated an average of 360 juniper trees/acre in 1998 and 2003. Fifteen percent of the trees sampled were “chained-over” trees which were still living. Juniper provided 45% of the browse cover in 1998 increasing to 61% in 2003. Canopy cover of juniper averaged 17% in 1998 and 24% in 2003. This much canopy cover can depress understory production, especially during long periods of drought. Eighty-five percent of the trees sampled in 2003 were in the 4-12 foot tall range.

Mountain big sagebrush, cliffrose, and bitterbrush are the preferred browse species. Big sagebrush is the key species on this site due to its abundance. With the original smaller sample used in 1985 and 1991, mountain big sagebrush density was estimated at 13,600 and 7,400 plants/acre respectively. The population was almost entirely young plants in 1985. The much larger sample used in 1998 and 2003 more accurately estimates shrub populations with clumped and discontinuous distributions. Density was estimated at 1,640 in 1998 and 1,300 plants/acre in 2003. The proportion of young plants in the population has steadily decreased with each reading. No young were sampled in 2003. Conversely, percent decadence has steadily increased with each successive reading. More than half (57%) of the big sagebrush sampled in 2003 were classified as decadent. Vigor declined in 2003 with 28% of the population being rated as poor. Utilization on mountain big sagebrush has been light to moderate in all years. In 2003, annual sagebrush leaders averaged only 1 inch of growth in June 2003.

Cliffrose and bitterbrush provide additional palatable forage for wintering deer, although these species occur in low densities. Both species had densities around 100 plants/acre in 2003. Use on cliffrose has been light to moderate. Yet bitterbrush has shown very little use in all years except 1998 when this species was moderately browsed. In 2003, 83% of the cliffrose population was classified as decadent. Prior to 2003, both cliffrose and bitterbrush displayed good vigor with no decadent plants in either population. Both bitterbrush and cliffrose were noted as having abundant leaders and flowers in 2003. Average annual leader growth was 2.1

inches for bitterbrush and 3 inches for cliffrose in June of 2003. Broom snakeweed was abundant in 1985, but has steadily declined since with the dry conditions with only 20 plants/acre estimated in 2003.

The herbaceous understory at this site has decent diversity but only fair production. As a group, perennial grasses have remained stable over all readings. Crested wheatgrass, bluebunch wheatgrass, and Sandberg bluegrass are the primary species. Several other perennial grasses are present on the site but have only been sampled in a quadrat or two in all surveys. Cheatgrass is present in the understory but it does not dominate this site as at other studies in the Fillmore unit. Cheatgrass significantly decreased in nested frequency in 2003, but was still sampled in more than half of the quadrats. The forb component has been sparse in all readings. Annual species by far outnumber perennial forms with pale alyssum being the most abundant.

1985 APPARENT TREND ASSESSMENT

Due to the low rate of erosion and healthy vegetation and litter cover, soils appear to be stable. The increase of junipers could indicate a slow downward vegetation trend, although the area should continue to provide a good quality and quantity of browse for at least 10 or more years. The key species are vigorous and the current amount of hedging appears sustainable.

1991 TREND ASSESSMENT

The basic cover values indicate a stable condition, with basal vegetative cover fairly high at 12% and percent bare ground at 15%. The mountain big sagebrush population has decreased by 46%, but much of this decline was because of the excessively large young age class (96%) in 1985. It is now at a more healthy density of 7,399 plants/acre. Cliffrose and bitterbrush are stable. Broom snakeweed has declined by 70%. Trend for key browse is considered stable. The herbaceous understory is stable. Two grasses, crested wheatgrass and bluebunch wheatgrass, are doing well. There are not many forbs on the site, but this appears normal for this herd unit.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1991. Trend for the key browse species is down slightly. Changes in density of sagebrush and cliffrose are mostly due to the much larger sample used in 1998. However, biotic potential and the proportion of young plants in the populations of these species is low and declining. Percent decadence and the proportion of plants displaying poor vigor have both increased within the sagebrush population. The larger sample used in 1998 picked up a few bitterbrush that were not previously sampled. They appear to be stable, moderately browsed, and in good vigor. Juniper trees are abundant with an estimated density of 367 trees/acre (point quarter data). Overhead canopy cover varies on the site, but the average is 17%. It appears that the increasing juniper cover may be negatively affecting the sagebrush. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses slightly increased. Perennial forbs are still lacking.

TREND ASSESSMENT

soil - stable (3)

browse - slightly downward (2)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is slightly down. Vegetation and litter cover both slightly declined in 2003, while bare soil increased to 27%. Erosion remains low, but the dominance of juniper in the overstory appears to be limiting understory abundance and may result in less vegetation and litter cover in the future. Trend for browse is slightly down. Mountain big sagebrush density decreased by 21%, poor vigor increased from 11% to 28%, percent decadence increased from 18% to 57%, and no young plants were sampled in 2003. Eighty-three percent of the cliffrose were also classified as decadent. These negative parameters associated with the key browse species are likely the result of drier conditions compared to 1998 as well as a highly competitive environment resulting from the dominance of juniper on the site. The herbaceous understory is stable, but remains in only fair condition with few abundant perennials. This site would be a good candidate for treatment to reduce juniper and increase the productivity of the key browse and herbaceous species.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 14

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	_a 101	_{ab} 111	_b 147	_a 92	7.93	2.69
G	Agropyron smithii	-	2	-	3	-	.15
G	Agropyron spicatum	_b 102	_{ab} 89	_{ab} 66	_a 58	2.36	1.71
G	Bouteloua gracilis	3	-	-	-	-	-
G	Bromus japonicus (a)	-	-	6	5	.03	.03
G	Bromus tectorum (a)	-	-	_b 191	_a 142	2.62	1.34
G	Festuca myuros (a)	-	-	-	3	-	.00
G	Poa bulbosa	-	-	-	4	-	.06
G	Poa fendleriana	-	3	1	2	.03	.00
G	Poa secunda	_a 15	_a 31	_a 31	_b 85	.39	1.08
G	Sitanion hystrix	13	3	5	6	.21	.01
G	Vulpia octoflora (a)	-	-	_b 12	_a -	.05	-
Total for Annual Grasses		0	0	209	150	2.70	1.38
Total for Perennial Grasses		234	239	250	250	10.93	5.73
Total for Grasses		234	239	459	400	13.64	7.11

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Alyssum alyssoides</i> (a)	-	-	_b 222	_a 158	2.38	.77
F	<i>Allium</i> spp.	-	-	-	10	-	.01
F	<i>Arabis</i> spp.	-	2	2	1	.03	.00
F	<i>Astragalus</i> spp.	-	-	-	-	.00	-
F	<i>Calochortus nuttallii</i>	-	5	-	2	-	.00
F	<i>Collinsia parviflora</i> (a)	-	-	_a -	_b 20	-	.04
F	<i>Cryptantha</i> spp.	-	-	3	-	.15	-
F	<i>Descurainia pinnata</i> (a)	-	-	5	3	.04	.00
F	<i>Draba</i> spp. (a)	-	-	13	14	.04	.03
F	<i>Galium</i> spp.	-	-	-	6	-	.02
F	<i>Holosteum umbellatum</i> (a)	-	-	_a 11	_b 29	.02	.14
F	<i>Microsteris gracilis</i> (a)	-	-	_b 21	_a 5	.04	.01
F	<i>Phlox longifolia</i>	-	3	-	3	-	.01
F	<i>Plantago patagonica</i> (a)	-	-	3	-	.00	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	_a 2	_b 32	.01	.11
F	<i>Tragopogon dubius</i>	6	-	-	-	-	-
F	Unknown forb-perennial	2	-	-	-	-	-
F	<i>Zigadenus paniculatus</i>	-	3	-	-	-	-
Total for Annual Forbs		0	0	277	261	2.54	1.13
Total for Perennial Forbs		8	13	5	22	0.19	0.05
Total for Forbs		8	13	282	283	2.74	1.19

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

BROWSE TRENDS --

Management unit 21 , Study no: 14

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata vaseyana	45	44	8.82	7.20
B	Chrysothamnus nauseosus hololeucus	7	1	1.67	.03
B	Cowania mexicana stansburiana	2	3	1.62	.59
B	Gutierrezia sarothrae	10	1	.01	-
B	Juniperus osteosperma	16	20	12.07	14.86
B	Opuntia spp.	1	1	-	-
B	Purshia tridentata	2	2	.15	.63
B	Quercus gambelii	6	5	2.38	1.14
Total for Browse		89	77	26.76	24.46

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 14

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	5.09
Chrysothamnus nauseosus hololeucus	-	.10
Chrysothamnus viscidiflorus stenophyllus	-	.01
Cowania mexicana stansburiana	-	2.70
Juniperus osteosperma	17.00	24.29
Opuntia spp.	-	.03
Purshia tridentata	-	.21
Quercus gambelii	-	2.70

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 14

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.0
Cowania mexicana stansburiana	3.0

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 14

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	367	354

Average diameter (in)	
'98	'03
3.6	6.4

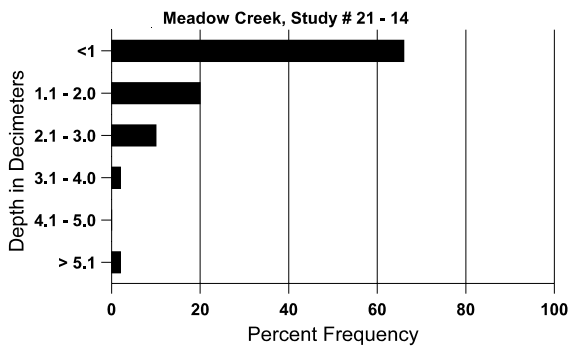
BASIC COVER --
Management unit 21 , Study no: 14

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	11.00	11.75	42.72	35.57
Rock	3.75	4.50	5.43	4.32
Pavement	4.25	6.50	6.07	2.23
Litter	63.50	61.25	55.46	49.52
Cryptogams	2.25	1.00	3.31	.81
Bare Ground	15.25	15.00	18.19	26.92

SOIL ANALYSIS DATA --
Management unit 21, Study no: 14, Study Name: Meadow Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.2	73.0 (8.7)	6.3	58.0	17.4	24.6	2.4	7.6	118.4	0.8

Stoniness Index



PELLET GROUP DATA --
Management unit 21 , Study no: 14

Type	Quadrat Frequency	
	'98	'03
Rabbit	46	11
Deer	22	16
Cattle	1	3

Days use per acre (ha)	
'98	'03
-	-
56 (138)	71 (175)
8 (20)	4 (9)

BROWSE CHARACTERISTICS --
Management unit 21 , Study no: 14

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	13600	1666	13000	600	-	-	.98	0	0	0	15/18
91	7399	-	1600	5333	466	-	10	7	6	4	6/6
98	1640	20	80	1260	300	440	15	2	18	11	25/37
03	1300	-	-	560	740	420	14	2	57	28	22/32
<i>Cercocarpus montanus</i>											
85	66	-	-	66	-	-	0	100	-	0	25/30
91	66	-	66	-	-	-	0	100	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	88/83
<i>Chrysothamnus nauseosus hololeucus</i>											
85	865	-	66	266	533	-	54	0	62	15	13/16
91	333	-	-	-	333	-	40	0	100	60	-/-
98	160	-	20	20	120	20	0	0	75	38	27/35
03	20	-	-	-	20	20	0	0	100	100	23/10
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	332	-	66	200	66	-	0	0	20	20	8/13
91	465	-	66	333	66	-	0	0	14	0	14/12
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	10/12
<i>Cowania mexicana stansburiana</i>											
85	199	-	66	133	-	-	67	33	0	0	20/28
91	199	-	133	66	-	-	67	0	0	0	35/39
98	40	-	20	20	-	40	0	0	0	0	55/63
03	120	-	-	20	100	-	17	0	83	17	67/64
<i>Ephedra viridis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	26/71
<i>Gutierrezia sarothrae</i>											
85	6999	400	2466	4133	400	-	0	0	6	.95	8/9
91	2132	-	200	1666	266	-	0	0	12	3	8/7
98	260	20	20	240	-	-	0	0	0	0	6/7
03	20	-	-	20	-	20	0	0	0	0	8/10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Juniperus osteosperma											
85	466	-	200	266	-	-	0	0	-	0	64/69
91	533	-	133	400	-	-	13	0	-	13	121/91
98	380	-	80	300	-	60	0	0	-	0	-/-
03	500	-	-	500	-	-	0	0	-	0	-/-
Opuntia spp.											
85	532	-	200	66	266	-	0	0	50	38	5/9
91	466	66	200	266	-	-	0	0	0	0	3/4
98	20	-	-	20	-	-	0	0	0	0	8/13
03	20	-	-	20	-	-	0	0	0	0	7/14
Purshia tridentata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	-	60	-	-	100	0	-	0	35/58
03	100	-	-	100	-	40	0	0	-	0	28/42
Quercus gambelii											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	780	-	360	420	-	-	0	0	0	0	43/29
03	800	-	180	580	40	-	0	0	5	0	35/26

Trend Study 21-15-03

Study site name: Fillmore Cemetery East.

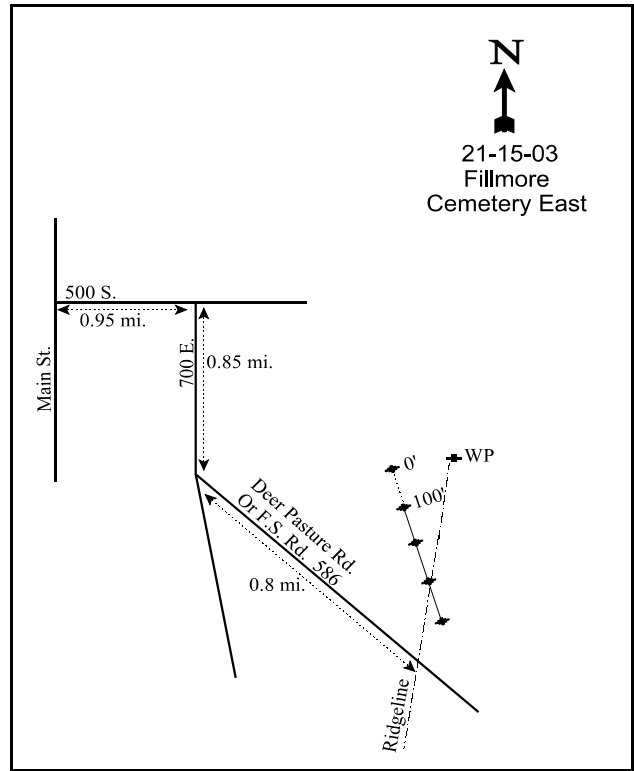
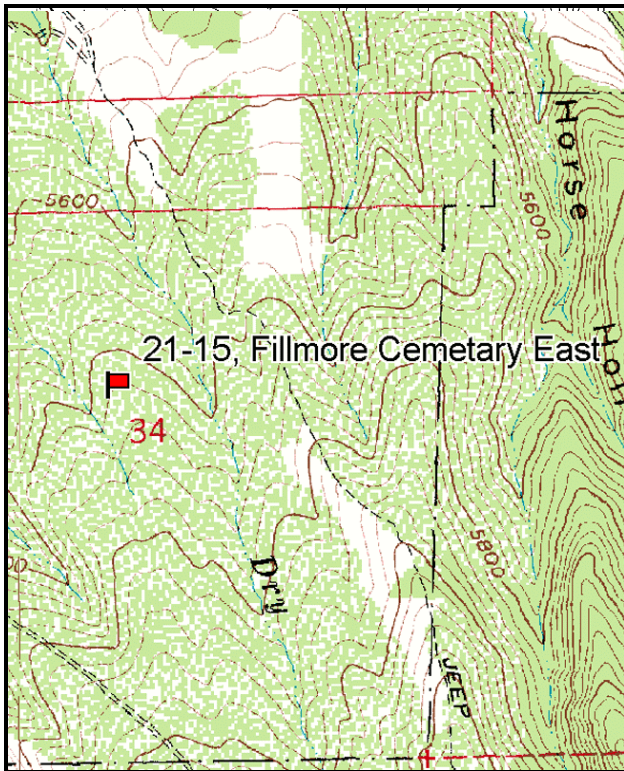
Vegetation type: Oak-Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From 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 27, UTM 12S 4311088 N, 388279 E

DISCUSSION

Fillmore Cemetery East - Trend Study No. 21-15

This study is located in the center of a Division owned section southeast of Fillmore. The site slopes to the northwest at 8% and has an elevation of 5,700 feet. The current community type is mountain big sagebrush-oak with scattered juniper. The site was chained and seeded in 1973. Cattle grazed the allotment in the late 1970's, but it has been rested since 1981. Pellet group data from the DWR South Chalk transect estimated an average of 49 deer days use/acre (121 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Deer use averaged 42 days use/acre (104 ddu/ha) between 1985 and 1990 (Jense et al. 1991). A pellet group transect read on site estimated 80 deer use days/acre (198 ddu/ha) in 1998 and 62 deer days use/acre (152 ddu/ha) in 2003. Elk use is minimal on this site at only 1 day use/acre (3 edu/ha) in 2003. Most of the pellet groups that were sampled in 1998 appeared to be from the fall or early winter of 1997 and were mostly centered around bitterbrush and sagebrush plants.

Soils on the site have fair depth, but are very rocky on the surface and throughout the profile. Effective rooting depth was estimated at almost 11 inches. Parent material is conglomerate, quartzite, and sandstone. Soils are slightly acidic (pH of 6.5) and sandy clay loam in texture. Under the shrubs, litter is deep and the organic content of the surface layer is relatively high. In the shrub interspaces there is a considerable amount of bare ground where rock/pavement cover is concentrated on the surface. However, erosion is not a serious problem on this site and any soil movement appears localized. An erosion condition class assessment rated soils as stable in 2003.

Overall, browse composition is dominated by mountain big sagebrush and Gambel oak. Oak occurs in scattered clones and in some places it is more abundant than sagebrush. All of the big sagebrush was classified as mountain big sagebrush although a portion of the population appears to be a hybrid with basin big sagebrush. Mountain big sagebrush provided about 60% of the browse cover in 1998 and 2003. Density has been fairly stable averaging about 2,500 plants/acre since 1985. There have been few young in all surveys, and percent decadence has been relatively high, ranging from 33% (1998) to 68% (1991). In 2003, nearly one-half of the decadent plants were classified as dying. With no young sampled in 2003, this may result in a population decline in the future. Use on big sagebrush has been light to moderate. Vigor was mostly normal in 1985 and 1998, but reduced on a portion of the population in 1991 and 2003. Annual sagebrush leaders averaged 1.8 inches of growth in June 2003.

Gambel oak occurs in dense clumps with many young sprouts. It appears to be increasing, with little sign of use, the trees are producing good quantities of browse that deer can utilize. The much larger sample used post-1992 sampled less oak compared to the earlier readings resulting in a lower density estimate. However, the larger sample better estimates shrub populations which often have clumped distributions such as oak on this site. Oak was estimated at 1,500 and 2,280 stems/acre in 1998 and 2003 respectively. Decadence is low, vigor normal, and use light on oak in all readings. Oak is rarely utilized on this site and is not as important to monitor as sagebrush and bitterbrush. Broom snakeweed was fairly common in 1998, but density declined by 81% in 2003.

Antelope bitterbrush occurs in low densities on the site and is found in the more open sagebrush areas. Bitterbrush density averaged 350 plants/acre in 1998 and 2003. This is a low-growing form due to moderate to heavy use. The population of bitterbrush has normal vigor and no decadence was noted in the population.

Perennial forbs and grasses are uncommon, especially where the oak is dense. Most of the herbaceous perennial species are found growing in close proximity to or underneath the protection of shrubs. The most common desirable grasses include bottlebrush squirreltail, crested wheatgrass, and Sandberg bluegrass. Bulbous bluegrass, a low value perennial, is increasing on the site. Cheatgrass and Japanese brome are

abundant and provided 60% of the grass cover in 1998 and 2003. Sum of nested frequency for annual grasses was nearly double that of perennial grasses in 2003. The abundance of annual grasses poses a serious fire hazard on this site as the key browse, mountain big sagebrush, is intolerant of fire. The dominance of annuals and the associated competition for resources creates an unfavorable environment for shrubs to reproduce in. Forbs are diverse, but have been dominated by annuals and thistle. The forb component was less abundant in 2003 compared to 1998 when pale alyssum was sampled at its highest frequency.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable to improving as erosion is slight and litter and soil conditions appear to be improving. Oak will continue to increase but the sagebrush is well established and it will take a long time to displace it. Therefore, the mixture of sagebrush and oak should supply forage and cover requirements for many years. A continued rest from grazing will benefit the scarce herbaceous vegetation.

1991 TREND ASSESSMENT

Soil trend is stable with most of the basic cover values remaining similar to 1985 conditions. Percent bare ground did increase slightly. Bare ground (relatively high) and vegetative basal cover (fairly low) should be watched closely for any significant changes. Key browse species sampled on the density plots were mountain big sagebrush and Gambel oak. Mountain big sagebrush demonstrated slight increases in density, but decadence increased to 68%, with 32% of the plants being classified as having poor vigor. The high percent decadence is a result of the drought we have been experiencing. Gambel oak exhibited a slight decrease in density, while broom snakeweed substantially increased. The overall trend for key browse is considered slightly down. Here again, we have the typically depleted understory of grasses and forbs for herd unit 21. There has been a slight increase (sum of nested frequency) for both grasses and forbs, but because the values are so low, trend is considered stable for now.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable. Declines in bare ground and litter cover balance each other out, as vegetation cover is relatively high. Erosion is not currently a problem on this site. Trend for browse is stable for the key species, mountain big sagebrush and bitterbrush. Density of Gambel oak declined in density due to the larger sample used in 1998. It is mostly not utilized and less important as forage. Sagebrush displays light to moderate use, improving vigor, and a decline in percent decadence from 68% to 33%. Young plants sampled in 1998 appear to be in sufficient numbers to maintain the current population. Bitterbrush was picked up in the larger sample used in 1998. Population density is currently estimated at 360 plants/acre. Utilization is moderate to heavy, but vigor is good and there were no decadent plants sampled. The herbaceous understory is depleted especially for forbs. Three species of perennial grasses are present in moderate numbers, but annual grasses consisting of Japanese brome and cheatgrass currently account for 60% of the grass cover. One of the perennial grasses is bulbous bluegrass, a less desirable species. It was first sampled in 1991 and has increased significantly in nested frequency. Forbs are diverse but dominated by annuals and thistle. Trend is considered stable.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover parameters are stable with very little sign of erosion in 2003. Trend for browse is stable. Mountain big sagebrush has a stable density with no young sampled in 2003. Decadence and poor vigor both slightly increased in 2003 but not enough to warrant a downward trend. The main negative factor with mountain big sagebrush is that 46% of the decadent plants were classified as dying in 2003. With no young in the population, big sagebrush density could decline in the future. The abundance of annual grasses in the understory has created an unfavorable environment for shrub species to reproduce in. Bitterbrush occurs in lower densities but has a stable, vigorous, healthy population. Gambel oak is slowly increasing, has low decadence, and good vigor. Although less preferred than big sagebrush and bitterbrush, oak in low densities provides some forage for wintering deer. Trend for the herbaceous understory is stable. Annual species, primarily cheatgrass and Japanese brome, dominate the understory, but perennial species have maintained stable frequencies since 1998. Bulbous bluegrass, a low value perennial, is slightly increasing on the site. Crested wheatgrass, bottlebrush squirreltail, and Sandberg bluegrass all have stable nested frequency values in 2003.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 15

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	22	11	28	23	1.03	.96
G	Agropyron spicatum	-	3	4	10	.03	.91
G	Bromus japonicus (a)	-	-	_b 155	_a 133	2.98	1.03
G	Bromus tectorum (a)	-	-	_a 266	_b 292	3.80	9.64
G	Festuca myuros (a)	-	-	-	8	-	.02
G	Poa bulbosa	_a -	_{ab} 8	_b 26	_c 66	1.16	2.07
G	Poa fendleriana	-	-	3	-	.03	-
G	Poa secunda	_a 16	_a 26	_b 55	_b 52	.87	.89
G	Sitanion hystrix	_a 22	_a 45	_{ab} 50	_b 77	1.35	2.04
G	Vulpia octoflora (a)	-	-	7	-	.01	-
Total for Annual Grasses		0	0	428	433	6.80	10.70
Total for Perennial Grasses		60	93	166	228	4.48	6.88
Total for Grasses		60	93	594	661	11.29	17.59

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Alyssum alyssoides</i> (a)	-	-	_b 157	_a 86	1.03	.45
F	<i>Arabis</i> spp.	-	-	3	-	.03	-
F	<i>Astragalus argophyllus</i>	2	3	3	-	.03	-
F	<i>Astragalus cibarius</i>	1	1	3	-	.04	-
F	<i>Asclepias</i> spp.	-	-	7	-	.18	-
F	<i>Calochortus nuttallii</i>	_a -	_b 8	_a -	_a -	-	-
F	<i>Chaenactis douglasii</i>	-	4	-	-	-	-
F	<i>Cirsium calcareum</i>	_a 17	_b 34	_a 15	_a 5	.70	.21
F	<i>Collinsia parviflora</i> (a)	-	-	8	5	.02	.01
F	<i>Crepis acuminata</i>	-	-	1	-	.00	-
F	<i>Cryptantha</i> spp.	-	3	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	13	1	.02	.00
F	<i>Draba</i> spp. (a)	-	-	_b 43	_a -	.42	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	3	-	.00	-
F	<i>Eriogonum racemosum</i>	-	5	-	-	-	-
F	<i>Galium boreale</i>	-	-	4	6	.01	.30
F	<i>Holosteum umbellatum</i> (a)	-	-	_b 27	_a 3	.06	.00
F	<i>Lactuca serriola</i>	_a -	_b 9	_a -	_a -	-	-
F	<i>Linum lewisii</i>	14	2	6	6	.04	.01
F	<i>Lithospermum ruderale</i>	6	7	-	5	.00	.16
F	<i>Machaeranthera canescens</i>	1	3	3	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	-	6	-	.04	-
F	<i>Phlox longifolia</i>	3	5	2	1	.01	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	_b 49	_a 9	.13	.01
F	<i>Sphaeralcea coccinea</i>	-	-	2	-	.00	-
F	<i>Streptanthus cordatus</i>	-	-	1	3	.00	.00
F	<i>Zigadenus paniculatus</i>	_a 6	_b 17	_{ab} 6	_{ab} 10	.07	.13
Total for Annual Forbs		0	0	306	104	1.74	0.49
Total for Perennial Forbs		50	101	56	36	1.14	0.82
Total for Forbs		50	101	362	140	2.89	1.31

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

BROWSE TRENDS --

Management unit 21 , Study no: 15

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata vaseyana	80	68	16.78	17.32
B	Gutierrezia sarothrae	41	18	2.22	.54
B	Juniperus osteosperma	0	0	-	1.16
B	Opuntia spp.	2	2	.15	-
B	Purshia tridentata	12	12	6.00	5.68
B	Quercus gambelii	16	19	2.68	3.82
Total for Browse		151	119	27.84	28.55

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 15

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	13.69
Gutierrezia sarothrae	.50
Juniperus osteosperma	2.68
Purshia tridentata	6.56
Quercus gambelii	6.88

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 15

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.8
Purshia tridentata	2.3

POINT-QUARTER TREE DATA --

Management unit 21 , Study no: 15

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	7	N/A

Average diameter (in)	
'98	'03
8.7	N/A

BASIC COVER --

Management unit 21 , Study no: 15

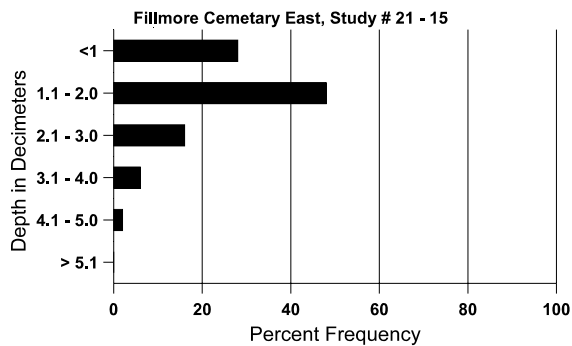
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	1.75	2.75	39.64	44.63
Rock	4.75	6.75	6.26	5.70
Pavement	17.25	12.50	16.35	9.59
Litter	57.25	57.00	54.25	43.54
Cryptogams	0	0	1.10	.57
Bare Ground	19.00	21.00	15.75	16.76

SOIL ANALYSIS DATA --

Management unit 21, Study no: 15, Study Name: Fillmore Cemetary East

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.7	66.0 (13.0)	6.5	46.0	27.4	26.6	2.8	23.4	169.6	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 15

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	15	6	-	-
Horse	1	-	-	-
Elk	-	-	-	1 (3)
Deer	51	35	80 (198)	62 (152)
Cattle	-	-	1 (2)	-

BROWSE CHARACTERISTICS --
Management unit 21 , Study no: 15

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	2466	66	-	1466	1000	-	38	0	41	5	26/29
91	2533	266	-	800	1733	-	13	0	68	32	31/35
98	2680	80	180	1620	880	520	15	0	33	7	28/38
03	2440	-	-	1440	1000	640	16	7	41	19	26/34
<i>Gutierrezia sarothrae</i>											
85	1399	266	933	466	-	-	5	0	0	14	7/6
91	2866	466	400	2333	133	-	0	0	5	0	9/11
98	5100	60	640	4460	-	-	0	0	0	0	7/9
03	980	-	60	880	40	80	0	0	4	2	7/9
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	20	-	-	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	7/16
03	40	-	-	40	-	-	0	0	-	0	6/19
<i>Purshia tridentata</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	360	-	60	300	-	-	67	17	-	0	21/46
03	340	-	-	340	-	-	0	100	-	0	25/87
<i>Quercus gambelii</i>											
85	9065	8066	7333	1666	66	-	2	0	1	7	66/45
91	8932	2266	5666	2200	1066	-	7	0	12	7	72/38
98	1500	180	700	800	-	300	0	0	0	0	50/35
03	2280	60	780	1240	260	360	10	.87	11	5	34/27

Trend Study 21-16-03

Study site name: Baker Canyon.

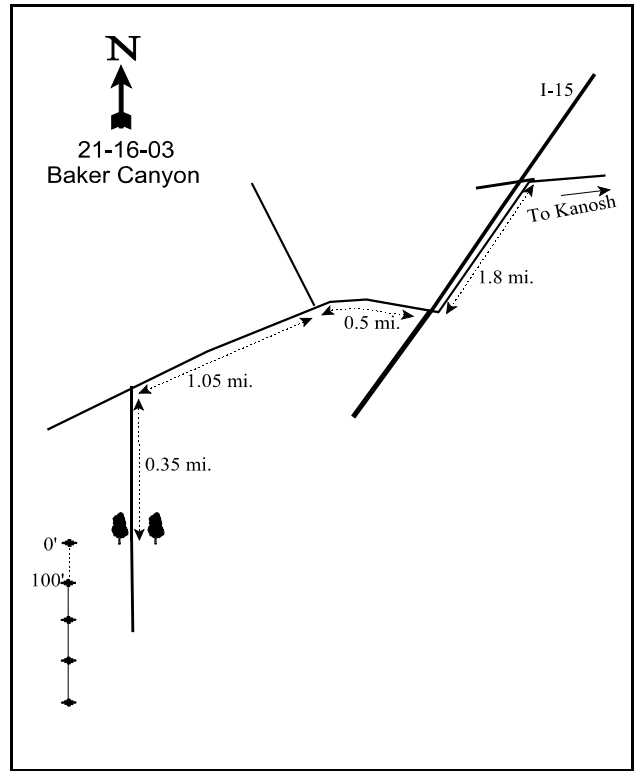
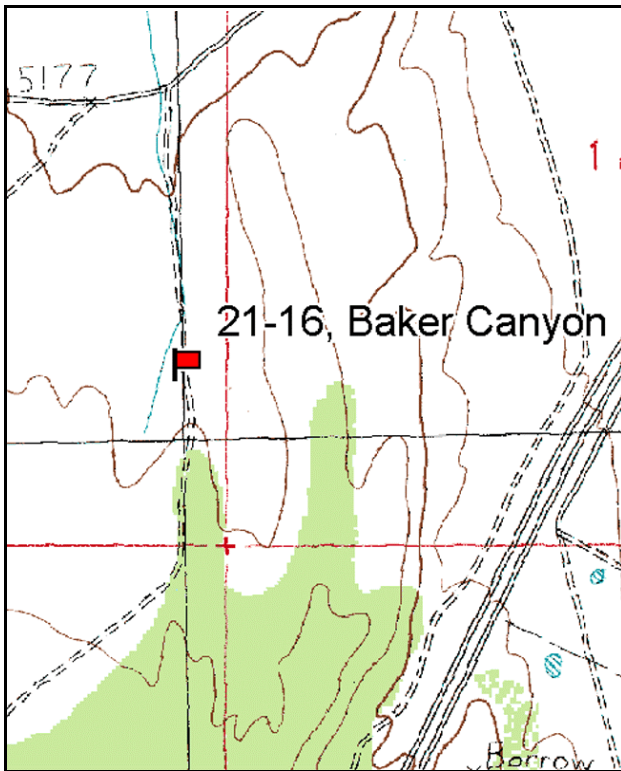
Vegetation type: Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

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 27, UTM 12S 4288116 N, 360986 E

DISCUSSION

Baker Canyon - Trend Study No. 21-16

The Baker Canyon trend study samples deer winter range west of Interstate 15 and the White Sage Flat area. It is an arid, nearly level site with a slight west, northwest aspect at an elevation of 5,300 feet. The range type is Wyoming big sagebrush-grass with scattered junipers. Some of the surrounding area was plowed and drilled with Russian wildrye in 1967, but the study site itself was not treated. The BLM did a control burn of the area prior to the 1991 survey to reduce Wyoming big sagebrush. The original frequency baseline remained unburned but the density plots were burned. The baseline was extended in 1998 which included the original frequency baseline and the burned density plots. This area has been used for spring grazing on a three pasture rest-rotation system. Traditionally, deer concentrate in the White Sage Flat area in the winter and spring, but past use was reported as being light. Sheep appeared to have used the area in the past putting heavy pressure on the sagebrush. Pellet group data from 1998 estimated 19 deer and 7 cow use days/acre (47 ddu/ha and 17 cdu/ha). Only 1 deer pellet group was sampled in the pellet group transect in 2003, while cattle use was estimated at 12 days use/acre (30 cdu/ha). The minimal amount of deer use on this site is concentrated in the fingers of unburned sagebrush. Use is also light due to the deer proof fence, built along I-15, which essentially eliminates historical winter deer migrations to the area. The heaviest use on this site appears to come from rabbits.

The soil is a moderately shallow, sandy clay loam of the Pharo Series which is very cobbly on the surface and throughout the soil profile. Parent material is limestone. Effective rooting depth was estimated at just over 11 inches. Soils on the site have undergone moderate erosion in the past as evidenced by pedestalling around bunchgrass and sagebrush stems, as well as the concentration of pavement and rock on the surface. Cover of rock and pavement has ranged from 25% to 37%. There is a buildup of litter and soil around the plants, but generally litter cover is low and bare soil abundant. Soil movement is not a serious problem because of the levelness of the terrain. An erosion condition class rated soils as stable in 2003. Average soil temperature at 12 inches in depth was high at nearly 70°F in 2003 indicating a dry soil profile.

Wyoming big sagebrush is the key browse although its density was greatly reduced following the controlled burn. Nearly all of the sagebrush on the site occurs within the unburned section while burned areas are dominated by herbaceous vegetation. Sagebrush density was estimated at 4,000 plants/acre in 1985, but only 780 and 560 plants/acre in 1998 and 2003 respectively. In the past, the rather short sagebrush plants had a "clubbed" appearance, which may be the result of past heavy hedging and poor annual growth. Utilization of the sagebrush was rated as moderate in all surveys with the exception of 2003 when use was light. Percent decadence and plants displaying poor vigor both increased in 2003 and no young plants were sampled. Annual sagebrush leaders averaged 1.3 inches of growth in June 2003.

Nevada ephedra provides additional palatable forage. Density was estimated at 100 plants/acre in 1998 increasing to 320 plants/acre in 2003. Rabbits have utilized some of the lower growing ephedra plants, but overall use is light to moderate. Sixty-nine percent of the ephedra sampled in 2003 were young plants indicating a possible population increase in the future. Some juniper trees were killed by the burn, but many remain scattered throughout the area.

Herbaceous vegetation makes up a significant component of this site especially on the burned portions. The most common perennial grasses are bluebunch wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail. Although not abundant on the transect, Russian wildrye was drill seeded as part of the original plowing treatment. It is quite abundant in the surrounding areas. The perennial grasses were large and robust in 2003 and had not been utilized. Cheatgrass is present but not dominant. Cheatgrass significantly decreased in nested frequency between 1998 and 2003 and average cover declined by nearly 80%. Perennial forbs are moderately abundant for this arid, low elevation site. Scarlet globemallow, Hood's phlox, and two *Astragalus*

species are the primary perennial forbs on the site. Annual forbs, primarily pale alyssum and bur buttercup, were very abundant in 1998 with the wet spring of that year. In 2003, drier conditions resulted in a dramatic decline in forbs.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable, mainly due to the levelness of the site. Vegetative trend also appears stable, except junipers appear to be slowly encroaching onto the sagebrush flat. The sagebrush appears to have been very heavily used but the age class composition indicates a self-sustaining population. This is an area where deer look for an early green-up feed source each spring. Any management to increase the herbaceous component without eliminating the sagebrush would be beneficial to both deer and livestock.

1991 TREND ASSESSMENT

The soil trend is stable with a slight increase in vegetative basal cover and small decrease in percent bare ground. The most significant change is the burn treatment that took place since 1985. It effected the density plots, but not the frequency baseline. The burn effectively left a mosaic pattern of shrub and grass openings. The key browse species, Wyoming big sagebrush, decreased by 95% while all of the juniper around the density plots were killed by the fire. For key browse, the overall trend is down. The herbaceous understory has shown significant improvement for the grasses, but much of the increased sum of nested frequency for forbs is for increasers like Russian thistle. Bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and bottlebrush squirreltail have all demonstrated substantial increases in their frequencies. The change is more significant than the data shows due to the fact that nearly all of the frequency data comes from the unburned part of the frequency baseline. Overall trend for herbaceous understory is up.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - up (5)

1998 TREND ASSESSMENT

Trend for soil appears down due to an increase in percent bare ground from 24% to 41% and a decline in litter cover (43% to 29%). Some of the differences are due to the much larger sample used in 1998 which sampled more of the burned areas. Previous frequency and cover data came almost entirely from an unburned finger of Wyoming big sagebrush which actually has higher vegetation and litter cover. The burned areas contain mostly bunchgrasses with bare ground in between. Photo point comparisons do not show any significant changes in ground cover characteristics. With this in mind, trend for soil is considered stable. No erosion is noticeable due in part to the level terrain. Trend for browse appears stable. Again, the last reading sampled sagebrush only in burned areas while the new, much larger sample includes part of the original frequency baseline which was left mostly unburned. Most of the mature and decadent shrubs sampled occurred within this unburned section. Utilization of the sagebrush is similar to 1991 levels, vigor is normal on all plants and percent decadence is low at 15%. However, recruitment is poor with no seedlings and few young being sampled. Trend for the herbaceous understory is stable for grasses but down for forbs. Nested frequency of the dominant grass, bluebunch wheatgrass, has increased significantly since 1991. This was in part due to the fact that more of the burned areas were sampled in 1998 where bluebunch wheatgrass is more abundant. All other perennial grasses encountered in 1991 declined significantly in nested frequency. Sum of nested frequency for perennial forbs has declined since 1991, but much of the difference is due to a lower frequency of Russian thistle. Trend is considered stable for the herbaceous understory.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Bare soil decreased by over 50% in 2003, but vegetation and litter cover also slightly declined. Rock and pavement increased, and erosion is not excessive. Trend for browse is slightly down. The key browse, Wyoming big sagebrush, declined in density, has no recruitment, and 21% of the population was classified in poor vigor. Percent decadence also increased from 15% to 29%. The most positive change in the browse component is due to the increase in Nevada ephedra. Young plants make up 69% of the population indicating a possible increase in the future. The herbaceous understory is stable overall although perennial grasses and forbs show opposite trends. Perennial grasses increased in sum of nested frequency while perennial forbs decreased. Bluebunch wheatgrass and bottlebrush squirreltail are stable while Sandberg bluegrass is increasing. Cheatgrass is much less abundant in 2003 compared to 1998.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 16

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	_a 77	_a 69	_b 132	_b 134	7.48	9.98
G	Bromus tectorum (a)	-	-	_b 238	_a 100	6.51	1.39
G	Elymus junceus	-	-	1	-	.00	-
G	Oryzopsis hymenoides	_a 4	_b 23	_a 8	_{ab} 14	.39	.38
G	Poa fendleriana	8	-	1	-	.15	-
G	Poa secunda	_a 53	_{ab} 96	_a 62	_b 110	1.73	2.16
G	Sitanion hystrix	_a 28	_b 68	_a 24	_a 22	.52	.68
Total for Annual Grasses		0	0	238	100	6.51	1.39
Total for Perennial Grasses		170	256	228	280	10.27	13.23
Total for Grasses		170	256	466	380	16.79	14.62
F	Alyssum alyssoides (a)	-	-	_b 304	_a 19	3.30	.05
F	Antennaria rosea	-	3	-	-	-	-
F	Astragalus calycosus	_a -	_c 48	_c 62	_b 12	.93	.08
F	Astragalus marianus	_b 17	_b 26	_{ab} 3	_a -	.04	-
F	Calochortus nuttallii	-	3	-	-	-	-
F	Chaenactis douglasii	3	12	-	-	-	-
F	Comandra pallida	-	-	5	6	.03	.18

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Crepis acuminata</i>	-	2	-	-	-	-
F	<i>Draba</i> spp. (a)	-	-	4	-	.01	-
F	<i>Erodium cicutarium</i> (a)	-	-	59	71	1.17	2.45
F	<i>Gilia</i> spp. (a)	-	-	-	2	-	.00
F	<i>Lactuca serriola</i>	-	4	1	-	.00	-
F	<i>Machaeranthera canescens</i>	c33	b8	bc15	a-	.23	-
F	<i>Phlox hoodii</i>	a25	b56	b64	a29	2.58	1.12
F	<i>Phlox longifolia</i>	a-	b18	a-	a3	-	.00
F	<i>Ranunculus testiculatus</i> (a)	-	-	b138	a-	1.04	-
F	<i>Salsola iberica</i> (a)	a-	b58	a-	a-	-	-
F	<i>Sphaeralcea coccinea</i>	14	25	33	28	1.40	1.28
F	<i>Thlaspi alpestre</i>	b11	a-	a-	a-	-	-
Total for Annual Forbs		0	58	505	92	5.53	2.50
Total for Perennial Forbs		103	205	183	78	5.23	2.68
Total for Forbs		103	263	688	170	10.77	5.18

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

BROWSE TRENDS --

Management unit 21 , Study no: 16

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia tridentata wyomingensis</i>	23	19	3.15	4.82
B	<i>Chrysothamnus nauseosus hololeucus</i>	1	2	1.00	.71
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	10	12	.99	1.22
B	<i>Ephedra nevadensis</i>	4	6	1.23	1.91
B	<i>Juniperus osteosperma</i>	2	2	2.90	3.12
Total for Browse		40	41	9.29	11.78

CANOPY COVER, LINE INTERCEPT --

Management unit 21 , Study no: 16

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	3.20
Chrysothamnus nauseosus hololeucus	-	.85
Chrysothamnus viscidiflorus stenophyllus	-	.46
Ephedra nevadensis	-	.95
Juniperus osteosperma	1.79	6.40

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21 , Study no: 16

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.3

POINT-QUARTER TREE DATA --

Management unit 21 , Study no: 16

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	N/A	34

Average diameter (in)	
'98	'03
N/A	2.8

BASIC COVER --

Management unit 21 , Study no: 16

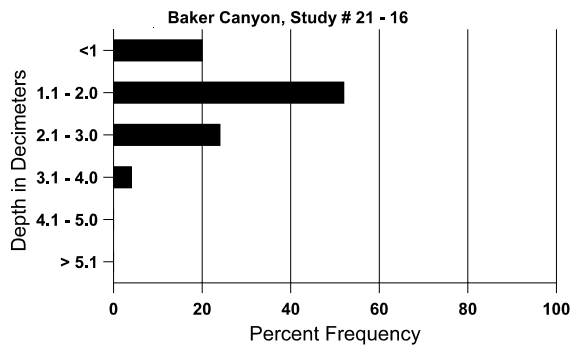
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	2.50	4.50	33.32	29.96
Rock	2.00	2.75	4.11	2.98
Pavement	26.00	22.75	23.60	34.47
Litter	40.25	42.75	28.61	23.34
Cryptogams	4.50	3.75	1.54	1.45
Bare Ground	24.75	23.50	40.77	19.85

SOIL ANALYSIS DATA --

Management unit 21, Study no: 16, Study Name: Baker Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
11.1	69.4 (12.0)	7.1	48.0	27.4	24.6	1.0	16.8	140.8	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 21, Study no: 16

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	7	32	-	-
Deer	13	9	19 (47)	1 (2)
Cattle	4	-	7 (17)	12 (30)

BROWSE CHARACTERISTICS --

Management unit 21, Study no: 16

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	3999	600	600	1733	1666	-	65	7	42	13	26/22
91	199	-	133	66	-	-	67	0	0	0	8/8
98	780	-	40	620	120	480	51	3	15	0	21/27
03	560	-	-	400	160	460	7	0	29	21	23/34
Chrysothamnus nauseosus hololeucus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	43/80
03	40	-	40	-	-	-	0	0	-	0	27/44

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	66	-	-	66	-	-	100	0	0	0	10/4
98	260	-	-	260	-	20	0	0	0	0	10/13
03	360	-	-	320	40	-	0	0	11	0	11/20
Ephedra nevadensis											
85	66	-	-	66	-	-	100	0	0	0	19/21
91	66	-	-	66	-	-	0	0	0	0	30/43
98	100	-	40	60	-	-	20	20	0	0	26/49
03	320	-	220	80	20	-	6	13	6	6	24/44
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	14/19
03	0	-	-	-	-	-	0	0	-	0	-/-
Juniperus osteosperma											
85	266	133	266	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	-/-
03	40	-	20	20	-	-	0	0	-	0	-/-
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	11/25

Trend Study 21-17-03

Study site name: Pioneer Peak.

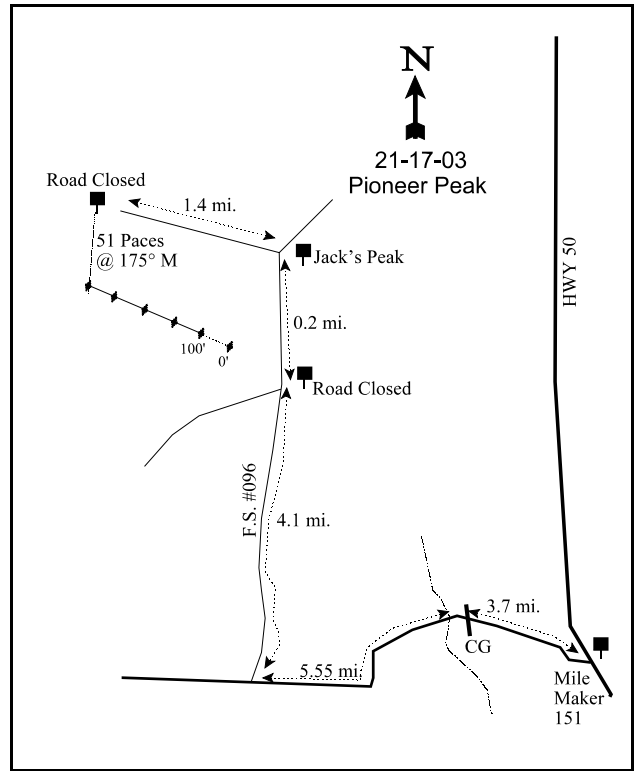
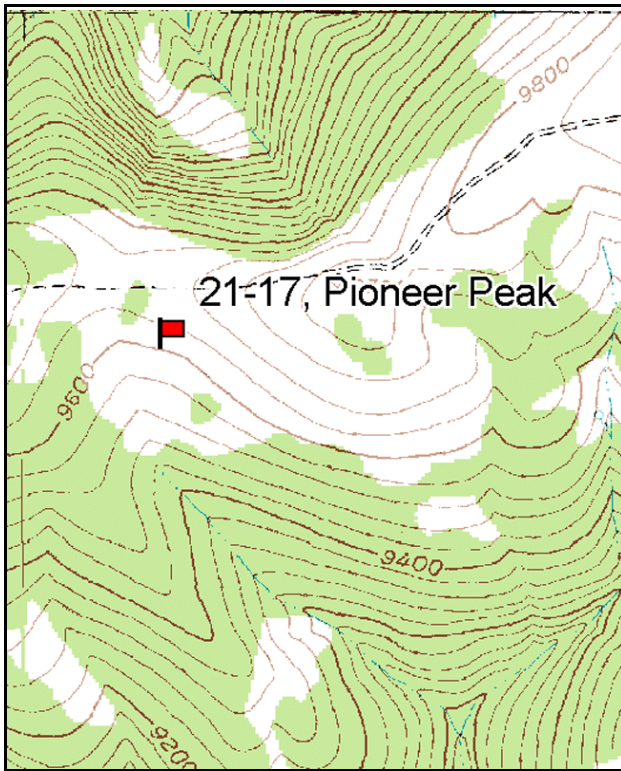
Vegetation type: Perennial grass/forb.

Compass bearing: frequency baseline 281 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). No rebar.

LOCATION DESCRIPTION

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 27, UTM 12S 4316480 N, 399264 E

DISCUSSION

Pioneer Peak - Trend Study No. 21-17

This study is located on the east side of the Pahvant Plateau near Pioneer Peak. The trend study was established in 1997 to address conflicts between elk and livestock grazing in this area. The transect samples a dry meadow type bordered on two sides by aspen at an elevation of 9,600 feet. It is located on a saddle that was contour furrowed and seeded in the past. Aspect is south-southeast with a slope of 20% to 25%. Cattle and elk use the area during the summer. A pellet group transect estimated 1 deer, 22 elk, and 33 cattle days use/acre (3 ddu/ha, 54 edu/ha, and 82 cdu/ha) in 1997. Cattle were present on the site in 1997 during study establishment and had utilized much of the grasses on the site, especially orchard grass. Cattle were also present in the area during the 2003 survey. In 2003, Elk use was estimated at 2 days use/acre (5 edu/ha) and cattle use at 19 days use/acre (47 cdu/ha). Most of the use on the site occurs on the seeded contoured furrows. A cattle pond is located about 200 yards down slope from the study site.

Soil on the site is deep with an estimated effective rooting depth of nearly 24 inches. Textural analysis indicates soils to be a clay loam with a moderately acidic pH (6.0). There are some large boulders on the surface and in the profile, but the soil is mostly rock free. Vegetation cover is abundant and consists almost entirely of grasses and forbs. Litter cover is fair. Although bare ground cover is common at 31% and 46% in 1997 and 2003 respectively, erosion is low due to the abundance of herbaceous vegetation and the contoured furrows. There is a lot of rodent burrowing throughout the site.

The plant composition is made up of almost entirely of grasses and forbs. No browse species were sampled in the density strips in either reading, although a few mountain snowberry and skunkbush sumac were measured for height and crown in 2003. Mature aspen clones border the site and mature trees appear high-lined. There are no young trees along the clone borders.

The herbaceous understory is abundant and diverse. Eight perennial grasses combined to produce nearly 20% average cover in 1997. An additional species, Kentucky bluegrass, was sampled in 2003. Species that appear to have been seeded onto the site include intermediate wheatgrass, mountain brome, smooth brome, and orchard grass. These species dominate the herbaceous understory and accounted for 84% of the grass cover in 1997 and 66% in 2003. Native grasses include slender wheatgrass, onion grass, subalpine needlegrass, and Letterman needlegrass. The significant increase in subalpine needlegrass and corresponding significant decrease in Letterman needlegrass between years is partly due to identification problems. The needlegrasses were present in intermediate forms that were difficult to distinguish between. The seeded grasses occur mainly in the furrows and were moderately utilized in 2003. Conversely, native grasses occur mostly in between furrows and receive minimal use.

Twenty-five species of forbs have been sampled on this site. They produced about 19% average cover in both 1997 and 2003. There are some useful species along with several increasers and undesirable species. The undesirable species include tarweed which is present in scattered clumps but is not widespread. The presence of tarweed along with larkspur, sticky geranium, slenderleaf collomia, hoary aster, dandelion, and sandwort indicate continued disturbance and past site degradation. Initially this area was most likely a tall forb community that, after being historically overgrazed by livestock, lost some of its site potential due to soil loss.

1997 APPARENT TREND ASSESSMENT

The soil trend appears stable even though percent bare ground is relatively high at 30%. Contour furrows, along with the abundant herbaceous vegetation cover, effectively limit erosion. However, litter cover is relatively low for a high elevation site like this one. Browse species are insignificant on the site but aspen

clones nearby appear to have been impacted by grazing. Mature trees are highlined and no reproduction is evident. The herbaceous understory is abundant with about one-half of the cover coming from grasses and the other half coming from forbs. However, forb composition is poor due to the abundance of less desirable species such as tarweed and larkspur. The site potential has obviously been reduced in the past due to overgrazing and soil erosion. It is not currently known what this site can support, but future trends for the herbaceous understory will depend on changes in nested frequency of larkspur, tarweed, and some of the other increasers.

2003 TREND ASSESSMENT

Trend for soil is slightly down. Erosion remains low, but bare soil increased to 46% and litter cover declined. There is no browse trend on this site as browse is insignificant on the site and of little importance on this high elevation summer range. Trend for the herbaceous understory is slightly down. Perennial grasses declined in sum of nested frequency overall. The only increase of significance comes from the combination of subalpine needlegrass and Letterman needlegrass which have only fair forage value. Orchard grass, intermediate wheatgrass, and mountain brome all significantly declined in nested frequency in 2003. Weeds and increasers still dominate the forb component and the number of desirable forb species are outnumbered by more than two to one. Annual forbs significantly decreased in nested frequency in 2003, with perennials remaining fairly stable. Neither tarweed or larkspur increased in 2003 which is a positive sign. Pacific aster did significantly increase however.

TREND ASSESSMENT

soil - slightly down (2)

browse - no trend (n/a)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 17

T y p e	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	Agropyron intermedium	_b 201	_a 169	8.41	6.84
G	Agropyron trachycaulum	_a 7	_b 35	.04	1.02
G	Bromus carinatus	_b 173	_a 135	5.08	2.86
G	Bromus inermis	63	39	2.18	1.75
G	Dactylis glomerata	_b 72	_a 5	.87	.01
G	Melica bulbosa	2	3	.01	.03
G	Poa pratensis	-	6	-	.03
G	Stipa columbiana	_a 1	_b 104	.00	4.00
G	Stipa lettermani	_b 125	_a 66	3.05	.78
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		644	562	19.66	17.34
Total for Grasses		644	562	19.66	17.34
F	Achillea millefolium	_a 1	_b 13	.03	.10
F	Agoseris glauca	_b 23	_a 3	.18	.04

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
F	Arabis spp.	16	24	.08	.12
F	Artemisia dracunculoides	2	2	.03	.68
F	Aster chilensis	_a 6	_b 102	.01	1.54
F	Collomia linearis (a)	_b 225	_a 84	2.25	.26
F	Delphinium occidentale	30	20	3.72	3.48
F	Epilobium paniculatum (a)	_b 25	_a -	.16	-
F	Erigeron eatonii	4	1	.00	.03
F	Geranium spp.	5	5	.39	.47
F	Lupinus argenteus	47	49	1.99	3.11
F	Machaeranthera canescens	_b 150	_a 107	2.51	2.13
F	Madia glomerata (a)	79	72	2.21	1.25
F	Mertensia spp.	18	10	.38	.27
F	Orthocarpus tolmiei (a)	5	3	.18	.03
F	Penstemon spp.	-	4	-	.01
F	Polygonum douglasii (a)	_b 184	_a 108	1.00	1.25
F	Ranunculus spp.	13	-	.19	-
F	Senecio spp.	-	4	-	.06
F	Stellaria jamesiana	_b 121	_a 38	1.03	.15
F	Taraxacum officinale	12	19	.08	.26
F	Tragopogon dubius	2	6	.03	.09
F	Vicia americana	50	46	.61	.74
F	Viguiera multiflora	121	117	1.40	3.44
F	Viola spp.	8	-	.09	-
Total for Annual Forbs		518	267	5.83	2.80
Total for Perennial Forbs		629	570	12.78	16.78
Total for Forbs		1147	837	18.61	19.58

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

BASIC COVER --

Management unit 21 , Study no: 17

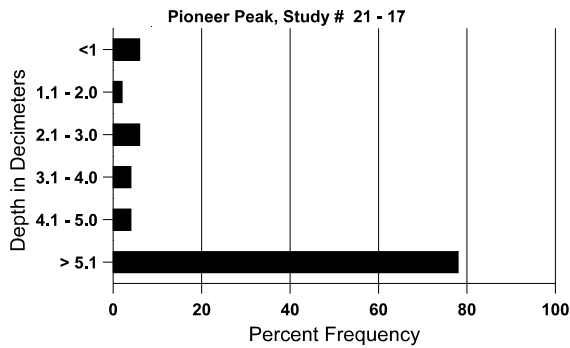
Cover Type	Average Cover %	
	'97	'03
Vegetation	50.48	35.20
Rock	3.24	3.06
Pavement	.43	.27
Litter	29.64	23.47
Cryptogams	1.00	0
Bare Ground	29.97	45.79

SOIL ANALYSIS DATA --

Management unit 21, Study no: 17, Study Name: Pioneer Peak

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
23.9	47.6 (17.7)	6.0	42.7	26.7	30.6	3.3	18.4	188.8	0.2

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 17

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Elk	5	1	22 (54)	2 (5)
Deer	-	-	1 (2)	-
Cattle	9	6	33 (82)	19 (47)

BROWSE CHARACTERISTICS --

Management unit 21 , Study no: 17

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Rhus trilobata											
97	0	-	-	-	-	-	0	0	-	0	6/9
03	0	-	-	-	-	-	0	0	-	0	-/-
Symphoricarpos oreophilus											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	19/49

Trend Study 21-18-03

Study site name: Teeples Ridge.

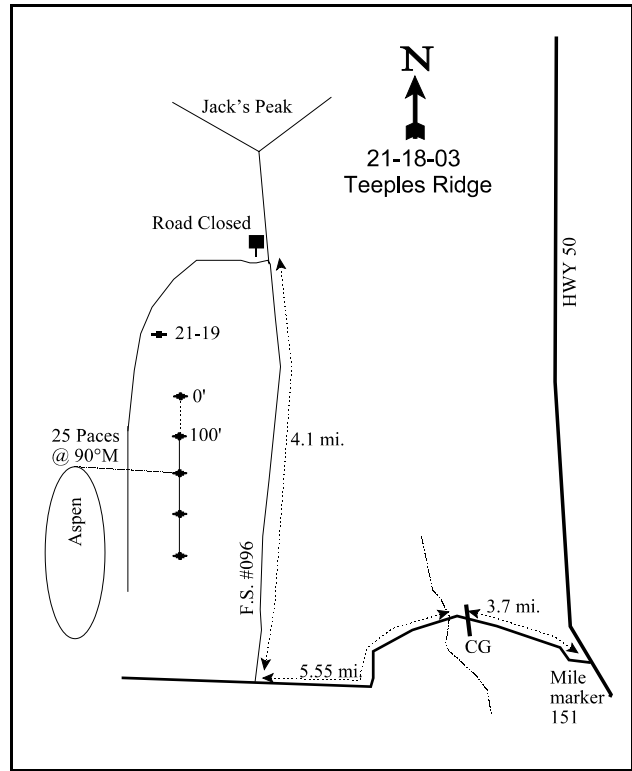
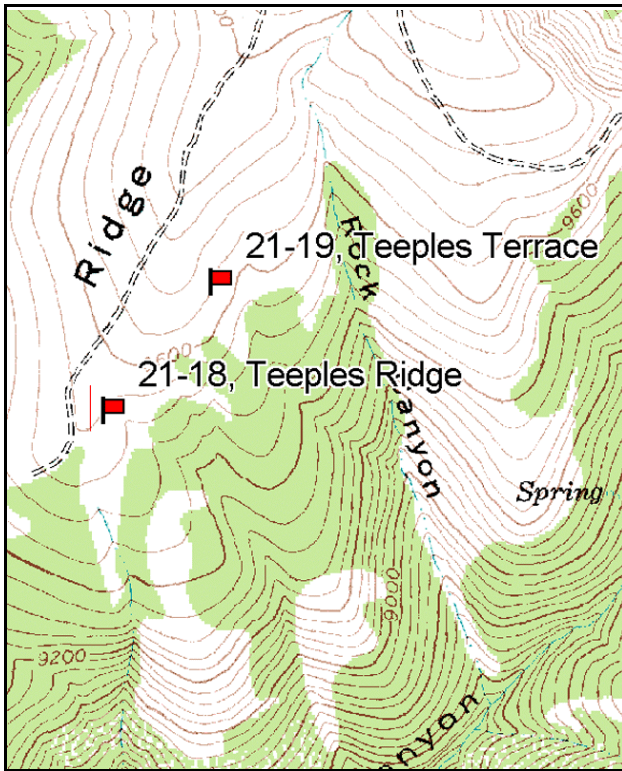
Vegetation type: Perennial grass/forb.

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

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: Mount Catherine

Diagrammatic Sketch

Township 21S, Range 3W, Section 13

GPS: NAD 27, UTM 12S 4315093 N, 400637 E

DISCUSSION

Teeples Ridge - Trend Study No. 21-18

This study was established in 1997 to monitor cattle and elk grazing competition about one-half mile south of Jack's Peak. The site samples a dry meadow type bordered by aspen which provides excellent escape cover for deer and elk. Slope varies from 8% to 15% with a south-southeast aspect. Elevation is approximately 9,500 feet. This area is used by deer, elk, and cattle during the summer. Cattle were grazing on the area when the study was established (8/21/97). Pellet group transect data estimated 61 elk and 50 cow use days/acre (151 edu/ha and 124 cdu/ha) in 1997. Data from 2003 estimated 18 elk (45 edu/ha) and 23 cow days use/acre (57 cdu/ha). Deer use was estimated at only 2 days use/acre (5 ddu/ha) in both 1997 and 2003. Aspen stands near the site were mostly mature highlined trees with little or no reproduction evident.

Soils on the site are deep and rock free with an effective rooting depth estimated at nearly 17 inches. Soil texture is a clay loam with a slightly acidic pH (6.4). Soil organic matter is moderately high at 3.8%. There is a considerable amount of bare soil estimated at nearly 40% in 1997 and 2003. Herbaceous vegetation and litter cover are moderate. Although not severe, erosion is evident from gullies and rills throughout the site. Soils were rated as slightly eroding from a condition class assessment in 2003.

Like Pioneer Peak, this site is dominated by grasses and forbs. Sagebrush is found to the north and aspen clones border the site to the east and west. Due to the apparent deep, rock free soil and lack of shrubs, this site also probably once supported a tall forb community. The area was seeded as part of the same watershed protection project that was done at Pioneer Peak. Although browse is not an important aspect of this summer range, a small number of mountain big sagebrush were encountered near the start of the baseline.

The herbaceous understory is relatively abundant with 30 species sampled in 2003. Total herbaceous cover was 31% in 1997 and 34% in 2003. This kind of a site should be producing at least 50% vegetative cover, and it is far below its potential. Two seeded grasses, smooth brome and intermediate wheatgrass, are the most common grass species providing 97% of the grass cover in both readings. Both species had increased nested frequency values in 2003 and showed light to moderate use. The most abundant forbs are annuals and weedy increasers including western yarrow, larkspur, and hoary aster. Tuber starwort was very abundant in 1997, but less so in 2003. The dominance of weeds and increasers suggests disturbance caused by heavy grazing. Bluebell, a preferred perennial forb is present on the site in low numbers and was heavily utilized by grasshoppers in 2003.

1997 APPARENT TREND ASSESSMENT

The soil trend appears stable although there is a considerable amount of bare ground. Erosion is not severe due to the lack of slope. Browse is not an important aspect of this summer range and there are only a few sagebrush and low rabbitbrush along the beginning of the baseline. The herbaceous understory is fairly abundant but the composition is poor, especially for forbs. The grass component is dominated by smooth brome and intermediate wheatgrass which account for 97% of the grass cover. Forb composition is dominated by increasers and poisonous species including western yarrow, larkspur, hoary aster, and tuber starwort. These species occur at high densities and account for 78% of the forb cover. Future herbaceous trends will depend on changes in nested frequency for these increaser species.

2003 TREND ASSESSMENT

Trend for soil is stable. Erosion is evident, but not severe. Ground cover parameters (vegetation, litter, and bare soil) are stable. As with the Pioneer Peak study, browse is insignificant on the site and there is no trend. Trend for the herbaceous understory is stable overall. Perennial grasses increased in sum of nested frequency

while forbs declined. Smooth brome and intermediate wheatgrass dominate the grasses. Both species have significantly increased in nested frequency since 1997. The forb component remains dominated by weeds and increasers, and is far below it's productivity potential. Perennial forbs decreased in sum of nested frequency due mostly to the significant decline in tuber starwort. Overall, sum of nested frequency of perennial grasses and forbs remained similar between readings.

TREND ASSESSMENT

soil - stable (3)

browse - no trend (n/a)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 18

T y p e	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	Agropyron intermedium	_a 166	_b 199	4.40	7.61
G	Agropyron trachycaulum	2	-	.00	-
G	Bromus carinatus	_a 1	_b 16	.01	.07
G	Bromus inermis	_a 235	_b 277	11.68	12.75
G	Dactylis glomerata	20	6	.27	.18
G	Melica bulbosa	-	4	-	.06
G	Poa pratensis	2	8	.00	.03
G	Stipa columbiana	-	8	-	.07
G	Stipa lettermani	11	18	.13	.27
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		437	536	16.52	21.06
Total for Grasses		437	536	16.52	21.06
F	Achillea millefolium	37	29	1.10	.50
F	Agoseris glauca	_b 56	_a 18	.49	.13
F	Arabis spp.	12	5	.05	.01
F	Artemisia dracunculul	4	-	.05	-
F	Aster chilensis	2	8	.00	.07
F	Astragalus spp.	-	3	-	.00
F	Cirsium spp.	1	2	.03	.00
F	Collomia linearis (a)	_b 52	_a -	.14	-
F	Cymopterus spp.	4	-	.01	-
F	Delphinium occidentale	_b 67	_a 42	5.99	4.09
F	Epilobium paniculatum (a)	8	-	.06	-
F	Erigeron eatonii	-	7	-	.06
F	Erigeron flagellaris	-	15	-	.33

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
F	<i>Machaeranthera canescens</i>	166	245	2.81	5.03
F	<i>Mertensia</i> spp.	64	60	.80	1.19
F	<i>Polygonum douglasii</i> (a)	139	80	.56	.45
F	<i>Rumex crispus</i>	3	-	.18	-
F	<i>Stellaria jamesiana</i>	177	17	1.00	.06
F	<i>Taraxacum officinale</i>	25	10	.17	.39
F	<i>Vicia americana</i>	32	-	.15	-
F	<i>Viguiera multiflora</i>	30	40	.41	.45
Total for Annual Forbs		199	80	0.76	0.45
Total for Perennial Forbs		680	501	13.27	12.35
Total for Forbs		879	581	14.03	12.81

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

BROWSE TRENDS --

Management unit 21 , Study no: 18

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Artemisia tridentata vaseyana</i>	5	6	.03	.18
Total for Browse		5	6	0.03	0.18

BASIC COVER --

Management unit 21 , Study no: 18

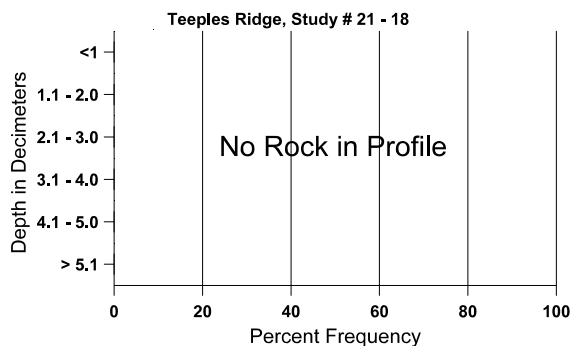
Cover Type	Average Cover %	
	'97	'03
Vegetation	34.34	33.40
Rock	.08	.55
Pavement	.69	.04
Litter	31.69	34.98
Bare Ground	38.18	39.83

SOIL ANALYSIS DATA --

Management unit 21, Study no: 18, Study Name: Teeples Ridge

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.9	47.6 (17.6)	6.4	32.7	28.7	38.6	3.8	18.2	252.8	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 21, Study no: 18

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Elk	9	10	61 (151)	18 (45)
Deer	2	2	2 (5)	1 (3)
Cattle	11	16	50 (124)	23 (57)

BROWSE CHARACTERISTICS --

Management unit 21, Study no: 18

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
97	100	-	60	40	-	20	0	0	-	0	10/9
03	120	-	20	100	-	40	0	0	-	0	14/13
<i>Chrysothamnus viscidiflorus lanceolatus</i>											
97	0	-	-	-	-	-	0	0	-	0	9/7
03	0	-	-	-	-	-	0	0	-	0	8/13

Trend Study 21-19-03

Study site name: Teeples Terrace.

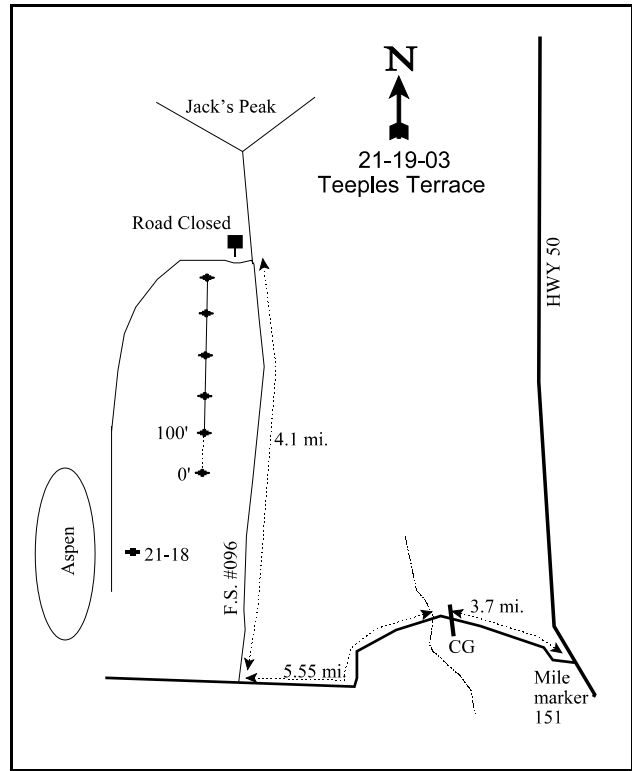
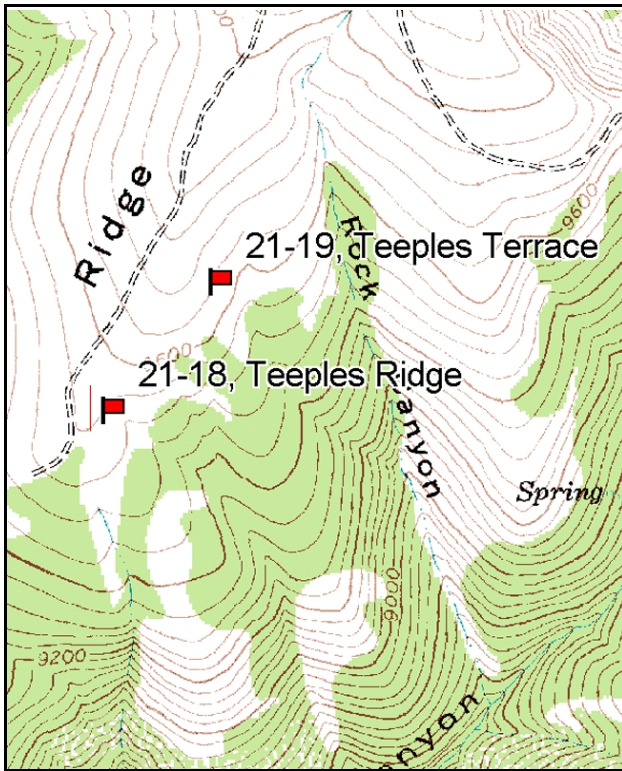
Vegetation type: Perennial grass/forb.

Compass bearing: frequency baseline approximately north (following terrace).

Frequency belt placement: Quadrats are read directly on transect. Even numbers read on the right, odd numbers on the left.

LOCATION DESCRIPTION

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 27, UTM 12S 4315407 N, 400908 E

DISCUSSION

Teeples Terrace - Trend Study No. 21-19

This study was established in conjunction with the Pioneer Peak and Teeples ridge studies (21-17 and 21-18) to monitor cattle and elk use on the Pahvant Plateau. It samples one of the watershed protection terraces on the east side of Teeples Ridge. There was concern voiced by grazing permittees that elk were causing degradation along these terraces. The general area slopes moderately (20-30%) to the east-southeast at an elevation of 9,600 feet. The watershed protection terraces are about 8 to 10 feet wide and follow the contour of the slope. Quadrats were placed along the baseline tape which extends 500 feet along one of these terraces. Cattle and wildlife use the terraces as trails to travel through the area. Cattle were on the area in both 1997 and 2003. A pellet group transect sampling use on the terraces estimated 44 cow and 19 elk days use/acre (109 cdu/ha and 47 edu/ha) in 1997 and 23 cow and 8 elk days use/acre (56 cdu/ha and 20 edu/ha) in 2003.

Soils are deep with an effective rooting depth estimated at nearly 21 inches. Rocks are rare on the surface and in the profile. Soil texture is a sandy clay loam and pH is strongly acidic at 5.0. Bare ground is much too high for a high elevation site, averaging over 40% in both 1997 and 2003. Litter cover is limited and much lower than it should be at 14% and 22% in 1997 and 2003 respectively. However, there is little erosion because of the effectiveness of the contoured terraces. Soils are stable.

Shrubs are not an important aspect of this site. Some mountain big sagebrush, mountain snowberry, and sticky leaf low rabbitbrush occur along the terraces but only in relatively small numbers. There are some aspen clones in the area which provide cover but little forage. These trees are all mature and unavailable to browsing.

The herbaceous understory is abundant and quite diverse. Herbaceous species provided a total of 37% average cover in 1997 and 42% in 2003. Smooth brome is by far the dominant herbaceous species as it provided more than one-half of the total vegetation cover in 2003. Smooth brome significantly increased in nested frequency in 2003 as did the less abundant grasses orchard grass and Kentucky bluegrass. Subalpine needlegrass and Letterman needlegrass are also present. The significant increase in subalpine needlegrass and corresponding significant decrease in Letterman needlegrass in 2003 is partly due to identification problems. The needlegrasses were present in intermediate forms that were difficult to distinguish between. Mountain brome and intermediate wheatgrass were less abundant in 2003. Although diverse, the forb component is composed almost entirely of increasers and weeds, an indication of heavy grazing in the past. The most common species in 1997 were western yarrow, silvery lupine, curly dock, and dandelion. These species all remained stable or increased in 2003 with the exception of curly dock which declined significantly.

1997 APPARENT TREND ASSESSMENT

Overall, the soil on the site appears stable due to the contoured terraces, however many of the terraces have cattle trails along the outer edge which leaves a considerable amount of bare ground exposed. The ratio of bare soil to protective ground cover is very poor for a site at this elevation. Browse are a minor aspect on this site and not important on a summer range. The herbaceous understory is abundant and diverse. Grasses consist entirely of perennial species with smooth brome providing 72% of the grass cover. Forb composition is poor and composed almost totally of increasers and weeds, a symptom of heavy grazing. Another indication of excessive grazing is the lack of any significant litter cover, which currently is only at 14%. Future improvements in the herbaceous understory will depend on reductions in nested frequency of these weedy species and increased frequency of more preferred forbs like penstemon and American vetch.

2003 TREND ASSESSMENT

Trend for soil is stable. Average cover of vegetation, litter, and bare ground show little change since 1997, and erosion is low because of the terracing. There is no browse trend as browse is insignificant on this site and unimportant on this summer range. Trend for the herbaceous understory is slightly up as perennial grasses, primarily smooth brome, increased in nested frequency. Perennial forbs also increased although the composition is poor and remains dominated by weedy increasers.

TREND ASSESSMENT

soil - stable (3)

browse - no trend (n/a)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Management unit 21 , Study no: 19

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	Agropyron intermedium	20	7	.51	.16
G	Bromus carinatus	_b 55	_a 9	2.73	.10
G	Bromus inermis	_a 292	_b 390	15.16	21.76
G	Carex spp.	3	-	.03	-
G	Dactylis glomerata	_a 9	_b 28	.18	.58
G	Poa pratensis	_a 14	_b 47	.59	1.35
G	Stipa columbiana	_a -	_b 83	-	1.79
G	Stipa lettermani	_b 87	_a 32	1.74	.37
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		480	596	20.95	26.13
Total for Grasses		480	596	20.95	26.13
F	Achillea millefolium	_a 62	_b 107	1.27	2.13
F	Agoseris glauca	32	43	.26	.29
F	Androsace septentrionalis (a)	-	4	-	.00
F	Arabis spp.	7	17	.02	.05
F	Artemisia dracunculus	1	-	.00	-
F	Aster chilensis	-	7	-	.03
F	Collomia linearis (a)	_b 108	_a 7	.63	.01
F	Epilobium paniculatum (a)	_b 17	_a -	.13	-
F	Erigeron eatonii	_a 7	_b 26	.02	.27
F	Erigeron flagellaris	5	4	.06	.01
F	Gayophytum ramosissimum(a)	_a 15	_b -	.08	-
F	Helianthella uniflora	-	5	-	.03
F	Lupinus argenteus	94	95	5.46	5.55

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
F	<i>Machaeranthera canescens</i>	53	72	.70	.95
F	<i>Microsteris gracilis</i> (a)	3	-	.00	-
F	<i>Orthocarpus tolmiei</i> (a)	-	3	-	.03
F	<i>Penstemon</i> spp.	1	-	.00	-
F	<i>Polygonum douglasii</i> (a)	_b 127	_a 52	.96	.35
F	<i>Potentilla</i> spp.	-	2	-	.03
F	<i>Ranunculus</i> spp.	3	-	.15	-
F	<i>Rumex crispus</i>	_b 60	_a 18	3.60	.91
F	<i>Stellaria jamesiana</i>	_b 44	_a 28	.27	.13
F	<i>Taraxacum officinale</i>	_a 112	_b 156	2.58	4.53
F	<i>Tragopogon dubius</i>	-	3	-	.04
F	<i>Vicia americana</i>	20	13	.14	.16
F	<i>Viguiera multiflora</i>	3	6	.03	.04
Total for Annual Forbs		270	66	1.81	0.40
Total for Perennial Forbs		504	602	14.60	15.20
Total for Forbs		774	668	16.42	15.60

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

BROWSE TRENDS --

Management unit 21 , Study no: 19

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Artemisia tridentata vaseyana</i>	2	2	.03	.00
B	<i>Chrysothamnus viscidiflorus lanceolatus</i>	2	0	-	-
B	<i>Symphoricarpos oreophilus</i>	0	1	-	.03
Total for Browse		4	3	0.03	0.03

BASIC COVER --

Management unit 21 , Study no: 19

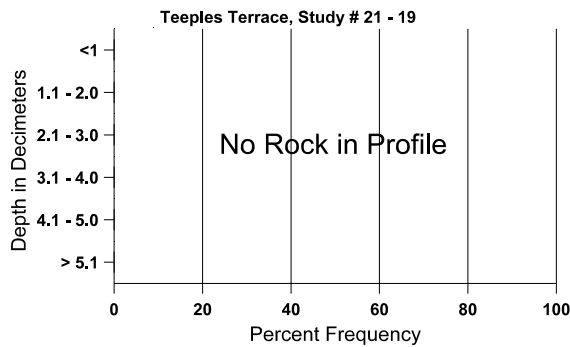
Cover Type	Average Cover %	
	'97	'03
Vegetation	38.49	39.74
Rock	2.25	4.46
Pavement	.47	.48
Litter	14.26	22.27
Cryptogams	3.31	0
Bare Ground	45.15	43.47

SOIL ANALYSIS DATA --

Management unit 21, Study no: 19, Study Name: Teeples Terrace

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.7	44.4 (17.7)	5.0	48.0	26.7	25.3	2.5	52.1	227.2	0.2

Stoniness Index



PELLET GROUP DATA --

Management unit 21 , Study no: 19

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Rabbit	-	1	-	-
Elk	4	6	61 (151)	8 (19)
Deer	1	1	2 (5)	-
Cattle	7	18	32 (79)	23 (56)

BROWSE CHARACTERISTICS --
 Management unit 21 , Study no: 19

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
97	40	-	20	-	20	-	0	0	50	0	17/38
03	40	-	20	20	-	-	0	0	0	0	14/13
<i>Chrysothamnus viscidiflorus lanceolatus</i>											
97	40	-	-	40	-	-	0	0	-	0	8/15
03	0	-	-	-	-	-	0	0	-	0	10/17
<i>Symphoricarpos oreophilus</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-

Trend Study 21R-1-03

Study site name: Corn Creek.

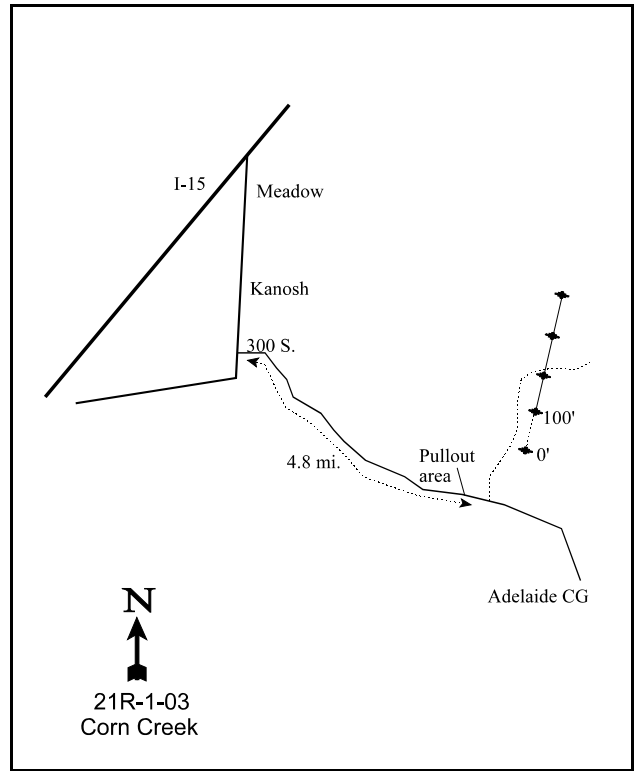
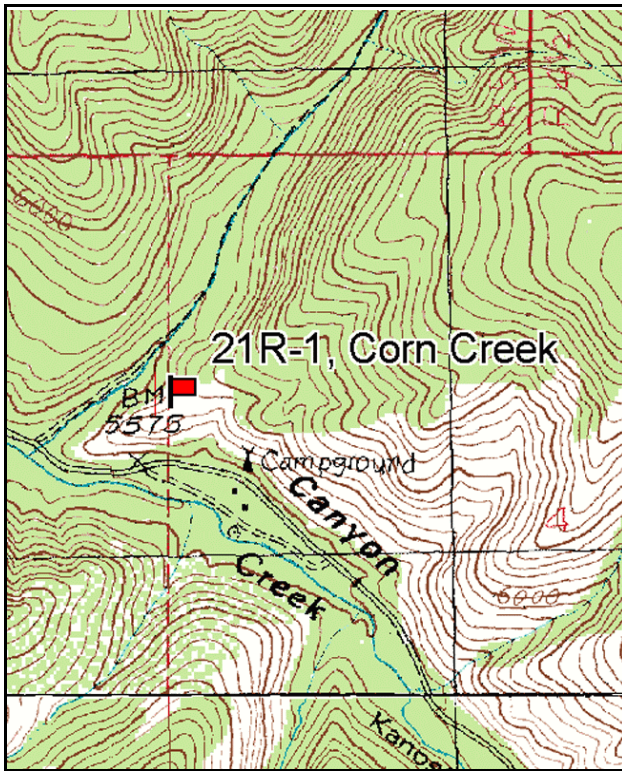
Vegetation type: Burn-seeded.

Compass bearing: frequency baseline 28 degrees magnetic.

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

LOCATION DESCRIPTION

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 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 27, UTM 12S 4290267 N, 381422 E

DISCUSSION

Corn Creek - Trend Study No. 21R-1

This site was established in 1997 to monitor a burn and seeding that occurs on important winter and spring range for big game, primarily elk. The site slopes to the south at 2-10% and elevation is about 5,800 feet. The transect was placed on a ridgeline that runs northeast from Kanosh Canyon, and lies about 1/4 mile from Corn Creek. The site burned and was seeded in 1996. This transect is to monitor the recovery of the vegetation community following the burn. Elk use was moderate in 1997, while deer was minimal. Pellet group transect data estimated 54 elk days use/acre (134 edu/ha) in 1997 and 33 elk days use/acre (83 edu/ha) in 2003. Cattle use was estimated at 15 days use/acre (38 cdu/ha) in 1997, but no cattle pats were sampled in 2003. Most of the elk pellets in 2003 appeared to be from winter months.

Soils on the site are fairly shallow and rocky. Effective rooting depth was estimated at less than 10 inches. Average soil temperature was high in both surveys at over 70°F. Soils have a sandy loam texture and are slightly acidic (pH of 6.4). Organic matter is good at 3.1%. Erosion is low due to the abundance of herbaceous vegetation on the site as well as a fair amount of litter cover. Bare soil accounted for 14% and 17% of the soil surface in 1997 and 2003 respectively. An erosion condition class assessment rated soils as stable in 2003.

The browse component on this site is not well developed. Eleven species were sampled for density and/or average height and crown in 2003 but only chokecherry was frequent. Chokecherry density was estimated at 1,740 stems/acre in 1997, increasing to 3,300 stems/acre in 2003. Most of the population consisted of young plants in 1997 (92%) which explains the increase in population density. In 2003, mature plants made up the majority of the population (78%). Use was light, decadence low, and vigor normal on chokecherry in both 1997 and 2003. More preferred species such as serviceberry, true mountain mahogany, and Stansbury cliffrose were all measured for average height and crown, but occur in very low numbers on the site. None of these species were sampled in the density strips, thus population estimates are not available.

The herbaceous species on this site are diverse and productive, although two species, bulbous bluegrass and storksbill dominate. Bulbous bluegrass made up 46% of the grass cover in 1997 increasing to 69% in 2003. Bulbous bluegrass is a low value perennial that has many similarities to annual species. Bulbous bluegrass is small statured, mat forming, and cures early in the season providing little forage during summer months. Storksbill, an annual forb contributed nearly 13% average cover in 2003 which accounts for 64% of the total forb cover. Combined, bulbous bluegrass and storksbill accounted for over 60% of the total vegetation cover on the site in 2003. More desirable perennial grasses include crested wheatgrass, bluebunch wheatgrass, slender wheatgrass, and Sandberg bluegrass. Of these, crested wheat and slender wheatgrass declined in frequency in 2003, while bluebunch wheatgrass and Sandberg bluegrass remained stable. Perennial grasses are found in scattered clumps with cheatgrass occurring where perennials are less abundant. With the exception of bulbous bluegrass, cheatgrass had the highest nested frequency value of any other grass species in 1997, but decreased significantly in 2003. The forb component is diverse with several desirable species being present. Pale agoseris, tapertip hawksbeard, redroot eriogonum, sulfur eriogonum, prickly lettuce, and yellow salsify are species that would provide spring forage for elk. Less desirable species include thistle, dandelion, and several annual species.

1997 APPARENT TREND ASSESSMENT

Soils appear stable especially on a newly burned site. Although herbaceous perennials occur in scattered patches, bare soil is relatively low at 14%, and vegetation and litter appear to be sufficiently holding soils in place. Bulbous bluegrass and cheatgrass are abundant where seeded species have not established, but these species do provide good soil protection. The browse component is obviously in a downward condition at the

present time following the fire. Only chokecherry is moderately abundant. Preferred species are few. The herbaceous component is diverse but dominated by annuals and low value species primarily bulbous bluegrass and cheatgrass. Overall, the herbaceous understory appears to be slightly down but should improve in the future as seeded perennials have time to become more established.

2003 TREND ASSESSMENT

Trend for soil is stable. Bare soil slightly increased, but litter and vegetation cover also increased. Soils are stable for the most part, and erosion is low. Trend for browse is slightly up. Although not highly preferred, chokecherry provides some forage for wintering animals and has an increased in density by 47% since 1997. Less desirable species such as broom snakeweed, Woods rose, and rubber rabbitbrush are present but have not increased. Trend for the herbaceous understory is slightly down. Bulbous bluegrass and storksbill are the dominate species and too many weedy increasers are present on the site. Crested wheatgrass and slender wheatgrass both declined in abundance in 2003. Cheatgrass also declined which is a positive sign. Several desirable forbs are present on the site but occur in low densities. Perennial forbs declined in sum of nested frequency, while annual species increased.

TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 21R, Study no: 1

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	Agropyron cristatum	73	38	2.95	1.67
G	Agropyron intermedium	-	2	-	.01
G	Agropyron spicatum	29	45	.96	1.79
G	Agropyron trachycaulum	135	80	2.18	1.46
G	Bromus japonicus (a)	-	1	-	.00
G	Bromus tectorum (a)	206	94	3.67	1.06
G	Koeleria cristata	20	8	.36	.04
G	Poa bulbosa	360	388	10.19	19.23
G	Poa fendleriana	-	2	-	.03
G	Poa secunda	117	122	1.84	2.65
G	Sporobolus cryptandrus	8	-	.01	.01
Total for Annual Grasses		206	95	3.67	1.06
Total for Perennial Grasses		742	685	18.50	26.91
Total for Grasses		948	780	22.18	27.97
F	Agoseris glauca	2	33	.01	.45
F	Allium spp.	101	-	1.33	-
F	Antennaria rosea	-	2	-	.30

T y p e	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
F	<i>Artemisia ludoviciana</i>	13	30	.18	1.22
F	<i>Astragalus</i> spp.	-	6	-	.01
F	<i>Balsamorhiza sagittata</i>	9	-	.69	.15
F	<i>Camelina microcarpa</i> (a)	9	-	.39	-
F	<i>Carduus nutans</i> (a)	1	-	.00	-
F	<i>Cirsium</i> spp.	13	13	.93	1.52
F	<i>Collomia linearis</i> (a)	1	-	.00	-
F	<i>Comandra pallida</i>	31	9	.29	.09
F	<i>Collinsia parviflora</i> (a)	28	-	.28	-
F	<i>Crepis acuminata</i>	19	20	.26	.48
F	<i>Epilobium paniculatum</i> (a)	19	-	.11	-
F	<i>Eriogonum cernuum</i> (a)	11	-	.07	-
F	<i>Erodium cicutarium</i> (a)	3	265	.03	12.89
F	<i>Erigeron</i> spp.	25	-	.85	-
F	<i>Eriogonum racemosum</i>	-	4	.03	.02
F	<i>Eriogonum umbellatum</i>	8	7	.09	.21
F	<i>Heterotheca villosa</i>	32	51	1.78	2.36
F	<i>Lathyrus brachycalyx</i>	42	2	.48	.03
F	<i>Lactuca serriola</i>	5	-	.04	-
F	<i>Linum lewisii</i>	3	-	.03	-
F	<i>Phlox longifolia</i>	39	34	1.00	.17
F	<i>Polygonum douglasii</i> (a)	28	-	.25	-
F	<i>Sanguisorba minor</i>	-	2	-	.03
F	<i>Taraxacum officinale</i>	7	3	.16	.00
F	<i>Tragopogon dubius</i>	45	4	.32	.03
Total for Annual Forbs		100	265	1.13	12.89
Total for Perennial Forbs		394	220	8.54	7.10
Total for Forbs		494	485	9.68	19.99

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	'97	'03
B	Artemisia tridentata wyomingensis	1	0	.38	-
B	Chrysothamnus nauseosus	0	0	.01	-
B	Eriogonum heracleoides	7	0	.50	-
B	Gutierrezia sarothrae	15	10	.16	.06
B	Prunus virginiana	13	15	1.00	4.43
B	Quercus gambelii	2	0	.76	-
Total for Browse		38	25	2.81	4.49

CANOPY COVER, LINE INTERCEPT --

Management unit 21R, Study no: 1

Species	Percent Cover	
	'97	'03
Prunus virginiana	-	3.96
Quercus gambelii	2.20	-

BASIC COVER --

Management unit 21R, Study no: 1

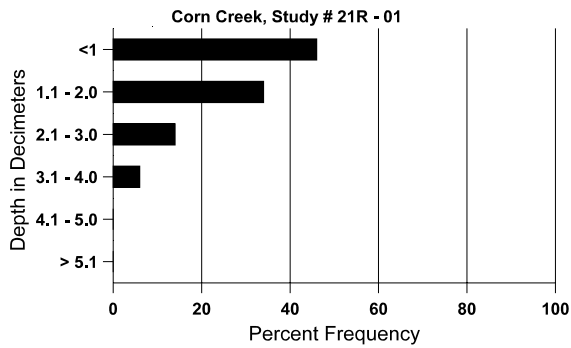
Cover Type	Average Cover %	
	'97	'03
Vegetation	32.26	50.62
Rock	10.16	7.10
Pavement	1.64	.43
Litter	35.57	39.31
Cryptogams	5.63	.14
Bare Ground	14.20	17.35

SOIL ANALYSIS DATA --

Management unit 21R, Study no: 1, Study Name: Corn Creek

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.6	70.8 (8.1)	6.4	54.0	29.2	16.8	3.1	11.0	185.6	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 21R, Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Elk	16	24	54 (134)	33 (83)
Deer	2	6	3 (7)	1 (2)
Cattle	4	2	15 (38)	-

BROWSE CHARACTERISTICS --

Management unit 21R, Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	128/112
Artemisia tridentata wyomingensis											
97	20	-	-	20	-	-	100	0	-	0	21/41
03	0	-	-	-	-	-	0	0	-	0	30/57
Cercocarpus montanus											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	87/72
Cowania mexicana stansburiana											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	138/128
Eriogonum heracleoides											
97	220	-	-	220	-	-	0	0	-	0	9/11
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
97	720	-	180	540	-	-	0	0	-	0	8/10
03	200	-	-	200	-	40	0	0	-	0	10/13
<i>Mahonia repens</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	4/6
<i>Prunus virginiana</i>											
97	1740	-	1600	140	-	180	7	8	0	0	-/-
03	3300	-	620	2580	100	780	0	0	3	2	18/16
<i>Quercus gambelii</i>											
97	180	80	120	60	-	80	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	104/100
<i>Rhus trilobata</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	52/89
<i>Rosa woodsii</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	10/13

SUMMARY

WILDLIFE MANAGEMENT UNIT 21 - FILLMORE

The majority of the range trend studies in this unit were established in 1985 and reread in 1991, 1998, and 2003. Four additional studies were established in 1997 and reread in 2003. A total of 19 studies were sampled in 2003 with one study, Wood Canyon, being suspended. The Wood Canyon transect samples an area that was burned and is no longer representative of critical winter range due the lack of browse following the burn. Deer use on the site was minimal in 1998. Sixteen of the 19 studies surveyed in 2003 sample winter range along the Oak Creek (Canyon Mountains) and Pahvant Ranges, while three studies sample summer range on top of the Pahvant Range.

Soil trends stayed reasonably stable in 2003. Fifteen studies had stable trends while four studies had downward trends. Stable soil trends are the result of basic ground cover parameters (% cover of vegetation, litter, and bare ground) being fairly constant, or the ratio of these categories to each other fluctuating very little since 1998. Most sites were given a stable rating from an erosion condition class assessment done at each study in 2003 as well. Browse trends were downward on 8 studies in 2003, stable on 5 studies, and improving on two studies. Improving browse trends occurred at Dog Valley (21-11) and Corn Creek (21R-1), both sites that are recovering from burns. Downward browse trends resulted due to one or more key factors including, but not limited to, population declines, increased decadence, reduced vigor, and lower reproduction in key browse species. Only three studies were rated as having downward herbaceous understory trends, while 11 sites remained stable and 5 showed improvements. Stable and improving trends are the result of perennial species either showing little fluctuation in abundance or increasing on a site. Conversely, downward trends were the result of perennial grasses and/or forbs decreasing in frequency in 2003. Average trends for each sampling year are graphically represented below.

Some important vegetation changes documented in 2003 are important to consider here. The invasive annual, cheatgrass, was abundant and widespread throughout the Fillmore unit in 1998. Cheatgrass was sampled on 16 sites in both 1998 and 2003. Nested frequency of cheatgrass declined on 12 of the 16 sites, while average cover declined on 10 of the 16 sites between 1998 and 2003. Bulbous bluegrass, a low value perennial, was sampled on 7 sites in 1998 increasing to 10 sites in 2003. Nested frequency and average cover of bulbous bluegrass increased on 7 of the 10 sites in 2003. As a group, perennial grasses are maintaining themselves quite well in the Fillmore unit. Perennial grasses declined in sum of nested frequency and/or average cover on only 4 of the 19 studies sampled in 2003. Forbs are more effected by precipitation than perennial grasses. Perennial forbs decreased in sum of nested frequency on 11 of 19 sites in 2003, while cover of perennial forbs declined on 9 of 19 sites.

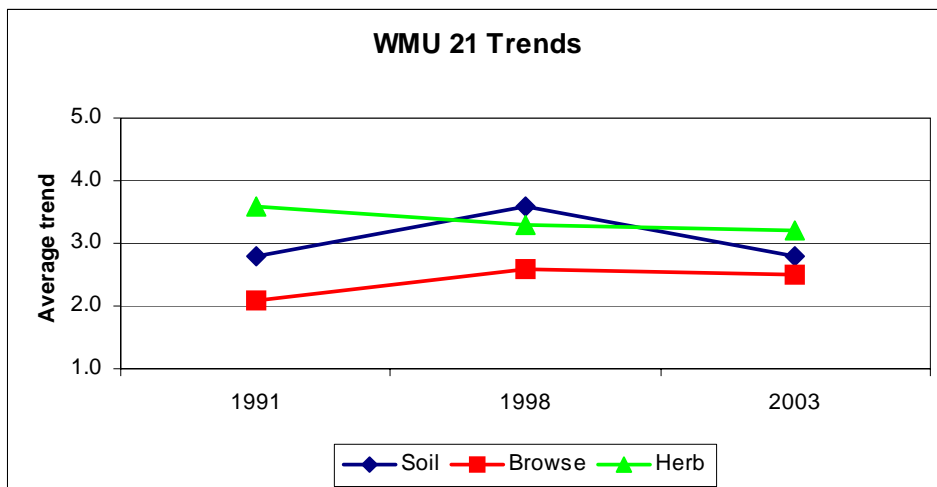
Key browse populations are perhaps the most important vegetative component on big game winter ranges as they represent the forage resource that allows deer and elk to survive the winter months. Big sagebrush (includes three subspecies; mountain big sagebrush, Wyoming big sagebrush, and basin big sagebrush), cliffrose, and to some extent bitterbrush represent the key browse species on most of the trend studies in the Fillmore unit. Between 1998 and 2003, both big sagebrush and the cliffrose/bitterbrush combination showed increased decadence on 8 of the 12 sites where sampled. Big sagebrush recruitment (% young) decreased on 9 of the 12 sites where sagebrush occurred, while cliffrose/bitterbrush had lower recruitment on 6 of the 12 sites that they were sampled on.

Soil and vegetation trends are largely driven by precipitation. Although Utah has been in a statewide drought for the past 5 years, some areas within the Fillmore management unit have not been as severely effected as other parts of the state. Weather station data at three locations was analyzed to look at precipitation trends for the Fillmore unit since range trend studies were established in 1985. These stations occur at Oak City, Fillmore, and Kanosh (Utah Climate Summaries 2004). Precipitation data was averaged over all three

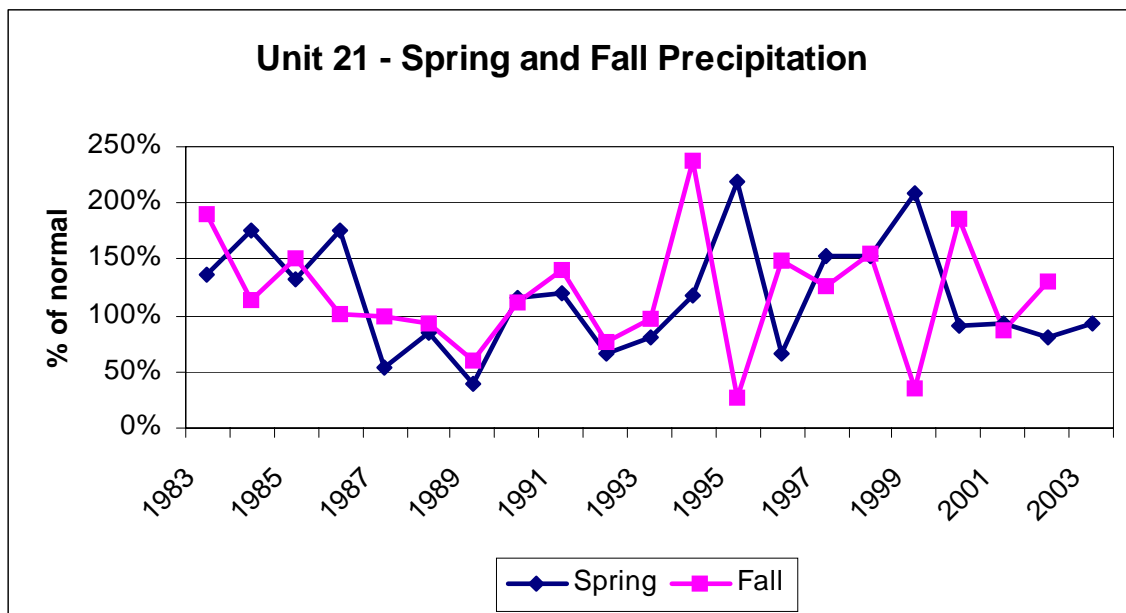
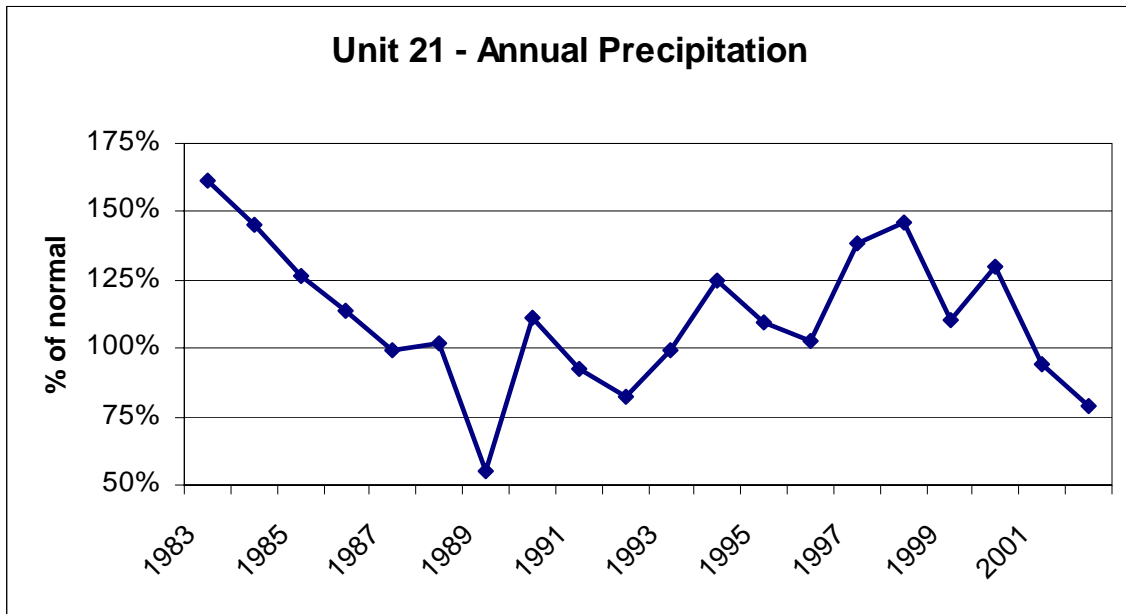
weather stations and data indicate that from 1985-2002, total annual precipitation was below normal in 1989, 1991-1992, and 2001-2002. The years 1991 and 2001 were near 90% (considered within the normal range) with 1989 (55%), 1992 (82%), and 2002 (79%) being the driest. All other years averaged normal or above normal at these 3 stations (see precipitation graphs below). Perhaps more important than total annual precipitation is seasonal distribution of precipitation. Data were analyzed for the different seasons of the year including winter, spring, and fall totals. Spring precipitation (April - June) is important for cool season perennial grasses and forbs, as well as shrub populations, as these species initiate growth during the spring. Weather data indicate that spring precipitation in the Fillmore unit was below 100% of normal in 1987-89, 1992-93, 1996, and 2000-03. For this report, the period from 2000-03 is the focus as it occurred prior to and during the 2003 reading and would most effect current range trends. Although the period from 2000-03 is technically below normal (less than 100%), three years were above 90% with 2002 being about 80% of normal. Although not severe, the period from 2000-03 was on the dry side compared to spring conditions preceding the 1998 reading (152% of normal in both 1997 and 1998). This helps explain why cheatgrass decreased in nested frequency and cover on the majority of the studies in 2003. Increased decadence and lower reproduction in shrub populations is partly due to lower precipitation preceding the 2003 reading compared to the 1998 reading.

Average Trends – WMU 21 Fillmore

	1991	1998	2003
Soil	2.8	3.6	2.8
Browse	2.1	2.6	2.5
Herb	3.6	3.3	3.1
	16 sites	16 sites	19 sites



Precipitation graphs for the Fillmore unit. Data is percent of normal precipitation averaged for three weather stations at Oak City, Fillmore, and Kanosh (Utah Climate Summaries 2004).



Trend Summary

	Category	1985	1991	1998	2003
21-1 Long Canyon	soil	est	2	3	3
	browse	est	3	3	2
	herbaceous understory	est	4	3	3
21-2 Lovell Hollow	soil	est	3	3	3
	browse	est	1	4	3
	herbaceous understory	est	4	3	3
21-3 Cascade Spring	soil	est	4	3	3
	browse	est	n/a	n/a	n/a
	herbaceous understory	est	3	5	3
21-4 Horse Hollow	soil	est	2	3	3
	browse	est	2	2	1
	herbaceous understory	est	4	1	4
21-6 'M' Hill	soil	est	3	5	2
	browse	est	3	3	3
	herbaceous understory	est	4	3	3
21-7 Bennett Field	soil	est	3	3	3
	browse	est	2	2	2
	herbaceous understory	est	4	2	4
21-8 Smiths Ridge	soil	est	5	3	2
	browse	est	2	4	3
	herbaceous understory	est	4	4	3
21-9 Wide Canyon BLM	soil	est	2	5	3
	browse	est	3	3	2
	herbaceous understory	est	3	3	3

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

	Category	1985	1991	1998	2003
21-10 Wide Canyon DWR	soil	est	2	4	3
	browse	est	2	2	1
	herbaceous understory	est	5	4	3
21-11 Dog Valley	soil	est	3	3	3
	browse	est	2	1	5
	herbaceous understory	est	3	4	2
21-12 Dameron Canyon	soil	est	2	5	3
	browse	est	2	3	3
	herbaceous understory	est	3	3	4
21-13 Walker Creek	soil	est	3	5	3
	browse	est	3	3	2
	herbaceous understory	est	3	4	4
21-14 Meadow Creek	soil	est	3	3	2
	browse	est	3	2	2
	herbaceous understory	est	3	3	3
21-15 Fillmore Cemetery East	soil	est	3	3	3
	browse	est	2	3	3
	herbaceous understory	est	3	3	3
21-16 Baker Canyon	soil	est	3	3	3
	browse	est	1	3	2
	herbaceous understory	est	5	3	3

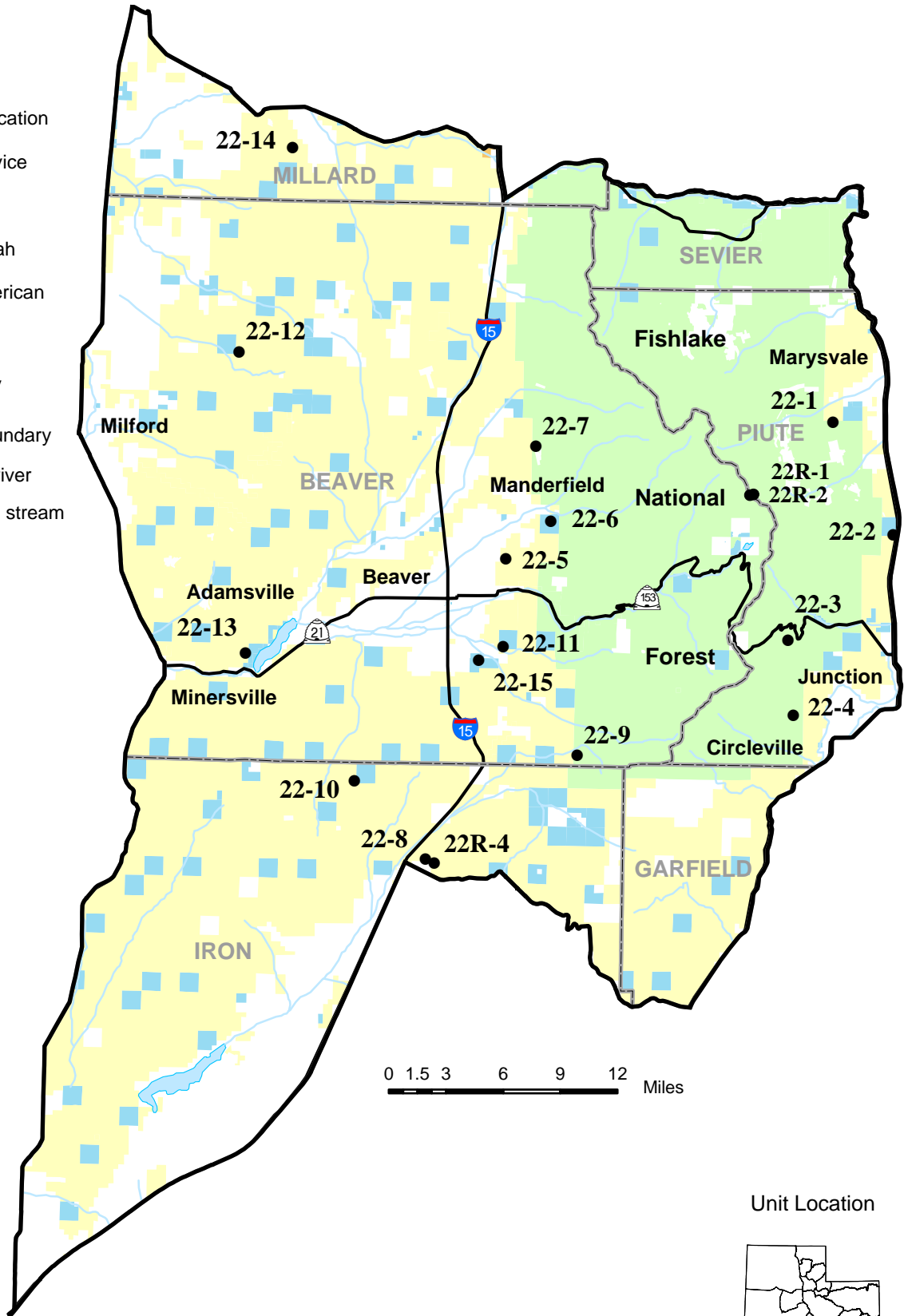
(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

	Category	1997	2003
21-17 Pioneer Peak	soil	est	2
	browse	est	n/a
	herbaceous understory	est	2
21-18 Teeples Ridge	soil	est	3
	browse	est	n/a
	herbaceous understory	est	3
21-19 Teeples Terrace	soil	est	3
	browse	est	n/a
	herbaceous understory	est	4
21R-1 Corn Creek	soil	est	3
	browse	est	4
	herbaceous understory	est	2

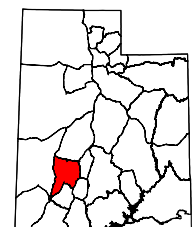
(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

Management Unit 22

- Transect location
- Forest Service
- BLM
- State of Utah
- Native American
- Private
- Water body
- County boundary
- Stream or river
- Intermittent stream
- Road



Unit Location



WILDLIFE MANAGEMENT UNIT 22 - BEAVER

Boundary Description

Iron, Garfield, Piute, Beaver, and Millard counties - Boundary begins at SR-130 and I-15; north on SR-130 to SR-21; north on SR-21 to SR-257; north on SR-257 to the Black Rock road; east on the Black Rock road to I-15; south on I-15 to I-70; east on I-70 to US-89; south on US-89 to SR-20; west on SR-20 to I-15; south on I-15 to SR-130.

Management Unit Description

The Beaver wildlife management unit includes both slopes of the Tushar Mountains south of I-70. It also contains the Mineral Mountains south of the Black Rock road, a portion of Parowan Valley, and Fremont Wash. Total usable mule deer range in the wildlife management unit is estimated at 1,154,744 acres. Sixty percent of the range is considered winter range and 40% is considered summer range. Total usable elk range is estimated at 507,698 acres with 55% of this being classified as summer range and 45% being winter range.

On the west side of the wildlife unit, the Black Mountains and the Mineral Mountains are typical of the arid mountains of western Utah. Neither support streams with permanent flows. They lack good summer range, but are vegetatively similar to most deer wintering areas of southern Utah. Both the Black and Mineral Mountains have relatively steep, rugged slopes and areas of rocky outcrops. Black Mountain is unlike the Mineral Mountains in that the top is dominated by gently rolling sagebrush hills and dry meadows.

The Tushar Mountains are more typical of the high elevation mountains of central and southern Utah and contain good summer range for deer and elk. The Tushar's have many small lakes and perennial streams. The western slopes of the Tushar Mountains are more gradual and receive sufficient precipitation to create good intermediate deer range which is used in the spring and fall and during mild winters. Delano Peak on the Tushar Mountains is the unit's highest point at an elevation of 12,173 feet. The low point in the unit is about 5,000 feet in the valley near Milford. The highest point in the Mineral Mountains is 9,578 feet on Granite Peak and Jack Henry Knoll at 8,668 feet is the highest area in the Black Mountains. Towns in this area include Beaver, Milford, and Minersville.

The east side of the Tushar Mountains is comprised of drainages which empty into the Sevier River. The major tributaries are Deer Creek, Beaver Creek, Bullion Creek, Cottonwood Creek, Ten Mile Creek, City Creek, Birch Creek, Pine Creek and Chokecherry Creek. Between Circleville and Marysvale, a broad river valley with gradual slopes joins the steep mountain slopes and sheer cliffs of the Tushar mountains. The portions north of Marysvale and south of Circleville (including Marysvale and Circleville Canyons) are composed of disjunct pinyon-juniper canyons. Towns in this area include Sevier, Marysvale, Junction, and Circleville.

Most of the big game winter range in this unit is located on Forest Service or BLM managed lands. Minor portions of the winter range in the unit occur on private holdings, Utah State School Trust Lands, and Division of Wildlife Resources management areas. In 1996, a fire burned on the north end of the management unit burning large tracts of winter range.

On the west side of the Tushar Mountains, most of the use on the winter range is on the Black and Mineral Mountains. The winter ranges on these mountains were used quite extensively in the past by deer migrating from summer range on the Tushars. These migrations were essentially eliminated by the construction and fencing of I-15. Two underpasses and one overpass were constructed to aid deer in crossing I-15, however, these have had limited success. Meanwhile, the winter range on the east side of I-15 must carry the burden. Still, there is ample range for deer in normal winters. Only in severe winters when the usable range is limited

to the lowest areas near the freeway does winterkill become a significant problem.

On the east side of the Tushar Mountains, the normal winter range boundaries range from 6,200 feet on the valley floor to 8,500 feet in the upper basins. Oak Basin often winters deer up to the 8,600 foot level. The upper limit along the steeper portions of the east face of Tushar Mountains is 7,200 feet. Severe winter range occupies 47,223 acres, 71% of the normal winter range (Huff and Bowns 1965). The upper limit of severe winter range is normally 7,000 feet, but goes as high as 8,000 feet in Oak Basin. Winter deer concentrations are found on south and southeast facing slopes. Minor migrations from the summer ranges of units 23 - Monroe and 24 - Dutton onto unit 22 winter ranges occur each year, but the major movement is an elevational movement from summer to winter range within the unit.

Wildlife Unit Management Objectives

Current management objectives for big game are to achieve a target population of 11,000 wintering deer with a post season buck to doe ratio of 15:100. Thirty percent of these bucks are to be 3-point or better. The target winter herd size for elk is to be 950 with a post season composition of 8 bulls to 100 cows. At least four of these bulls must be 2½ years of age or older. Harvest and population classification data for deer and elk are available in the Division's annual big game reports.

Trend Study Description

Fourteen range trend studies were initially established in the Beaver unit in 1985. These studies were reread in 1991 and 1998. Additional range trend studies were established in 1998 at South Creek, 22-15 and in 1999 at 22R-4, Above Fremont Wash, due to additional monitoring needs on critical deer winter ranges. In 1997, two additional transects were established on top of the Tushar Mountains to monitor the effect that mountain goats were having on the Tushar paintbrush, a sensitive species endemic to the area. All of the studies were resampled in 2003.

Trend Study 22-1-03

Study site name: Deer Flat.

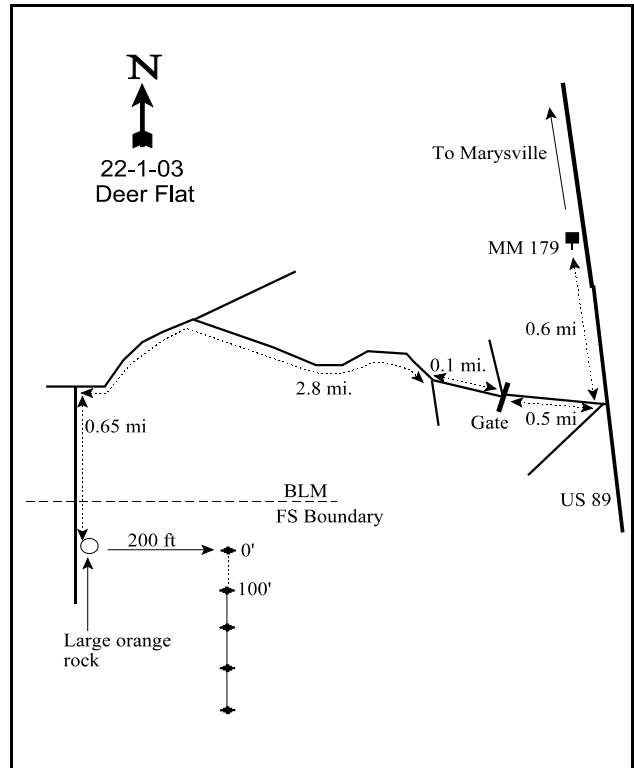
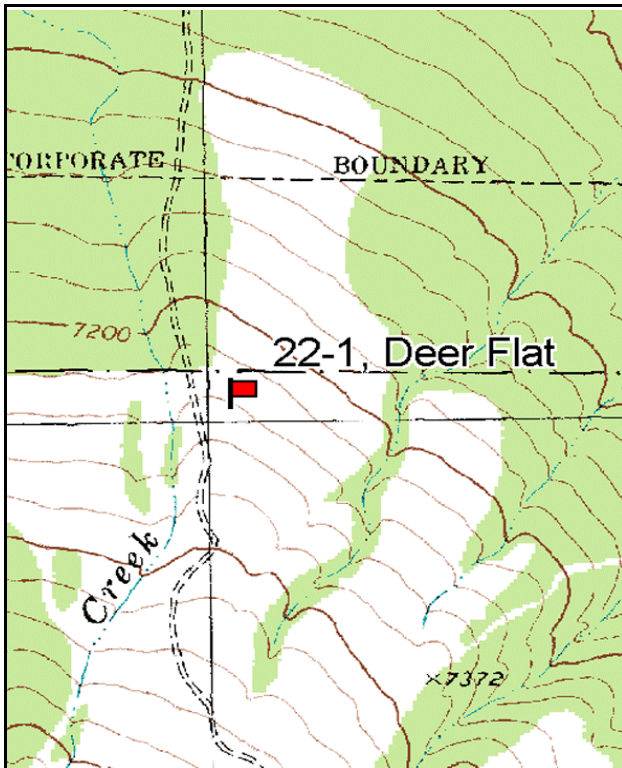
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From mile marker 179 south of Marysville, proceed 0.6 miles and turn right on a dirt road. The road forks immediately beyond a fence, stay to the right. Proceed 0.5 miles to another fork in the road at a fence corner. Go straight through the gate, passing a road on each side. Continue 0.1 miles and turn right. Proceed 2.8 miles up this road, following a ditch, passing 2 ponds and passing through a DWR fence to another fork. Turn left. Go 0.65 miles (through a gate) to a large painted rock on the left side of the road. The 0-foot baseline stake is 200 feet east of the rock. It is a rebar with a browse tag #7106 attached.



Map Name: Mount Brigham

Diagrammatic Sketch

Township 27S, Range 4W, Section 35

GPS: NAD 27, UTM 12S 4252025 N, 388050 E

DISCUSSION

Deer Flat - Trend Study No. 22-1

This study is located on BLM administered land southwest of Marysvale. The area is considered an important deer wintering area. The area was chained and seeded to perennial grasses in 1968. The study site slopes moderately (15%) to the north at an elevation of 7,200 feet. Water is available in Pine Creek which is located about ½ mile to the north. There is another chaining and seeding project that was completed in 1981 across the Forest Service-BLM boundary about 200 feet north of this study. Pellet group transect data collected in 1998 estimated 58 deer days use/acre (143 ddu/ha), 12 elk days use/acre (30 edu/ha), and 11 cow days use/acre (27 cdu/ha). In 2003, pellet group transect data indicated increased use of the site by deer and elk at an estimated 149 deer days use/acre (369 ddu/ha) and 39 elk days use/acre (96 edu/ha). Cattle use remained low in at an estimated 8 days use/acre (20 cdu/ha). Deer and elk pellet groups indicated both winter and spring use in 2003.

Soil analysis indicates a sandy clay loam texture which appears to have good permeability and water holding capacity. Parent material appears to be sandstone and limestone, and soils are slightly acidic (pH of 6.2). The soil profile is rocky throughout and soils are fairly shallow with an effective rooting depth of less than 9 inches. Average soil temperature was moderate in both 1998 and 2003 at less than 60°F. Soils directly on the site show minimal erosion, although the road to the site crosses a small creek and the water washes down the road causing severe cutting. Soils were rated stable from an erosion condition class assessment completed on site in 2003.

The browse component at Deer Flat is diverse and abundant. Mountain big sagebrush is the key species, with black sagebrush being of secondary importance. A portion of the sagebrush on this site is likely a hybrid between the two species, and project personnel classified sagebrush by color, growth form, leaf size, and seed-head formation in 2003. Mountain big sagebrush has a fairly stable population with an estimated 3,640 plants/acre in 1998 and 3,480 in 2003. This is a much lower estimate compared to the 1985 and 1991 surveys, but this is because of the much larger sample size used after 1992. This larger sample size gives more accurate density estimates for browse populations. Young plants made up a large proportion of the population in both 1985 and 1991 (54% and 47% respectively), but have steadily declined in 1998 (13%) and 2003 (1%). The decline in young plants may also be due in part to the larger sampling scheme used in 1998 and 2003. Use on mountain big sagebrush has been moderate to heavy in all readings, but vigor has been generally normal. Decadence was fairly low between 1985 and 1998, but increased to 45% in 2003. Annual sagebrush leaders averaged almost three inches of growth by June 2003. Black sagebrush density was estimated at 3,920 plants/acre in 1998 and 3,520 in 2003. Use on black sagebrush has been lighter compared to mountain big sagebrush in most years. Vigor has generally been good. As with mountain big sagebrush, percent decadence in black sagebrush increased in 2003 to 50%. Recruitment by young black sagebrush plants mimics that of mountain big sagebrush at 13% in 1998 and 1% in 2003.

Other browse sampled on the site include both curlleaf and true mountain mahogany, slenderbush eriogonum, dwarf rabbitbrush, Parry rabbitbrush, and Gambel oak. The mahogany species consist of mature plants that are very short due to heavy browsing each year. In 2003, both dwarf and Parry rabbitbrush were noted as being heavily browsed. Parry rabbitbrush had been hedged nearly to the ground on many plants, but had abundant long leaders of growth up to 14 inches in length. Gambel oak has slowly but steadily increased with each reading and had an estimated density of 1,040 stems/acre in 2003. Oak displayed moderate to heavy use in 2003, with no decadent plants being sampled. Less desirable species include broom snakeweed, pricklypear cactus, stickyleaf low rabbitbrush, and gray horsebrush. These species all occur in very low densities. In the absence of some type of disturbance, these species do not appear to be a threat to increase in the near future. In 2003, pinyon and juniper had estimated densities of 55 and 22 trees/acre respectively. Although tree density remains relatively low, photographs show a noticeable increase in the size of the trees

across the site.

The herbaceous understory is highly diverse, but production is only moderate. Crested wheatgrass is the most abundant grass on the site and has maintained a fairly stable frequency over all years. Crested wheatgrass provided 35% of the grass cover in 1998 and 48% in 2003. Other fairly abundant grasses include smooth brome, mutton bluegrass, and bottlebrush squirreltail. These grasses are desirable species that add variety to the diets of game animals and livestock. A total of 11 perennial grass species were sampled on the site in 2003 with crested wheatgrass and smooth brome showing light to moderate use. Cheatgrass was sampled in both 1998 and 2003. However, it is in low abundance due to the highly competitive perennial grass component. Although diverse, forbs offer little cover or forage. Longleaf phlox and redroot eriogonum are the most common perennial species. Annual stickseed had the highest nested frequency value of all the forb species in 2003. Forbs are an important source of deer forage during early spring green-up when energy demands for recovery from winter survival, fetal development and antler growth are high. An increase in perennial forbs would greatly add to the usefulness of this site for wildlife.

1985 APPARENT TREND ASSESSMENT

Erosion was not detected and the soil appears stable to improving. Seventeen years after the chaining, the vegetative community appears healthy with high diversity and a good mixture of grasses, forbs and shrubs. The community appears stable, although age composition indicates that the shrub component may expand somewhat.

1991 TREND ASSESSMENT

Here again is the repetitious theme, the extended drought has apparently aggravated the situation with increases in percent bare ground, decreasing litter cover, thus exposing the soil to the harmful effects of high intensity summer storms. The soil trend is slightly downward. Most of the key shrubs (black sagebrush, mountain big sagebrush, curlleaf mountain mahogany) have experienced some kind of increases in their respective densities. Mountain mahogany was the only key browse species that experienced a noticeable decrease in its density. Rates of decadency have increased for all key browse species regardless of the direction of their respective population changes. Another important characteristic to monitor is the proportion of the plants that are considered to be in poor vigor. This trend should turn around with better precipitation patterns in coming years and an end to the extended drought. The browse trend is slightly up. Most of the herbaceous understory species are also experiencing increased values for nested and quadrat frequency. The herbaceous understory trend is slightly upward.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly up (4)

herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

Vegetation and litter cover are abundant on this site and there is little sign of current erosion. The soil trend is stable. With the exception of black sagebrush, the browse populations show a decrease in density. This decrease is due to the much larger sample size now used to estimate density. Mountain big sagebrush age structure indicates a maturing population that is currently healthy. The black sagebrush population is also healthy, although more seedling plants for each population would be beneficial. The browse trend is stable. The herbaceous understory trend is slightly downward due a decrease in sum of nested frequency for perennial species. Grasses dominate the herbaceous understory and account for most of the nested frequency decline.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Trend for soil is stable. Protective ground cover from vegetation and litter remains adequate to help limit erosion. Percent bare soil remains at about the same level as in 1998. Trend for browse is down slightly. The key species, mountain big sagebrush and black sagebrush show slight declines in density, but higher decadence and very low recruitment rates in 2003. More preferred yet less abundant species such as curleaf and true mountain mahogany display heavy browsing and no reproduction. The current drought period is likely the main factor driving these downward trends for browse populations. The herbaceous understory trend is slightly down due to the decrease in sum of nested frequency for perennial grasses and forbs. The most abundant perennial grass, crested wheatgrass, remained stable in 2003. The second most abundant grass, mutton bluegrass, declined in frequency but not significantly. Grass production declined by nearly one-half as average cover of perennial grasses was 7% in 2003. Forbs are diverse but provide very little forage or cover. Sum of nested frequency for forbs slightly decreased in 2003.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	75	104	107	114	5.05	3.38
G	Agropyron spicatum	4	10	14	3	.42	.04
G	Bouteloua gracilis	_{ab} 14	_b 39	_a 10	_{ab} 12	.07	.20
G	Bromus inermis	27	45	41	48	1.92	1.52
G	Bromus tectorum (a)	-	-	_b 37	_a 15	.56	.06
G	Carex spp.	_{ab} 12	_{ab} 14	_b 20	_a 1	.14	.00
G	Koeleria cristata	_b 59	_b 43	_b 60	_a 9	1.04	.05
G	Oryzopsis hymenoides	-	5	-	3	-	.03
G	Poa fendleriana	_c 255	_b 195	_a 107	_a 65	3.30	.93
G	Poa secunda	-	-	_b 45	_a 3	1.68	.03
G	Sitanion hystrix	_a 40	_b 65	_a 21	_a 37	.20	.62
G	Stipa comata	_a 9	_b 49	_a 7	_a 9	.19	.11
Total for Annual Grasses		0	0	37	15	0.56	0.06
Total for Perennial Grasses		495	569	432	304	14.05	6.94
Total for Grasses		495	569	469	319	14.61	7.00

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Agoseris glauca</i>	a-	b ⁹	ab ⁶	ab ³	.04	.01
F	<i>Alyssum alyssoides</i> (a)	-	-	-	2	-	.00
F	<i>Antennaria rosea</i>	-	2	3	-	.03	-
F	<i>Arabis demissa</i>	3	-	1	-	.03	-
F	<i>Astragalus</i> spp.	b ¹¹	ab ⁵	b ⁹	a-	.08	-
F	<i>Astragalus utahensis</i>	-	-	2	1	.00	.00
F	<i>Castilleja chromosa</i>	a-	b ¹¹	ab ¹	a-	.00	-
F	<i>Camelina microcarpa</i> (a)	-	-	1	-	.00	-
F	<i>Calochortus nuttallii</i>	bc ¹⁴	c ¹⁸	a-	ab ⁸	-	.01
F	<i>Collinsia parviflora</i> (a)	-	-	-	6	-	.01
F	<i>Descurainia pinnata</i> (a)	-	-	-	8	-	.04
F	<i>Erigeron pumilus</i>	-	3	6	4	.06	.03
F	<i>Eriogonum racemosum</i>	23	26	31	26	.25	.39
F	<i>Eriogonum umbellatum</i>	-	-	-	3	-	.03
F	<i>Lappula occidentalis</i> (a)	-	-	a-	b ¹⁰⁰	-	.92
F	<i>Lesquerella intermedia</i>	-	-	1	3	.00	.03
F	<i>Lithospermum ruderales</i>	2	1	3	2	.30	.15
F	<i>Lomatium</i> spp.	-	3	-	7	.00	.01
F	<i>Machaeranthera canescens</i>	-	-	-	-	.01	-
F	<i>Microsteris gracilis</i> (a)	-	-	2	11	.00	.02
F	<i>Orobancha fasciculata</i>	-	-	7	-	.04	-
F	<i>Petradoria pumila</i>	14	12	15	9	.66	.10
F	<i>Phlox longifolia</i>	ab ⁴¹	b ⁵⁸	b ⁵⁵	a ²⁶	.23	.13
F	<i>Polygonum douglasii</i> (a)	-	-	b ¹⁵	a ⁶	.04	.01
F	<i>Sphaeralcea coccinea</i>	7	7	3	-	.03	-
F	<i>Tragopogon dubius</i>	4	-	-	-	-	-
F	<i>Trifolium</i> spp.	ab ²⁸	b ³¹	a ¹²	a ¹⁰	.03	.05
F	Unknown forb-perennial	2	-	-	-	-	-
Total for Annual Forbs		0	0	18	133	0.05	1.02
Total for Perennial Forbs		149	186	155	102	1.82	0.96
Total for Forbs		149	186	173	235	1.87	1.99

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

BROWSE TRENDS --

Management unit 22 , Study no: 1

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	53	48	8.77	6.34
B	Artemisia tridentata vaseyana	83	79	18.67	15.26
B	Cercocarpus ledifolius	5	2	.06	-
B	Cercocarpus montanus	18	21	.38	.33
B	Chrysothamnus depressus	5	8	.01	.03
B	Chrysothamnus parryi	0	2	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	-	-
B	Eriogonum microthecum	14	18	.73	.23
B	Gutierrezia sarothrae	1	2	.03	.15
B	Juniperus osteosperma	0	1	-	1.25
B	Opuntia spp.	26	23	.41	.43
B	Pediocactus simpsonii	0	3	-	-
B	Pinus edulis	5	3	2.64	2.34
B	Purshia tridentata	0	0	.00	-
B	Quercus gambelii	9	9	1.80	1.08
B	Sclerocactus	2	0	.01	-
B	Tetradymia canescens	0	2	-	.00
Total for Browse		222	221	33.52	27.48

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 1

Species	Percent Cover
	'03
Artemisia nova	6.40
Artemisia tridentata vaseyana	12.98
Cercocarpus montanus	.51
Chrysothamnus depressus	.06
Eriogonum microthecum	.26
Juniperus osteosperma	2.40
Opuntia spp.	.45
Pinus edulis	4.43
Quercus gambelii	6.71

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 1

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	2.7
Cercocarpus montanus	3.7
Cercocarpus ledifolius	3.2

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 1

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	13	22
Pinus edulis	39	55

Average diameter (in)	
'98	'03
3.8	4.7
4.2	4.3

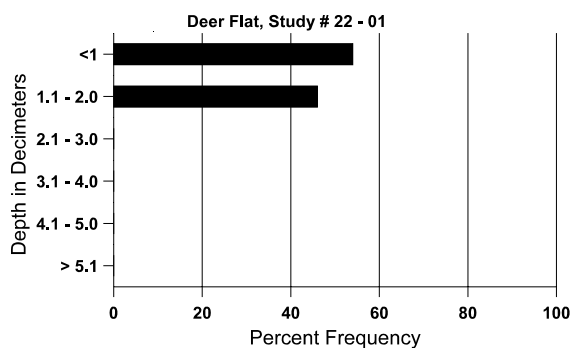
BASIC COVER --
Management unit 22 , Study no: 1

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	9.50	11.00	42.20	36.33
Rock	9.50	11.75	15.98	17.59
Pavement	8.00	3.50	9.25	5.68
Litter	60.00	53.50	50.24	40.18
Cryptogams	0	.25	.58	.18
Bare Ground	13.00	20.00	12.41	14.11

SOIL ANALYSIS DATA --
Management unit 22, Study no: 1, Study Name: Deer Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
8.7	59.0 (7.7)	6.2	52.0	27.4	20.6	6.5	12.1	233.6	1.0

Stoniness Index



PELLET GROUP DATA --
Management unit 22 , Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	37	13	-	-
Elk	5	8	12 (30)	39 (96)
Deer	55	31	58 (143)	149 (369)
Cattle	7	2	11 (27)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
85	1999	466	1266	600	133	-	30	0	7	3	13/20
91	3265	-	1066	1666	533	-	22	49	16	6	10/17
98	3920	20	500	2800	620	140	17	1	16	2	15/23
03	3520	-	20	1740	1760	220	7	3	50	4	16/20
<i>Artemisia tridentata vaseyana</i>											
85	9333	1200	5000	3933	400	-	44	2	4	.71	23/29
91	9599	-	4533	3000	2066	-	35	31	22	6	24/28
98	3640	-	480	2480	680	140	39	6	19	1	22/32
03	3480	-	20	1900	1560	380	32	52	45	9	25/29
<i>Cercocarpus ledifolius</i>											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	133	-	133	-	-	-	50	50	-	0	-/-
98	120	-	100	20	-	-	0	0	-	0	16/16
03	40	-	-	40	-	-	0	100	-	0	11/13
<i>Cercocarpus montanus</i>											
85	1399	933	1266	133	-	-	19	71	0	0	15/13
91	932	133	266	466	200	-	0	86	21	7	9/11
98	380	60	260	120	-	20	32	5	0	0	18/18
03	480	-	-	480	-	-	8	75	0	0	14/14
<i>Chrysothamnus depressus</i>											
85	133	-	-	133	-	-	0	0	0	0	2/5
91	0	-	-	-	-	-	0	0	0	0	-/-
98	120	-	60	60	-	-	17	0	0	0	2/8
03	280	-	-	260	20	-	14	86	7	0	6/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	13/18
Chrysothamnus viscidiflorus viscidiflorus											
85	66	-	-	66	-	-	0	0	0	0	4/9
91	66	-	-	-	66	-	0	100	100	0	-/-
98	20	-	-	20	-	-	0	0	0	0	11/13
03	0	-	-	-	-	-	0	0	0	0	-/-
Eriogonum microthecum											
85	1399	-	533	866	-	-	5	10	0	0	5/7
91	2199	-	333	1733	133	-	15	21	6	3	6/6
98	400	-	20	360	20	-	10	0	5	5	6/12
03	680	-	40	640	-	-	24	35	0	0	5/6
Gutierrezia sarothrae											
85	1799	-	333	1466	-	-	0	0	0	0	7/5
91	399	-	-	333	66	-	0	0	17	0	8/8
98	20	-	-	20	-	-	0	0	0	0	7/5
03	40	-	20	20	-	-	0	0	0	0	6/6
Juniperus osteosperma											
85	66	-	-	66	-	-	0	0	-	0	44/33
91	66	-	-	66	-	-	0	0	-	0	63/67
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
85	2932	-	666	2066	200	-	0	7	7	18	4/6
91	2466	200	1333	1000	133	-	0	14	5	0	5/11
98	720	40	180	500	40	-	0	0	6	6	5/10
03	820	-	-	700	120	-	0	7	15	5	5/10
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	-	-	-	0	0	-	0	-/-
03	100	-	40	60	-	-	0	0	-	0	2/4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pinus edulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	100	-	-	100	-	20	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	-	0	-/-
Quercus gambelii											
85	66	200	66	-	-	-	100	0	0	0	-/-
91	133	-	133	-	-	-	50	50	0	0	-/-
98	540	-	100	420	20	40	7	26	4	4	31/28
03	1040	-	200	840	-	20	63	17	0	0	19/16
Sclerocactus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	40	20	20	20	-	-	0	0	-	0	2/3
03	0	-	-	-	-	-	0	0	-	0	-/-
Tetradymia canescens											
85	66	-	-	66	-	-	0	0	-	0	4/6
91	133	-	-	133	-	-	0	0	-	0	6/7
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	20	20	-	-	0	0	-	0	6/10

Trend Study 22-2-03

Study site name: Piute Reservoir.

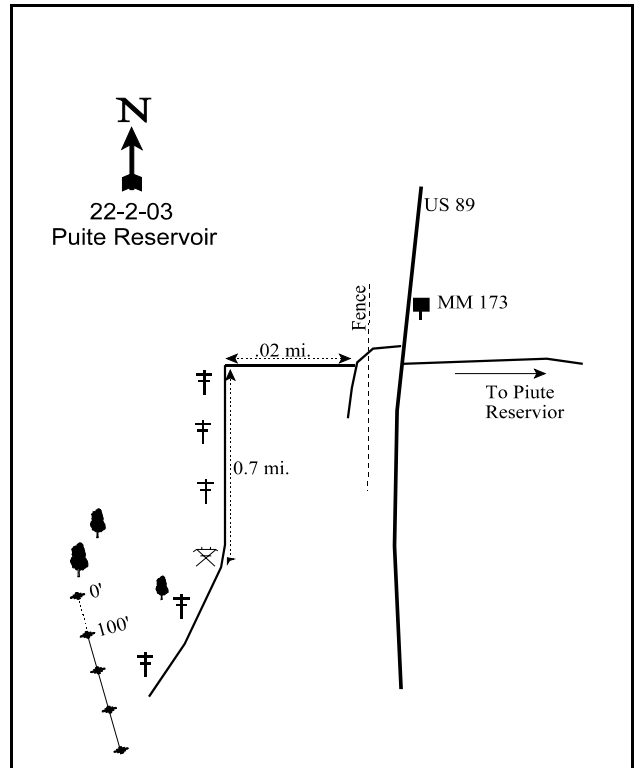
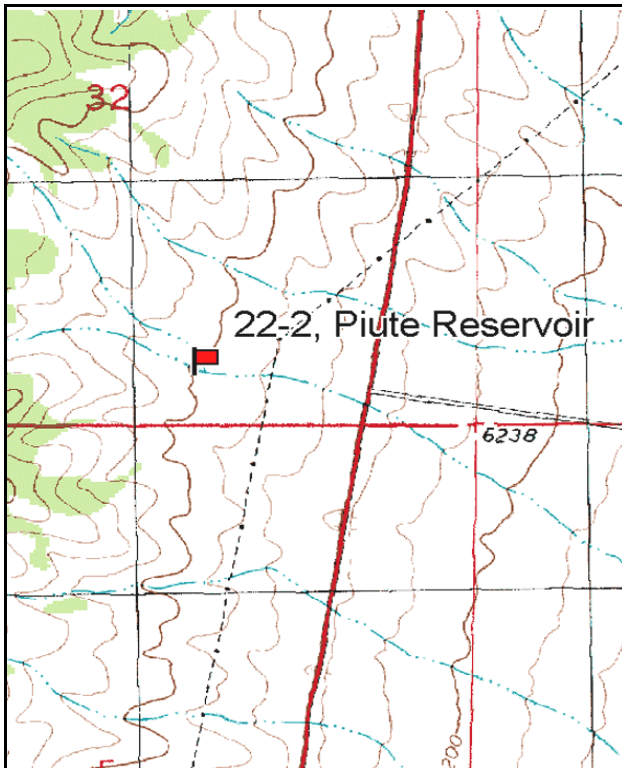
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From mile marker 173 on Route 89 south of Marysvale, go 0.1 miles south and turn west on a faint, grassy road. Take an immediate right after going through the fence. Proceed 0.2 miles to a fork, go left for 0.7 miles to a large steel power pole where the powerlines turn. From the steel power pole, go about 600 feet at 225 degrees magnetic between to large juniper trees to another juniper. The 0-foot end of the frequency baseline is 5 yards south of the juniper. The stakes are all rebar and the 0-foot stake has a browse tag #7080 attached.



Map Name: Piute Reservoir

Diagrammatic Sketch

Township 29S, Range 3W, Section 5

GPS: NAD 27, UTM 12S 4242530 N, 393135 E

DISCUSSION

Piute Reservoir - Trend Study No. 22-2

The Piute Reservoir transect is located on BLM administered land approximately 1½ miles west of the dam and ¼ mile west of Highway 89. The slope is gentle (2-3%) with a southeast aspect and an elevation of 6,400 feet. The range type is Wyoming big sagebrush. The study is within the Junction Cattle Allotment with joint Forest Service and BLM grazing seasons from May 1 through June 10 and November 1 through February 15 annually. Deer use occurs mainly during the winter and early spring. In 1991, it was noted that pellet groups were scattered throughout the area and one antler shed was found. In 1998, a pellet group transect on the site indicated 21 deer days use/acre (52 ddu/ha), and 5 shed deer antlers were found in the area. Pellet group transect data from 2003 estimated only 3 deer and 5 elk days use/acre (8 ddu/ha and 13 edu/ha). Lighter use in 2003 is likely due to several mild winters preceding the survey allowing deer to stay at higher elevations.

Soils are sandy loam in texture with a neutral pH (7.3). The soil is loose and infiltration rates and water holding capacity are probably quite high. Soil temperature averaged about 72°F at a depth of 14 inches in both 1998 and 2003 indicating a dry soil profile. Rock and pavement cover a high proportion of the soil surface ranging from 38% in 2003 to 59% in 1985. In 1991, small erosion rills were common on the slopes and active gullies were prominent throughout the area. In 1998, some erosion was apparent, but it did not appear to be excessive or accelerated. Soils were given a stable rating from an erosion condition class assessment in 2003 as erosion was minimal. Bare soil has steadily increased with each reading and was estimated at 27% in 2003.

The key browse on the site is Wyoming big sagebrush. Sagebrush density was estimated at 3,560 plants/acre in 1998 increasing to 4,660 plants/acre in 2003. These plants average 20 inches in height and show light to moderate hedging in all years. The lightest use on sagebrush was in 2003. Young plants were abundant in both 1985 and 1991, moderate in 1998, and few sampled in 2003. The Wyoming big sagebrush population has become mostly mature and decadent since the initial reading in 1985. Percent decadence has been moderately high since 1991, peaking at 40% in 2003. Although percent decadence increased in 2003, the proportion of decadent plants classified as dying declined from 47% to 13%. With low reproduction and increasing decadence, the Wyoming big sagebrush population could decline by the next reading. The percentage of plants in poor vigor was low in 2003 at 5%, a decrease from 31% in 1991 and 15% in 1998. Annual leader growth averaged 1.4 inches for Wyoming big sagebrush in 2003, while canopy cover averaged 17.6%.

Low rabbitbrush is also abundant on the site with an estimated density of 3,400 plants/acre in 1998 and 3,920 in 2003. Age structure is shifting to a more mature population with fewer seedling and young plants encountered in 1998 and 2003 than in previous years. Low rabbitbrush showed light to moderate use in 1985, but very little use since. A thick pinyon and juniper woodland occurs west of this transect with a few trees starting to encroach onto the flat. These trees provide good thermal and escape cover for wintering deer.

Herbaceous vegetation is sparse on this site as illustrated by a total cover of 3% or less for all surveys. Only five species of grasses have been sampled in all years. Perennial species include bottlebrush squirreltail, Indian ricegrass, a sedge, and needle-and-thread grass. All are cool season species and occur in very low densities. Cheatgrass is found on the site yet was only sampled in one or two quadrats. The forb composition is split nearly evenly between annual and perennial species. Fiddleneck was the most abundant forb species in 2003 occurring in 39% of the quadrats. An annual *Gilia* and tansy mustard were also fairly abundant in 2003. An annual ragweed was particularly abundant along washes and the disturbed roadway in 1998.

1985 APPARENT TREND ASSESSMENT

The soil is one of high erosion potential and soil loss is common throughout the area. Both of the prominent browse species, Wyoming big sagebrush and low rabbitbrush, appear to be increasing in the absence of competition from grasses and forbs. Sod-forming grasses are conspicuously lacking. Herbaceous species are sparse and provide very little soil protection between the shrubs. Thus, trend of both the soil and the vegetative community appear downward due in large measure to the absence of sod-forming grasses and more desirable forbs. Perhaps spring livestock grazing should be eliminated for several years.

1991 TREND ASSESSMENT

The soil trend is downward because of the sharp increase in percent bare ground and decrease in litter cover. This makes soil much more susceptible to erosion during high intensity summer storms. Wyoming big sagebrush and low rabbitbrush, have noted increases in their respective densities, but percent decadence has increased for sagebrush (34%). There are two more critical measurements that are of concern for this sagebrush community. This would include form class which is indicating that 29% of the plants are heavily browsed, but more importantly, the proportion of the population that are classified as having poor vigor has increased to 31%. The browse trend is slightly downward. There are very few forbs or grasses occurring on the site and most have shown declines since 1985. The trend for herbaceous understory is slightly downward. The only way to turn around this trend is to discontinue habitual spring livestock grazing.

TREND ASSESSMENT

soil - down (1)

browse - slightly down (2)

herbaceous understory - slightly down (2)

1998 TREND ASSESSMENT

The soil trend is stable, but the soil is still vulnerable to high intensity rainstorms. Percent bare ground cover is increasing, while percent rock and pavement cover combined is decreasing. The shrub interspaces are devoid of any protective ground cover due to low frequencies of herbaceous species. The browse trend is stable. There has been an increase in the percentage of decadent sagebrush plants classified as dying (47%), but there are currently enough young plants in the population to replace these individuals. Percent decadence slightly declined overall, and the percentage of plants classified with poor vigor has declined to 15%. The herbaceous understory trend is slightly upward. Perennial grass sum of nested frequency has increased from 33 in 1991 to 73 in 1998. Similarly, total perennial herbaceous sum of nested frequency has increased from 47 in 1991 to 99 in 1998.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly up (4)

2003 TREND ASSESSMENT

Trend for soil is slightly down due to an increase in bare soil and a decrease in litter cover. Erosion remains low, but the potential for erosion is moderate with very little protective cover within the shrub interspaces. Trend for browse is stable. The key parameters for Wyoming big sagebrush are mixed. Positive changes include increased density, improved vigor, lighter use, and a decrease in the proportion of decadent plants classified as dying. However, recruitment from young plants declined and percent decadence increased to 40%. The increaser, low rabbitbrush, increased in density in 2003, although not enough to cause concern at

the present time. The herbaceous understory is stable, but sparse and in poor condition. Perennial grass frequency slightly declined while perennial forb frequency increased. Herbaceous vegetation is almost insignificant on this site. A change in management would be beneficial on this area to help stimulate herbaceous production. This might include mechanical treatment and seeding, and adjustments in the grazing system, or both.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 2

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Bromus tectorum (a)	-	-	3	6	.00	.03
G	Carex spp.	-	2	1	-	.00	-
G	Oryzopsis hymenoides	3	11	11	12	.28	.22
G	Sitanion hystrix	ab ²²	ab ¹⁹	b ³⁶	a ¹⁶	.71	.16
G	Stipa comata	ab ¹²	a ¹	b ²⁵	ab ¹⁶	.65	.07
Total for Annual Grasses		0	0	3	6	0.00	0.03
Total for Perennial Grasses		37	33	73	44	1.65	0.46
Total for Grasses		37	33	76	50	1.65	0.50
F	Alyssum alyssoides (a)	-	-	-	3	-	.00
F	Allium spp.	-	-	-	3	-	.00
F	Ambrosia spp.	2	-	-	-	-	-
F	Amsinckia spp.	-	-	a ⁻	b ⁸²	-	1.93
F	Astragalus spp.	c ²⁹	ab ⁵	bc ¹⁵	a ⁻	.23	-
F	Castilleja linariaefolia	-	-	-	3	-	.03
F	Chaenactis douglasii	-	-	1	3	.00	.00
F	Collomia linearis (a)	-	-	a ⁻	b ¹⁵	-	.04
F	Cryptantha spp.	-	-	6	-	.06	-
F	Descurainia pinnata (a)	-	-	a ⁻	b ⁵³	-	.41
F	Draba spp. (a)	-	-	-	1	-	.00
F	Eriogonum cernuum (a)	b ³⁵	a ⁷	a ⁵	a ¹	.01	.00
F	Gilia spp. (a)	-	-	a ⁻	b ⁶⁰	-	.21
F	Mentzelia albicaulis (a)	-	-	-	7	-	.01
F	Orobanche fasciculata	-	-	1	-	.00	-
F	Phlox longifolia	3	6	3	6	.00	.01
F	Sphaeralcea grossulariaefolia	-	-	-	1	-	.00

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Unknown forb-annual (a)	-	7	-	-	-	-
F	Unknown forb-perennial	3	3	-	-	-	-
Total for Annual Forbs		35	14	5	140	0.00	0.70
Total for Perennial Forbs		37	14	26	98	0.30	1.99
Total for Forbs		72	28	31	238	0.31	2.69

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

BROWSE TRENDS --

Management unit 22 , Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	1	0	-	-
B	Artemisia tridentata wyomingensis	84	90	18.43	21.65
B	Chrysothamnus viscidiflorus stenophyllus	63	61	7.55	5.90
B	Juniperus osteosperma	0	1	-	.03
B	Leptodactylon pungens	0	0	.38	-
B	Opuntia spp.	1	1	.15	-
B	Pinus edulis	2	1	.18	.41
Total for Browse		151	154	26.70	28.00

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 2

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	17.56
Chrysothamnus viscidiflorus stenophyllus	6.26
Pinus edulis	.88

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 2

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.4

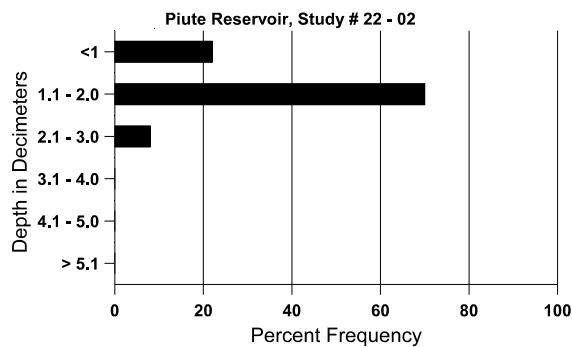
BASIC COVER --
Management unit 22 , Study no: 2

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.00	4.25	29.79	30.15
Rock	.75	3.25	3.83	6.93
Pavement	58.50	48.75	43.54	31.50
Litter	29.25	24.25	26.39	17.25
Cryptogams	0	.25	.15	.15
Bare Ground	8.50	19.25	21.88	27.26

SOIL ANALYSIS DATA --
Management unit 22, Study no: 2, Study Name: Piute Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.2	72.0 (14.7)	7.3	68.0	17.4	14.6	3.9	16.2	332.8	0.9

Stoniness Index



PELLET GROUP DATA --
 Management unit 22 , Study no: 2

Type	Quadrat Frequency	
	'98	'03
Rabbit	11	10
Elk	-	2
Deer	6	1

Days use per acre (ha)	
'98	'03
-	-
-	5 (13)
21 (52)	3 (8)

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	-	0	0	100	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Artemisia tridentata wyomingensis											
85	6799	2733	2333	3200	1266	-	49	9	19	3	20/24
91	6932	66	2666	1933	2333	-	37	29	34	31	18/25
98	3560	140	500	2040	1020	340	44	4	29	15	20/33
03	4660	-	60	2740	1860	540	8	.42	40	5	20/29
Cercocarpus ledifolius											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	100	0	-	0	11/5
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus											
85	2133	10066	800	933	400	-	13	13	19	3	13/9
91	2266	-	800	1400	66	-	0	3	3	6	12/8
98	3400	260	240	2660	500	20	0	2	15	5	12/13
03	3920	-	60	2420	1440	40	0	0	37	1	12/15
Juniperus osteosperma											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	20	-	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Opuntia</i> spp.											
85	66	-	-	66	-	-	0	0	-	0	5/9
91	66	-	-	66	-	-	0	0	-	0	5/8
98	20	-	-	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	5/5
<i>Pinus edulis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-

Trend Study 22-3-03

Study site name: Oak Basin.

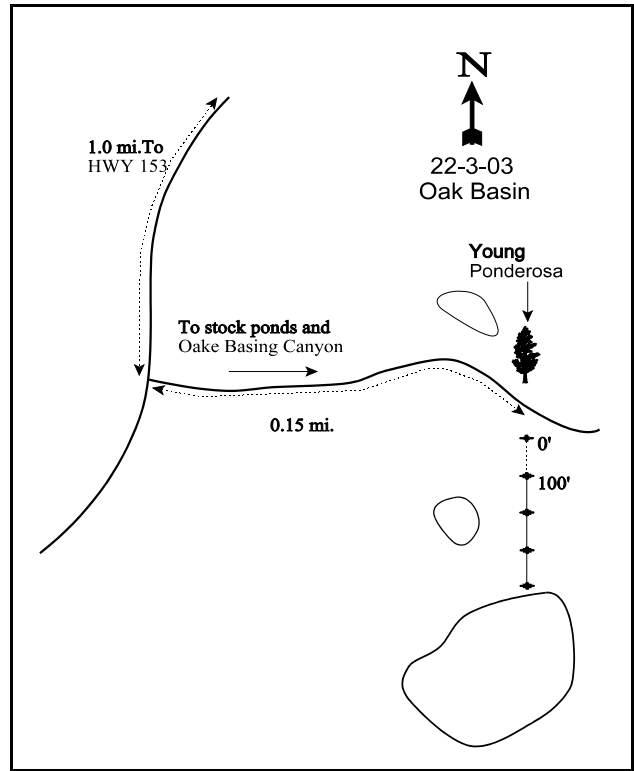
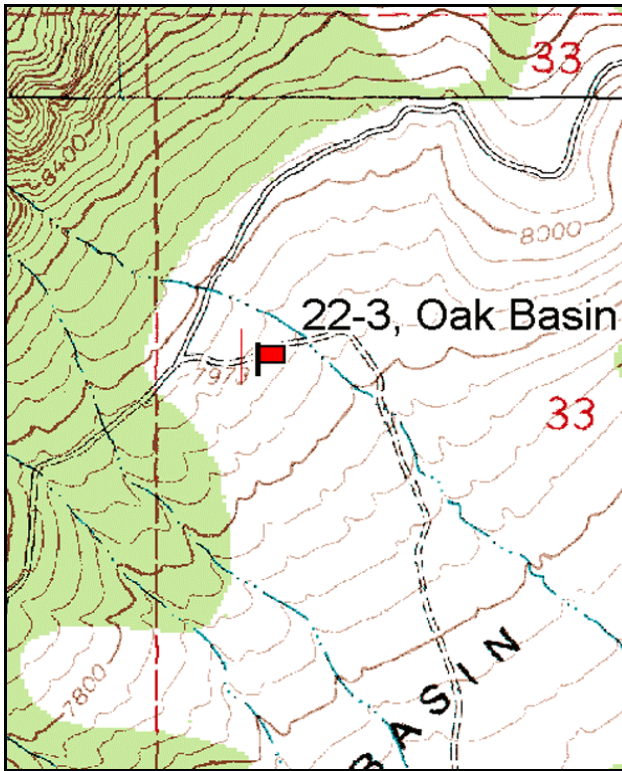
Vegetation type: Oak-Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 2 on 3ft, belt 5 on 7ft.

LOCATION DESCRIPTION

From the center of Junction in Piute County, go west on Highway 153 for 7.6 miles. Take the left fork (Oak Basin Cottonwood or Rd 134) and go just under 1 mile to another fork. Turn left and go 0.15 miles to a lone ponderosa pine 15 feet to the left of the road. The baseline starts 100 feet south of the pine. The 0-foot stake is a steel rebar tagged #7044.



Map Name: Circleville

Diagrammatic Sketch

Township 29S, Range 4W, Section 33

GPS: NAD 27, UTM 12S 4233609 N, 384257 E

DISCUSSION

Oak Basin - Trend Study No. 22-3

This transect is located in Oak Basin approximately 5½ miles west of Junction. The site is moderately steep (20%) and drains to the southeast at an elevation of 7,900 feet. The study is part of a 600-acre tract that was dixe harrowed and seeded in 1965. The site also burned between the 1985 and 1991 surveys. Deer use the area as spring-fall range and during mild winters. The area is grazed as part of the Circleville Cattle Allotment on a 3 year rest rotation system. In the first year, cattle graze the area from June 1 to July 24. In the second year, cattle graze from July 24 through October 15. The pasture is then rested in the third year. The DWR Oak Basin pellet group transect is located 200 to 300 feet higher in elevation and about ½ mile to the north. Deer days use/acre rose from 13 (32 ddu/ha) in 1976-77 to 42 (104 ddu/ha) in 1984-85 with 5-year averages of 16 deer days (40 ddu/ha) between 1976 and 1981 and 75 deer days (185 ddu/ha) between 1981 and 1985 (Jense et al. 1985). The trend for deer days use/acre appeared stable from 1985-86 through 1991-92 with an average of 28 (69 ddu/ha) (Jense et al. 1991). Pellet group data was not collected in 1992-93, but beginning in 1993-94, there was an obvious decline in use patterns with average days use/acre dropping to an average of 4 (10 ddu/ha) between 1993-94 through 1996-97 (Evans et al. 1997). A pellet group transect read on the site in 1998 estimated 39 deer days use/acre (96 ddu/ha). Data from 2003 estimated 46 deer days use/acre (114 ddu/ha). Cattle use was estimated at 75 cow days use/acre (185 cdu/ha) in 1998 and 25 cow days use/acre (63 cdu/ha) in 2003. Cattle were grazing the site when it was read in July of 2003. A few elk pellet groups were also sampled in 2003. Jackrabbits, cottontail rabbits, sage grouse, and blue grouse are also found nearby.

Soils are sandy clay loam in texture with a slightly acidic pH (6.3). Soil depth is fairly shallow as the effective rooting depth is estimated at less than 9 inches. Average soil temperature was 61.2°F at 12 inches in 1998 and 74°F in 2003. The difference in temperature between years is a function of soil moisture. Higher soil temperatures indicate a drier profile which is not surprising as the 2003 survey occurred during drought. Parent material is metamorphic rock originating from the cliffs west of the transect. Initially, bare soil was low at 6%, but has increased to 26% in 2003. Conversely, percent litter cover has steadily declined with each reading ranging from 67% in 1985 to 32% in 2003. In 1998, no signs of erosion were noted and the soil appeared to be building. In 2003, an erosion condition class assessment rated soils as stable. Many of the changes in basic cover categories were brought about by the fire that burned through the site prior to the 1991 reading.

Mountain big sagebrush is the key browse species on the site. In 1985, the age structure of this species indicated a maturing population as seedlings and young plants accounted for 1% and 10% of the population respectively. All plants were vigorous and hedging was light to moderate depending on the ecotypic variation of individual plants. Due to a fire that burned through the site between 1985 and 1991, there were no mountain big sagebrush plants encountered in the density plots in 1991. The population has since returned with an estimated density of 1,240 plants/acre in 1998 and 2003. In 1998, young plants were abundant as they made up 26% of the population. With drier conditions in 2003, young sagebrush represented only 10% of the population yet are abundant enough to replace those individuals classified as decadent and dying. Vigor has been mostly normal in all readings. Sagebrush had abundant seedhead production in 2003 and annual leader growth averaged just under 2 inches.

Antelope bitterbrush and Gambel oak are also important on this site. The bitterbrush is scattered throughout the site with an estimated density of 120 plants/acre in 1998 and 2003. Bitterbrush plants are short statured due to many years of heavy browsing, but the population is generally healthy and vigorous. The Gambel oak population was drastically reduced following the burn. Pre-burn estimates were nearly 16,000 stems/acre for oak, while density was estimated at 520 stems/acre in 1998 and 960 in 2003 following the burn. The majority of the oak sampled in 1998 were classified as young (62%), but nearly the entire population was classified as

mature in 2003 (96%). Oak has been healthy and vigorous in all readings. It has been rated as only lightly hedged in all years except 1998 when use was classified as more moderate. The remainder of the browse species are relatively unimportant in terms of total production, but add diversity and offer variety to the deer diet.

The herbaceous understory is dominated by perennial grasses. Ten grasses were encountered on the site in 1998 and 12 in 2003. Intermediate wheatgrass is by far the dominant species as it provided nearly 80% of the total grass cover in 1998 and 2003. It also provided over one-half of the total vegetation cover for the site in both years. This species has maintained a fairly constant nested frequency value in all years, both pre and post-burn samples included. Crested wheatgrass is second to intermediate wheatgrass in abundance. Crested wheatgrass has significantly declined on the site since 1985, yet was still sampled in almost one-half of the quadrats in 2003. The only native perennial grass to be fairly abundant is mutton bluegrass. This species is found primarily under the protection of shrubs and where intermediate wheatgrass is less abundant. Utilization on grasses was moderate at the time of sampling in 1998, but somewhat lighter in 2003. In 1998, the grasses under the canopy of browse plants received the lightest use, while those in the interspaces were generally clipped to within a few inches of the ground. Perennial grass sum of nested frequency has declined over all years.

The forb component is poor for a site at this high of an elevation. Silvery lupine has been the most abundant forb species in all samples, although it significantly declined in nested frequency between 1998 and 2003 due to drier conditions. Most other species are sparse in the area. Use of these forbs by cattle is light. However the forbs, especially the lupine, are unquestionably important in the spring and summer diet for deer. A highly competitive perennial grass component, primarily seeded exotics, will make it difficult for most forbs to increase in the future.

1985 APPARENT TREND ASSESSMENT

The soil is well protected and building, with no indication of erosion problems. Vegetative trend was influenced by the seeding project in 1965. Species diversity is good and there is a healthy balance between the grass, forb, and shrub components. With the exception of spreading patches of Gambel oak, the community appears stable at present. In the long-term, the browse species can be expected to slowly decline unless reproduction increases.

1991 TREND ASSESSMENT

Because of a recent wildfire, the soil trend has changed dramatically since 1985. Percent bare ground has increased from 6% to 18% and percent litter has decreased substantially. Trend is down and should be monitored closely. Browse trend is obviously down with the loss of all browse except for Gambel oak and pricklypear cactus to the fire. The herbaceous understory trend is slightly downward. Of the 29 species encountered, 14 show downward trends. Even with crested wheatgrass and intermediate wheatgrass with quadrat frequencies of 67% and 99% respectively, the overall trend with the effects of long-term drought and a relatively recent fire is slightly down.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - slightly down (2)

1998 TREND ASSESSMENT

The soil trend is slightly upward with a decrease in percent bare ground cover. There currently appears to be

adequate vegetation and litter cover to protect the soil from accelerated erosion. Percent rock and litter cover have stayed relatively stable over all years. The browse trend is upward with the recovery of mountain big sagebrush after the fire. The population appears healthy with young plants making up 26% of the population. Utilization is light to moderate with percent decadence at 15%. The herbaceous understory trend is again slightly down. As a group, sum of nested frequency for perennial grasses and forbs continues to decline. However, intermediate wheatgrass and crested wheatgrass are the most abundant herbaceous species and both have slightly increased nested frequency values in 1998.

TREND ASSESSMENT

soil - slightly up (4)

browse - up (5)

herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Trend for soil is down. Drought conditions have resulted in an increase in bare soil and large decreases in both vegetation and litter cover. Average cover and nested frequency of herbaceous perennials both show declines in 2003 as well. Soils do not show evidence of accelerated erosion at the present time. Trend for browse is stable. The key species, mountain big sagebrush, has a stable density and normal vigor throughout most of the population. Percent decadence slightly increased and recruitment by young plants declined. However, the current level for both of these parameters are acceptable with the dry conditions in 2003. Bitterbrush also has a stable density, while Gambel oak is increasing on the site. Trend for the herbaceous understory is down. Intermediate wheatgrass, the dominate grass on the site, maintained a stable nested frequency value in 2003. Crested wheatgrass significantly declined as did *Carex*. The only abundant perennial forb, silvery lupine, also significantly declined in frequency and cover in 2003. Overall, average cover of herbaceous perennials declined by 1/3, and sum of nested frequency decreased by over 20%. The dry conditions in 2003 played a definitive role in the decline of herbaceous species.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 3

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	c221	b169	bc176	a101	4.73	2.94
G	Agropyron intermedium	ab316	a303	b326	ab319	20.23	15.73
G	Agropyron spicatum	-	-	-	3	-	.00
G	Agropyron trachycaulum	-	4	-	-	-	-
G	Bouteloua gracilis	4	2	1	8	.03	.44
G	Bromus inermis	b16	a-	ab12	ab5	.16	.07
G	Carex spp.	b34	b24	b26	a1	.55	.03
G	Elymus junceus	b10	a-	a-	a-	-	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Koeleria cristata</i>	1	3	-	3	-	.03
G	<i>Oryzopsis hymenoides</i>	-	-	3	-	.00	-
G	<i>Poa fendleriana</i>	_b 127	_b 102	_a 28	_a 43	.33	.41
G	<i>Poa pratensis</i>	8	-	3	5	.00	.03
G	<i>Poa secunda</i>	-	-	-	2	-	.00
G	<i>Sitanion hystrix</i>	1	1	2	-	.00	-
G	<i>Stipa comata</i>	3	7	-	1	-	.00
G	<i>Stipa lettermani</i>	_{ab} 19	_b 31	_{ab} 24	_a 8	.46	.21
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		760	646	601	499	26.53	19.93
Total for Grasses		760	646	601	499	26.53	19.93
F	<i>Agoseris glauca</i>	_a -	_b 13	_{ab} 9	_a -	.01	-
F	<i>Arabis</i> spp.	_a -	_b 16	_a -	_a 1	-	.03
F	<i>Astragalus convallarius</i>	_{ab} 6	_b 7	_a -	_b 7	-	.02
F	<i>Astragalus</i> spp.	4	-	6	3	.16	.06
F	<i>Castilleja chromosa</i>	_b 10	_b 14	_a -	_a -	-	-
F	<i>Calochortus nuttallii</i>	_{ab} 2	_b 9	_{ab} 3	_a -	.00	-
F	<i>Chenopodium album</i> (a)	-	8	-	-	-	-
F	<i>Cryptantha</i> spp.	5	-	-	2	-	.00
F	<i>Eriogonum racemosum</i>	5	6	2	1	.03	.00
F	<i>Hackelia patens</i>	-	2	2	-	.00	-
F	<i>Lactuca serriola</i>	-	-	4	-	.01	-
F	<i>Lithospermum ruderales</i>	-	-	-	4	-	.00
F	<i>Lomatium</i> spp.	-	2	-	-	-	-
F	<i>Lotus utahensis</i>	_b 12	_a 4	_a -	_a -	-	-
F	<i>Lupinus argenteus</i>	_{ab} 45	_{bc} 50	_c 70	_a 29	7.11	2.34
F	<i>Medicago sativa</i>	4	1	4	3	.06	.00
F	<i>Microsteris gracilis</i> (a)	-	-	_a -	_b 21	-	.14
F	<i>Phlox longifolia</i>	_a 12	_b 33	_a 3	_a 3	.01	.00
F	<i>Polygonum douglasii</i> (a)	-	-	_b 47	_a -	.16	-
F	<i>Zigadenus paniculatus</i>	8	6	-	7	-	.01
Total for Annual Forbs		0	8	47	21	0.15	0.14
Total for Perennial Forbs		113	163	103	60	7.41	2.50
Total for Forbs		113	171	150	81	7.57	2.64

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

BROWSE TRENDS --

Management unit 22 , Study no: 3

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata vaseyana	41	40	3.79	4.25
B	Cercocarpus ledifolius	0	1	.15	-
B	Chrysothamnus depressus	0	0	-	.03
B	Chrysothamnus nauseosus hololeucus	0	1	-	-
B	Chrysothamnus viscidiflorus	1	1	-	-
B	Juniperus osteosperma	2	1	.85	.98
B	Opuntia spp.	6	3	.36	.21
B	Purshia tridentata	6	5	.18	.91
B	Quercus gambelii	7	6	.21	.30
Total for Browse		63	58	5.54	6.68

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 3

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	7.33
Chrysothamnus depressus	.08
Juniperus osteosperma	1.39
Opuntia spp.	.20
Purshia tridentata	.38
Quercus gambelii	1.21

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 3

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.9
Purshia tridentata	2.4

BASIC COVER --

Management unit 22 , Study no: 3

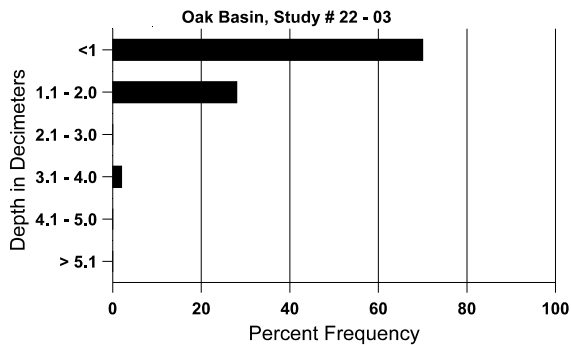
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	7.50	7.25	46.47	30.70
Rock	17.75	20.25	19.61	23.41
Pavement	2.00	1.00	1.47	1.69
Litter	66.50	53.75	48.23	31.67
Cryptogams	0	.25	.05	.00
Bare Ground	6.25	17.50	9.83	26.11

SOIL ANALYSIS DATA --

Management unit 22, Study no: 3, Study Name: Oak Basin

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
8.5	74.0 (10.1)	6.3	70.0	9.4	20.6	3.9	16.2	332.8	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	5	7	-	-
Elk	1	-	-	3 (7)
Deer	25	16	39 (96)	46 (114)
Cattle	17	6	75 (185)	25 (63)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
85	66	-	-	-	66	-	100	0	100	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Artemisia tridentata vaseyana											
85	5265	66	533	2866	1866	-	38	15	35	0	20/19
91	0	-	-	-	-	-	0	0	0	0	-/-
98	1240	20	320	740	180	300	31	0	15	3	21/26
03	1240	-	120	840	280	220	24	11	23	2	26/30
Cercocarpus ledifolius											
85	200	-	200	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	20	0	100	-	0	23/22
Chrysothamnus depressus											
85	66	-	-	66	-	-	0	0	-	0	6/6
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	7/13
Chrysothamnus nauseosus hololeucus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	100	-	0	-/-
Chrysothamnus viscidiflorus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	6/10
03	20	-	-	20	-	-	0	0	-	0	9/10
Juniperus osteosperma											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
85	66	-	66	-	-	-	0	0	0	0	-/-
91	66	-	-	66	-	-	0	0	0	100	9/16
98	140	20	-	120	20	-	0	0	14	0	7/12
03	120	-	-	120	-	-	0	0	0	0	5/11
Purshia tridentata											
85	465	-	66	333	66	-	71	29	14	0	18/20
91	0	-	-	-	-	-	0	0	0	0	-/-
98	120	-	-	120	-	-	0	100	0	0	11/26
03	120	-	-	100	20	-	0	100	17	17	11/30
Quercus gambelii											
85	15799	2266	13333	2000	466	-	5	0	3	2	33/14
91	9066	5733	9066	-	-	-	0	0	0	0	-/-
98	520	20	320	200	-	20	42	0	0	0	24/24
03	960	-	40	920	-	60	0	0	0	0	27/23

Trend Study 22-4-03

Study site name: Wades Canyon.

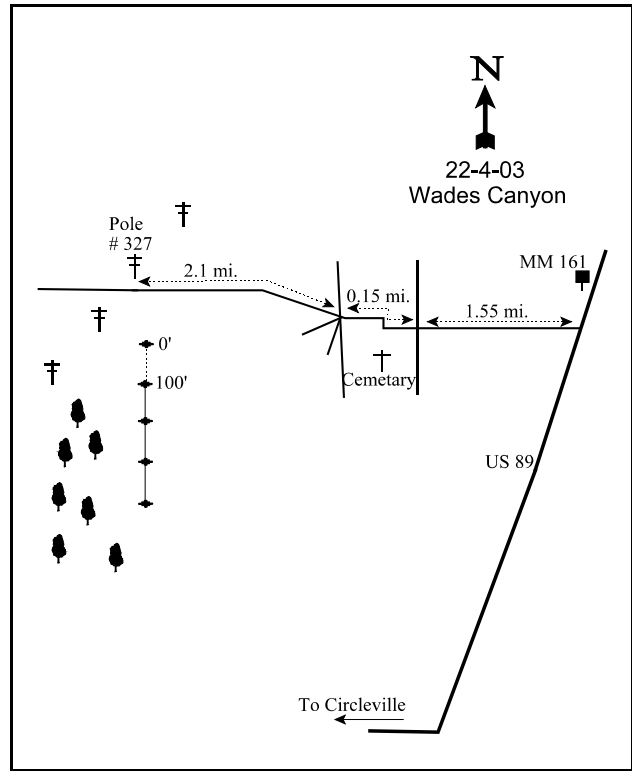
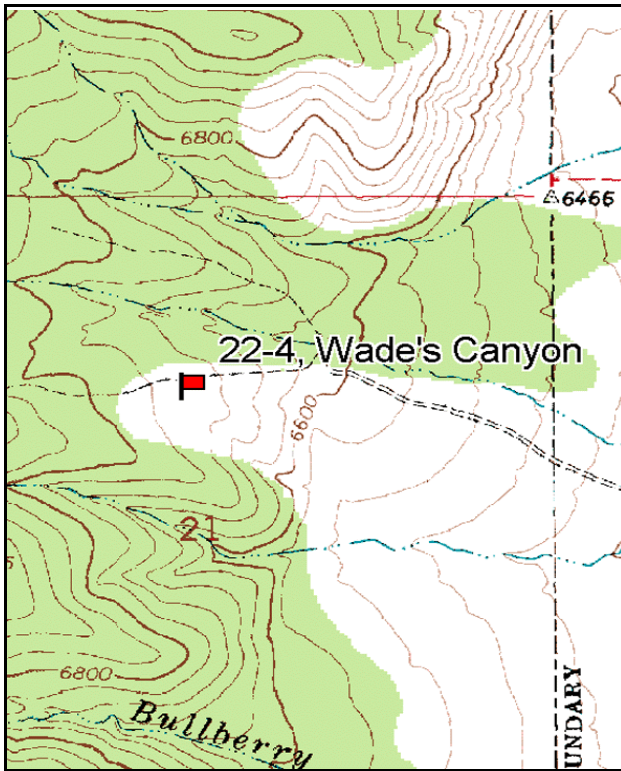
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From mile marker 161 on US 89, north of Circleville, drive south 0.5 mile to a dirt road. Turn west and go 1.55 miles through the north end of Circleville to a jog in the road. Continue west past the jog 0.15 miles to the Circleville cemetery. Drive around the cemetery to the northeast corner. From the corner, a faint road takes off at a 45-degree angle to the northwest. Proceed up this road 2.1 miles to the point where it crosses under a high tension powerline. Stop here. The pole (# 327) nearest the road has a red browse tag #7046 attached under a yellow reflector. Walk 300 feet due south to the first frequency baseline stake. The 0-foot stake is a 2-1/2 foot tall rebar tagged #7045. There is an unmarked pellet group transect here also.



Map Name: Circleville

Diagrammatic Sketch

Township 30S, Range 4W, Section 21

GPS: NAD 27, UTM 12S 4227350 N, 384704 E

DISCUSSION

Wades Canyon - Trend Study No. 22-4

This study is located northwest of Circleville just inside the Forest Service boundary at an elevation of 6,700 feet. The site drains to the east on a 7-10% slope. The vegetation type is sagebrush-grass, but pinyon-juniper are encroaching onto the site. The DWR Wades Canyon pellet group transect located nearby showed that deer use increased from 3 deer days use/acre (8 ddu/ha) in 1976-77 to 17 (42 ddu/ha) in 1980-81, with a 5 year average of 12 days use/acre (30 ddu/ha). Deer use had increased to 31 days use/acre (77 ddu/ha) by 1984-85, with a 5 year average between 1981 and 1985 of 24 deer days use/acre (59 ddu/ha) (Jense et al. 1985). Between 1986 and 1990, the trend continued to increase with an average of 27 deer days use/acre (67 ddu/ha). It appears that 1990 was the last time the permanent pellet group transect was read. A pellet group transect read on the trend study site in 1998 estimated 42 deer days use/acre (104 ddu/ha) and <1 cow days use/acre (2 cdu/ha). Pellet group transect data in 2003 indicated a large increase of deer on the site at an estimated 154 deer day use/acre (380 ddu/ha). A few elk pellet groups were also sampled in the transect.

Soils are a loam in texture and have a neutral pH (7.1). Soil depth is moderate with an effective rooting depth of 11 inches. Soil temperature averaged 62°F at a depth of 12 inches in 1998. A dense hardpan is found at a depth of about 10-12 inches. Phosphorous is relatively low at 8.8 ppm when at least 10 ppm is considered necessary for normal plant growth. The soil's water holding capacity is poor. Some soil movement is detectable, but the negligible slope reduces the potential for serious erosion problems. An erosion condition class assessment rated soils as stable to slightly eroding in 2003. Rock and pavement are abundant on the soil surface and bare soil was relatively low at 11% in 2003. Soil pedestalling around shrub and bunchgrass stems is high.

Wyoming big sagebrush is the principal key species. Wyoming big sagebrush provides about 1/2 of the browse cover on the site and had an estimated density of 2,920 plants/acre in 1998 and 2003. The population of Wyoming big sagebrush on this site is in poor condition. Seedling and young plants occurred in low densities in 1998 and 2003 and percent decadence has been high in all years ranging from 38% in 1985 to 61% in 1998. Decadence declined in 2003 to 47%, but this level is still too high. The proportion of the decadent age class classified as dying has also been high from 1991-2003 ranging from 45%-67%. Use on Wyoming big sagebrush has been moderate to heavy in most years. The proportion of the population displaying poor vigor peaked at 64% in 1998. Those plants with poor vigor was only moderately high in both 1991 and 2003 at 31% and 21% respectively. In 1985, it was reported that surrounding the Circleville dump, located between Circleville and the transect, there was an extensive area (1-2 square miles) where the sagebrush appeared very chlorotic and in poor health. Except for a healthy-looking row on either side of the road (in the burrow pit), these plants appeared to have lost most of their leaves and were just starting to grow new ones. This could have been due to a Roga moth infestation. Periods of drought corresponding to the 1991 and 2003 surveys have also had a definitive negative effect on the health of sagebrush. Annual leader growth on big sagebrush averaged 1.6 inches in 2003.

Narrowleaf low rabbitbrush and broom snakeweed were both abundant in 1998 and 2003. Rabbitbrush density was estimated at 4,840 plants/acre in 1998 and 5,860 in 2003. Broom snakeweed density increased by 72% in 2003 from 1,680 plants/acre to 6,020. These populations should be monitored closely in the future for further increases. Point-center quarter data estimated 67 pinyon trees/acre and 58 Utah juniper trees/acre in 2003.

The herbaceous understory at Wades Canyon has low diversity. Indian ricegrass and bottlebrush squirreltail are the only perennial grass species to be sampled on the transect. Bottlebrush squirreltail was more abundant in 1998 than Indian ricegrass, but significantly declined in nested frequency and cover in 2003. Indian ricegrass has maintained a stable nested frequency value over all years. In 2003, Indian ricegrass was noted as

having good stature and vigor. Needle-and-thread grass has a more clumped distribution, it was not sampled within the transect. Sum of nested frequency for perennial grasses increased the first three readings, but declined by 35% in 2003 with drought conditions. Composition and production of the forb component is poor on this site. No annual forbs were sampled until 2003 when an annual *Gilia* was the most abundant forb on the site. Tansy mustard and stickseed are other annual species sampled in 2003. Prickly phlox and low fleabane were the most abundant perennial forbs in 1998, but both species declined in 2003. Sum of nested frequency for perennial grasses and forbs declined by 51% between 1998 and 2003. This is not surprising as spring precipitation averaged less than 50% of normal at Circleville from 2001 to 2003 (Utah Climate Summaries 2004).

1985 APPARENT TREND ASSESSMENT

The soil appears stable due largely to the gentle slope. Trend in the vegetative community appears stable to slightly downward. The sagebrush is receiving increasingly heavy use from wintering deer. Reproduction and vigor may be declining. Pinyons appear to be encroaching into the sagebrush flats.

1991 TREND ASSESSMENT

Since 1985, percent bare ground cover has increased from 8% to 14%. Percent litter, rock, and vegetation cover have all decreased. This indicates a slight downward trend for soil. This could turn around with an end to the extended drought we are now in. The key browse species is Wyoming big sagebrush. Low rabbitbrush, an increaser, is also abundant. Both species experienced increases in their respective densities, but percent decadence for sagebrush is high at 47%. Sagebrush also shows increased heavy use and poor vigor since 1985. The trend for browse is slightly downward. The herbaceous understory has a slightly downward trend due to a decrease in mostly perennial forbs.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - slightly down (2)

1998 TREND ASSESSMENT

The soil trend is slightly upward with an increase in percent litter cover and a decrease in percent bare ground. Erosion potential is low due to the relative levelness of the site. The browse trend is downward with the health of the Wyoming big sagebrush population continuing to deteriorate. There is an increase in percent decadence as well as the proportion of decadent plants classified as dying. Currently, there are three live plants for every one dead encountered. It appears that this will continue to increase in the future. The herbaceous understory trend is stable. Grass sum of nested frequency has increased while forb sum of nested frequency has decreased. Overall, herbaceous sum of nested frequency values are similar to 1991 estimates.

TREND ASSESSMENT

soil - slightly up (4)

browse - down (1)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics remain similar to 1998 estimates. There is some erosion occurring on the site but it is not excessive. Trend for browse is stable. Wyoming big sagebrush shows some improvement in percent decadence as well as the proportion of the decadent age class classified as dying has decreased. Vigor has also improved considerably since 1998. Even with these improvements, decadence

remains relatively high at 47%. Composition of young plants only makes up about 5% of the population. This is not adequate to replace the decadent, dying plants within the population. The density estimate for Wyoming big sagebrush is identical to 1998. Two increasers, low rabbitbrush and broom snakeweed, increased in density in 2003. These increasers should be monitored closely for further expansion. The herbaceous understory has a downward trend as sum of nested frequency values for perennial species declined by a large margin in 2003. Bottlebrush squirreltail was the most abundant perennial grass in 1998, but significantly declined by 2003. Perennial forb nested frequency declined by nearly 75% in 2003 with the biggest loss coming to low fleabane. Annuals are also coming into the site as they were first sampled in 2003.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 4

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Bromus tectorum (a)	-	-	1	5	.00	.03
G	Oryzopsis hymenoides	138	133	150	144	5.26	4.76
G	Sitanion hystrix	_a 63	_a 84	_b 184	_a 74	7.67	.59
Total for Annual Grasses		0	0	1	5	0.00	0.03
Total for Perennial Grasses		201	217	334	218	12.94	5.36
Total for Grasses		201	217	335	223	12.94	5.39
F	Arabis spp.	-	4	-	-	-	-
F	Astragalus calycosus	_b 46	_b 62	_a 12	_a 2	.08	.00
F	Castilleja chromosa	_b 15	_a -	_a -	_a -	-	-
F	Chaenactis douglasii	_c 28	_{ab} 9	_a 3	_a -	.00	-
F	Delphinium occidentale	-	-	-	1	-	.00
F	Descurainia pinnata (a)	-	-	-	57	-	.28
F	Erigeron pumilus	_c 150	_b 95	_{bc} 118	_a 2	1.21	.01
F	Gilia spp. (a)	-	-	_a -	_b 209	-	1.75
F	Lappula occidentalis (a)	-	-	_a -	_b 13	-	.14
F	Mentzelia spp.	-	-	_a -	_b 12	-	.07
F	Physaria chambersii	_b 36	_b 21	_b 32	_a -	.10	-
F	Phlox hoodii	_{ab} 72	_b 99	_{ab} 82	_a 48	2.44	.53
F	Thlaspi montanum	_b 19	_a -	_a -	_a -	-	-
F	Unknown forb-perennial	1	-	-	-	-	-
Total for Annual Forbs		0	0	0	279	0	2.18
Total for Perennial Forbs		367	290	247	65	3.84	0.63
Total for Forbs		367	290	247	344	3.84	2.81

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

BROWSE TRENDS --

Management unit 22 , Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	76	74	11.38	8.52
B	Chrysothamnus viscidiflorus stenophyllus	73	80	8.23	7.46
B	Gutierrezia sarothrae	36	49	.79	.68
B	Juniperus osteosperma	2	3	.78	2.00
B	Opuntia spp.	2	4	.03	.03
B	Pinus edulis	2	3	.63	-
Total for Browse		191	213	21.85	18.71

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 4

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	6.21
Chrysothamnus viscidiflorus stenophyllus	-	8.13
Gutierrezia sarothrae	-	.06
Juniperus osteosperma	-	2.16
Pinus edulis	1.20	1.20

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 4

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 4

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	47	58
Pinus edulis	58	67

Average diameter (in)	
'98	'03
5.1	3.8
4.7	2.7

BASIC COVER --

Management unit 22 , Study no: 4

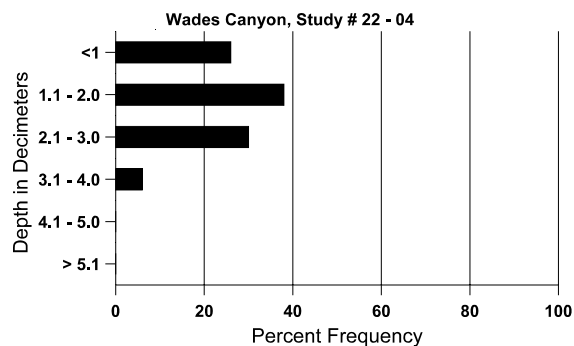
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	6.25	5.25	34.92	27.25
Rock	21.25	17.75	17.62	16.10
Pavement	39.75	41.50	30.56	24.55
Litter	25.00	17.25	26.46	26.49
Cryptogams	.25	4.75	2.44	4.17
Bare Ground	7.50	13.50	6.94	11.24

SOIL ANALYSIS DATA --

Management unit 22, Study no: 4, Study Name: Wades Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.0	68.0 (12.5)	7.1	42.0	31.4	26.6	3.0	8.8	96.0	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	18	10	-	-
Elk	-	2	-	3 (8)
Deer	24	31	42 (104)	154 (380)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	4599	66	666	2200	1733	-	58	20	38	6	20/24
91	5399	-	733	2133	2533	-	27	62	47	31	17/22
98	2920	60	240	900	1780	1000	26	4	61	64	19/27
03	2920	-	140	1400	1380	920	55	11	47	21	19/24
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	7199	-	1200	4933	1066	-	12	0	15	0	10/10
91	8266	-	400	6400	1466	-	23	61	18	5	8/9
98	4840	-	360	4240	240	40	1	0	5	2	12/16
03	5860	-	40	5700	120	180	0	0	2	.34	13/16
<i>Gutierrezia sarothrae</i>											
85	200	-	-	200	-	-	0	0	0	0	8/5
91	333	-	-	333	-	-	0	20	0	0	7/6
98	1680	-	340	1280	60	80	0	0	4	4	8/9
03	6020	-	4820	1080	120	40	0	0	2	.99	7/6
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
85	266	-	66	200	-	-	0	0	-	75	5/3
91	133	-	-	133	-	-	0	0	-	0	5/9
98	40	-	-	40	-	-	0	0	-	0	5/11
03	80	-	-	80	-	-	0	0	-	0	4/9
<i>Pinus edulis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	-/-
03	60	-	40	20	-	-	0	0	-	0	-/-

Trend Study 22-5-03

Study site name: Bone Hollow.

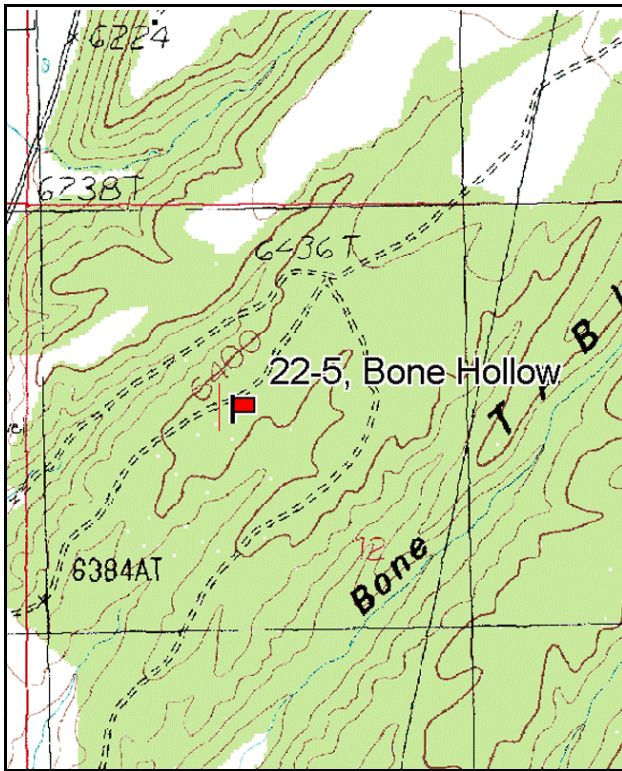
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 165 degrees magnetic. Lines 2-4 208° M.

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

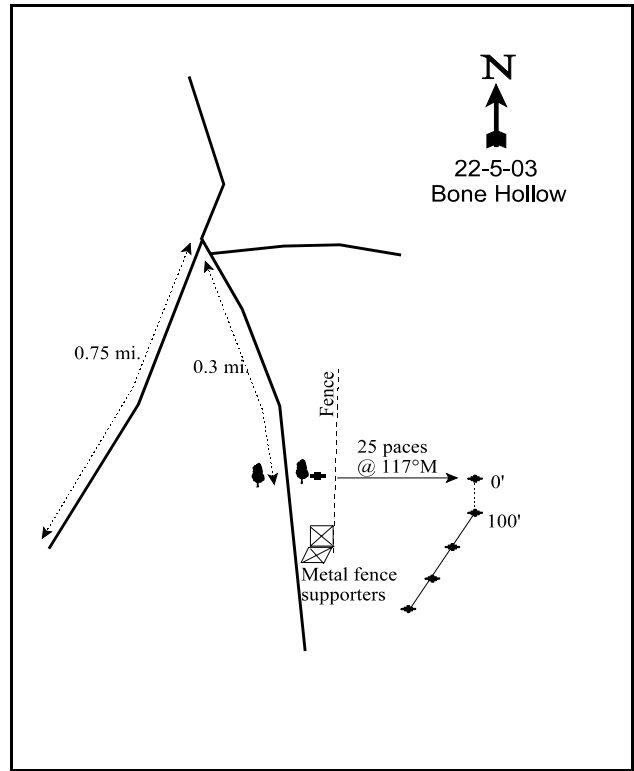
LOCATION DESCRIPTION

From the intersection of North Creek Road and SR 153 on the east side of Beaver, go north 1.95 miles past an irrigation pond on the left to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw (ignore the numerous other small dirt roads). Drive up this road 0.75 miles to a fork. Turn right onto another major dirt road and go south 0.3 miles. Look for a fencepost 50 feet to the left that is not part of the fence (30 feet north of metal crossposts). The fencepost marks the start of a pellet group transect. Walk 25 paces at 117 degrees magnetic from the witness post to the 0' stake marked by a 3-foot rebar tagged #7048.



Map Name: Beaver

Township 29S, Range 7W, Section 12



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4240485 N, 360446 E

DISCUSSION

Bone Hollow - Trend Study No. 22-5

The Bone Hollow trend study samples an area of Wyoming big sagebrush and juniper on land administered by the BLM. The transect is located on a slight south facing slope at an elevation of 6,400 feet. This site is typical of the untreated winter ranges on the benches above Beaver, which have been historically important deer winter range. Deer use is moderate to heavy and varies somewhat from year to year depending on the severity of the winter. A pellet group transect read on the site in 1998 and 2003 estimated 93 deer days use/acre (230 ddu/ha) and 132 deer days use/acre (326 ddu/ha) respectively. In 2003, about one-half of the deer pellet groups appeared to be from the winter, while the other half were more recent and likely from early spring. A few old, weathered cattle pats were also noticed on the site.

Soils are moderately deep, fairly compacted, and very stony throughout. Effective rooting depth was estimated at just over 12 inches in 1998 with a low average soil temperature of 49°F at almost 15 inches in depth. Soil temperature averaged 71°F in 2003 indicating a much drier soil profile compared to 1998. Soil textural analysis indicates a sandy clay loam with a neutral pH (6.7). Plant development may be limited due to relatively low amounts of phosphorous (8.5 ppm). Past erosion is apparent with a high percentage of pavement and rock cover on the soil surface. Litter and herbaceous vegetation are found mostly under sagebrush plants. Erosion was minimal in 2003 and soils were rated as stable from an erosion condition class assessment.

A fairly dense and uniform stand of Wyoming big sagebrush, along with an open woodland of juniper and pinyon, gives this extensive area its vegetative aspect. Wyoming big sagebrush is the only desirable browse species that is abundant enough to be considered important. Sagebrush density was estimated at 4,680 plants/acre in 1998, declining to 3,920 in 2003. Browsing pressure has been moderate to heavy in all readings, although vigor has been generally good. Reproduction has been low since 1991, with young plants making up less than 5% of the total population. Percent decadence was moderate but stable from 1985 to 1998 (30-35%), but increased to 46% in 2003. In 2003, 25% of the decadent age class was classified as dying and with no young plants being sampled, sagebrush could show further declines in the future. Seed production appeared low in both 1991 and 1998, but was noted as good in 2003. Annual sagebrush leaders averaged 1.6 inches of growth by June 2003. Drought and the abundance of pinyon-juniper on the site are likely playing a role in declining sagebrush health. Point-center quarter data collected in 2003 estimated 63 pinyon trees/acre and 196 Utah juniper trees/acre. Total canopy cover of pinyon and juniper was estimated at almost 18% in 2003. Pinyon and juniper trees have some value as thermal cover, and many have been highlined. This site would be a good candidate for mechanical treatment to reduce tree density. A reduction in pinyon-juniper tree density would decrease competition between trees and sagebrush/herbaceous understory species. Other browse species scattered throughout the site in low abundance are increasers including broom snakeweed, narrowleaf low rabbitbrush, and prickly pear cactus.

A variety of grass species are found on the site, although most occur in low abundance. Cheatgrass was the dominant grass in 1998 as it provided 79% of the herbaceous understory cover and 40% of the total vegetative cover on the site. Cheatgrass was encountered in every quadrat in 1998, with a nested frequency value of 379 out of a possible 400. In 2003, with drier conditions, cheatgrass significantly declined in nested frequency and was sampled in only 69 of the 100 quadrats. Cheatgrass cover dropped by 86% in 2003 as well. Several valuable perennial grasses have been sampled on the site but all occur in low densities including bottlebrush squirreltail, Indian ricegrass, Sandberg bluegrass, and bluebunch wheatgrass. These species are remaining stable, but an increase is not likely with the abundance of cheatgrass, drought, and the high density of pinyon-juniper trees on the site. Forbs occur sporadically throughout the community. Composition is composed of annuals and/or small statured species that contribute little forage in the spring. Sum of nested frequency for perennial forbs was fairly stable from 1985-1998, but declined in 2003.

1985 APPARENT TREND ASSESSMENT

The soil trend may be slightly downward with erosion occurring in the openings and slow soil building under browse plants. The vegetative composition and age structure indicate a stable Wyoming sagebrush/grass community with slow pinyon-juniper encroachment. Cool season herbaceous species are conspicuously absent as a result of constant heavy livestock spring grazing in the past. A chaining could be used to help restore the area to a more productive state, but the rockiness of the surface soil would limit the success of broadcast seeding unless the soil is sufficiently disturbed.

1991 TREND ASSESSMENT

The soil trend is still considered slightly downward. Vegetative basal cover is still low at 4%. Rock-pavement cover has decreased, with percent bare ground rising to 19% and percent litter cover decreasing to 40%. There is only one key browse species, Wyoming big sagebrush, which has a 4% increase in its population density. Biotic potential (seedlings) and the number of young plants have decreased, while percent decadence remains high but stable at 33%. The percentage of plants classified as having poor vigor has more than doubled to 18%. The browse trend is slightly downward with the decline of the young and seedling sagebrush as well as increased poor vigor. The trend for the herbaceous understory is stable although sum of nested frequency has slightly declined with drought.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

The soil trend is stable. There does not appear to be accelerated erosion on the site at this time. Percent bare ground cover has declined since 1991, as well as combined percent rock and pavement cover. Percent litter cover has increased to 48%, although much of the litter is comprised of fine fuels contributed by cheatgrass. The browse trend is slightly downward. Percent decadence in the big sagebrush population has increased since 1991. Although the percentage of dying plants has decreased, there are still many dying plants encountered with few seedling or young plants being encountered in 1998. Sagebrush density also decreased. The herbaceous understory trend is stable with little change in perennial herbaceous understory sum of nested frequency. Cheatgrass is dominant and could carry a catastrophic fire where all the browse would be lost.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics are similar to 1998 estimates, especially for the key parameters. Litter cover declined in 2003, but most of this was due to the decline in cheatgrass cover which went from 20% to 3%. Erosion remains minimal and soils are stable at the present time. Trend for browse is down. Several key parameters in the Wyoming big sagebrush population showed negative changes in 2003 including a decline in density, no recruitment, and increases in heavy use and percent decadence. Additionally, 25% of the decadent sagebrush were classified as dying in 2003. Trend for the herbaceous understory is stable. Perennial grasses have a stable sum of nested frequency value while they have increased in cover. Perennial forbs declined in sum of nested frequency in 2003, but are less significant than grasses on

this site. Another positive change in the understory is the significant decline in cheatgrass frequency and cover.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 5

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron intermedium	-	-	-	1	-	.00
G	Agropyron spicatum	1	3	1	-	.03	.00
G	Bouteloua gracilis	ab1	a-	ab12	b12	.12	.39
G	Bromus tectorum (a)	-	-	b379	a186	20.28	2.75
G	Oryzopsis hymenoides	50	35	34	33	1.51	1.95
G	Poa secunda	a-	b11	ab2	b10	.00	.05
G	Sitanion hystrix	b122	ab99	ab103	a91	2.21	2.35
G	Stipa comata	9	12	11	13	.64	.26
G	Vulpia octoflora (a)	-	-	-	1	-	.00
Total for Annual Grasses		0	0	379	187	20.28	2.76
Total for Perennial Grasses		183	160	163	160	4.52	5.01
Total for Grasses		183	160	542	347	24.80	7.77
F	Agoseris glauca	a5	a5	b17	a-	.11	-
F	Alyssum alyssoides (a)	-	-	9	-	.01	-
F	Antennaria rosea	-	3	4	-	.01	-
F	Arabis demissa	1	1	5	5	.04	.01
F	Astragalus spp.	a-	ab4	b17	a-	.10	-
F	Camelina microcarpa (a)	-	-	-	3	-	.03
F	Chaenactis douglasii	a7	b20	a5	a-	.01	-
F	Collinsia parviflora (a)	-	-	-	7	-	.01
F	Cryptantha spp.	b10	b20	a-	b9	-	.11
F	Descurainia pinnata (a)	-	-	3	8	.00	.02
F	Draba spp. (a)	-	-	-	9	-	.01
F	Erigeron pumilus	b10	a-	a3	a-	.00	-
F	Gayophytum ramosissimum(a)	-	-	-	7	-	.01
F	Gilia spp. (a)	-	-	a-	b136	-	1.27
F	Holosteum umbellatum (a)	-	-	-	1	-	.00
F	Lappula occidentalis (a)	-	-	-	6	-	.03

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Leucelene ericoides	-	7	5	11	.03	.02
F	Machaeranthera canescens	_b 11	_a 2	_a -	_a -	-	-
F	Microsteris gracilis (a)	-	-	1	5	.00	.01
F	Phlox austromontana	_{ab} 17	_a 9	_b 27	_a 5	.23	.04
F	Ranunculus testiculatus (a)	-	-	_a 33	_b 77	.16	.84
F	Schoenocrambe linifolia	-	-	-	3	-	.00
F	Sphaeralcea coccinea	5	14	16	18	.22	.13
Total for Annual Forbs		0	0	46	259	0.18	2.26
Total for Perennial Forbs		66	85	99	51	0.79	0.31
Total for Forbs		66	85	145	310	0.97	2.58

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

BROWSE TRENDS --

Management unit 22 , Study no: 5

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	0	0	.00	-
B	Artemisia tridentata wyomingensis	87	88	17.43	15.22
B	Atriplex canescens	0	0	-	.15
B	Chrysothamnus nauseosus	1	0	.03	-
B	Chrysothamnus parryi	0	1	-	-
B	Chrysothamnus viscidiflorus stenophyllus	0	0	-	-
B	Gutierrezia sarothrae	4	1	.06	-
B	Juniperus osteosperma	11	14	4.32	7.50
B	Mahonia repens	0	1	-	-
B	Opuntia spp.	4	3	.03	.15
B	Pinus edulis	2	7	2.65	4.05
B	Sclerocactus	1	0	-	-
Total for Browse		110	115	24.54	27.07

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 5

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	11.89
Juniperus osteosperma	9.39	12.43
Opuntia spp.	-	.16
Pinus edulis	2.00	5.19

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 5

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 5

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	149	196
Pinus edulis	39	63

Average diameter (in)	
'98	'03
4.5	3.4
3.3	2.8

BASIC COVER --

Management unit 22 , Study no: 5

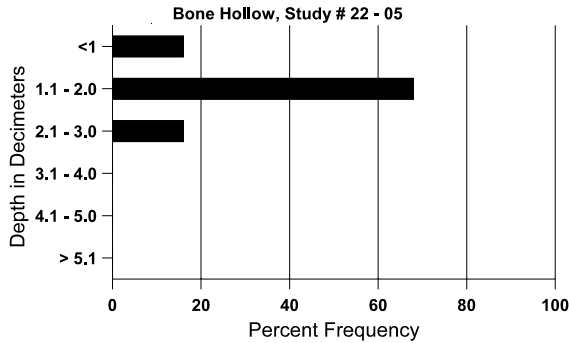
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.75	3.75	41.04	35.17
Rock	1.75	2.25	6.06	3.44
Pavement	42.75	35.25	27.36	31.30
Litter	43.00	39.75	48.47	34.86
Cryptogams	0	.50	.26	.07
Bare Ground	8.75	18.50	14.31	12.32

SOIL ANALYSIS DATA --

Management unit 22, Study no: 5, Study Name: Bone Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
12.4	70.6 (11.9)	6.7	52.4	23.1	24.6	2.6	8.5	96.0	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 5

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	34	4	-	-
Deer	66	27	93 (230)	132 (326)
Cattle	1	-	-	-

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 5

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	5865	1133	1266	2866	1733	-	44	16	30	8	15/15
91	6133	-	333	3800	2000	-	45	14	33	18	13/24
98	4680	80	200	2860	1620	680	59	18	35	8	17/27
03	3920	-	-	2100	1820	580	32	37	46	12	19/27
Chrysothamnus nauseosus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Chrysothamnus parryi											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	6/6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	100	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	133	-	133	-	-	-	0	0	-	0	-/-
98	100	80	-	100	-	-	0	0	-	0	7/9
03	20	-	20	-	-	-	0	0	-	0	8/8
Juniperus osteosperma											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	133	66	-	-	-	0	0	-	0	-/-
98	240	180	160	80	-	-	0	0	-	0	-/-
03	280	20	160	120	-	-	0	0	-	0	-/-
Mahonia repens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
85	66	66	66	-	-	-	0	0	-	0	-/-
91	466	-	200	266	-	-	0	0	-	0	5/6
98	80	-	-	80	-	-	0	0	-	0	5/10
03	60	-	-	60	-	-	0	0	-	0	4/9
Pinus edulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	40	-	-	-	0	0	-	0	-/-
03	140	-	120	20	-	-	0	0	-	0	-/-
Sclerocactus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	2/4
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 22-6-03

Study site name: Beaver Table.

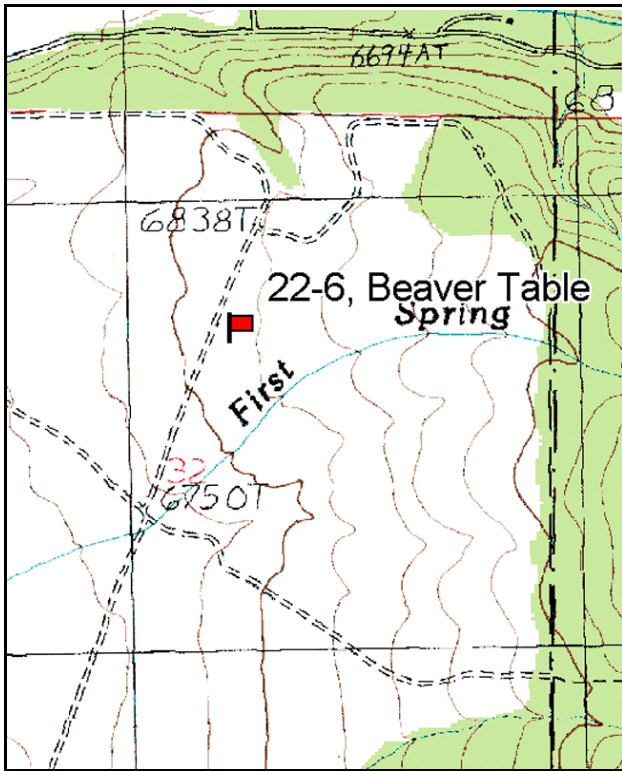
Vegetation type: Cabled, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

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

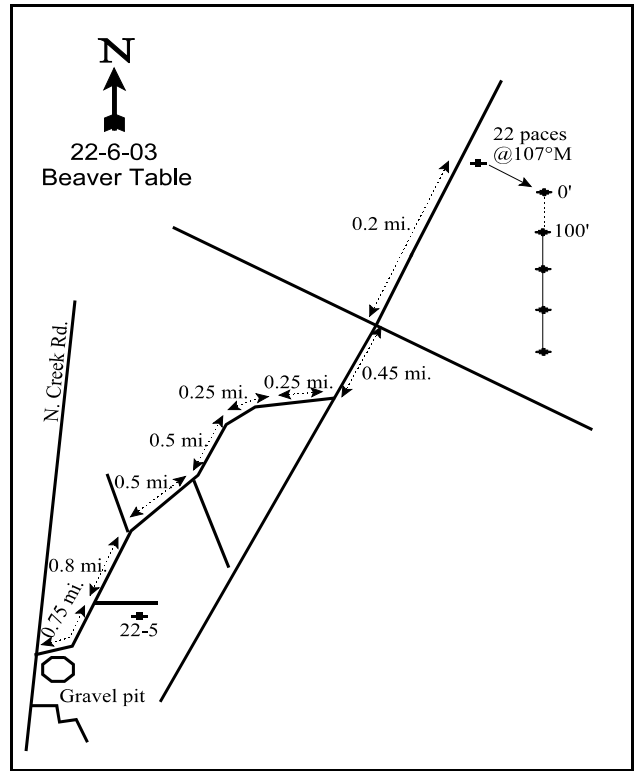
LOCATION DESCRIPTION

From the corner of North Creek Road and SR 153 in Beaver, go north 1.95 miles to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw. Drive up this road 0.75 miles to a fork, go straight (right fork goes to Bone Hollow transect). Continue 0.8 miles to a fork and turn right through the fence. Go 0.5 miles to another fork, then go straight heading north then east 0.5 miles to a fence. Continue east past the fence 0.25 miles to another fenceline with a fork just beyond it. Go straight (east) another 0.25 miles to a junction with a road going north-south, then turn left (north). Go 0.45 miles to a junction with a road going east-west. Continue north 0.2 miles to a witness post on the right. From the witness post walk 22 paces at 107 degrees magnetic. The 0-foot stake is marked by rebar tagged #7049.



Map Name: Beaver

Township 28S, Range 6W, Section 32



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4243683 N, 364222 E

DISCUSSION

Beaver Table - Trend Study No. 22-6

The Beaver Table trend study is located on a bench at the foot of the Tushar Mountains northeast of Beaver. This area is recognized as critical range to wintering deer, especially since completion of I-15 has restricted movement to the extensive historical winter ranges west of the interstate. The study is in the center of a Division of Wildlife Resources owned section, which was cabled and seeded in 1957. The general terrain is a long gentle slope (3-5%) with a western aspect at an elevation of 6,800 feet. The vegetative community is dominated by Wyoming big sagebrush and scattered bitterbrush and juniper. Cattle grazing was not authorized in the area in the past, although a few cattle pats were sampled in the pellet group transect in 2003. A DWR pellet group transect is located near the trend study site. It showed an average of 40 deer days use/acre (99 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Through the winter of 1990-91, the average was even higher at 56 deer days use/acre (138 ddu/ha) (Jense et al. 1991). Between 1993 and 1997, deer use averaged 18 days use/acre (44 ddu/ha) (Evans et al. 1997). A pellet group transect read on the trend study site in 1998 and 2003 estimated 47 deer days use/acre (116 ddu/ha) and 71 deer days use/acre (175 ddu/ha) respectively. A buck and doe were bedded down on the site in 2003.

Soils are alluvially deposited and have good depth with an average effective rooting depth of 17 inches. Textural and chemical analysis indicates a clay soil with a neutral pH (6.6). There is a lime cemented hardpan approximately 2 feet below the surface, which could limit rooting depth. A number of large rocks from basaltic parent material are found throughout the soil profile. There is also a concentration of rocks and pavement on and near the soil surface. Good litter and vegetation cover and the gentle slope moderates the hazard of severe soil erosion. In 2003, both litter and vegetation cover declined due mostly to the decrease in cheatgrass with the dry conditions. Some overland water movement was apparent near the end of the transect prior to the 2003 reading. Pedestalling is moderate around sagebrush stems and soil movement was noticeable. An erosion condition class assessment rated soils as stable to slightly eroding in 2003.

The dominant and key browse species is Wyoming big sagebrush. Density was estimated at 5,420 plants/acre in 1998 and 5,740 in 2003. The relatively large decrease in sagebrush density from 1991 to 1998 can be partially explained by number of dead plants in the population. However, the majority of the change is because of the larger sample used in 1998 which gives more accurate estimates for browse populations with clumped and/or discontinuous distributions. Recruitment by young plants was very low in both 1998 and 2003. This population is best categorized as overly mature with a moderate to high rate of decadence. Percent decadence was very high in 1991 and 1998 (53% and 48%), but more moderate in 1985 and 2003 (26% and 31%). Nearly one-fourth of the population was classified as decadent and dying in 1998 and 2003. Utilization has been consistent over all years with most plants showing light to moderate use. Plants displaying poor vigor has also been relatively consistent over all years (7-16%). Annual leader growth on big sagebrush averaged 1.7 inches in 2003. Although less abundant, antelope bitterbrush provides additional forage on this site. It is a highly preferred species by deer and has been moderately to heavily hedged in all readings. Bitterbrush density was estimated at 780 plants/acre in 1998 and 600 in 2003. Browsing intensity does not seem to have adversely effected bitterbrush vigor. Recruitment by young plants was high in 1991 and 1998, but no young were sampled in 2003. Annual leader growth on bitterbrush averaged 2.7 inches in 2003.

Young Utah juniper trees are scattered over the area and show signs of reinvasion in the upper end of the treated section. Point-center quarter data from 2003 estimated 95 juniper trees/acre. Broom snakeweed, an undesirable increaser, shows high fluctuations in density between all years. Density was estimated between 7,000 and 8,000 plants/acre in 1985 and 1998, but only 1,000 to 2,000 plants/acre in 1991 and 2003. It is interesting to note that the two lower density estimates occurred during periods of drought. This high fluctuation in snakeweed density is typical for areas that have experienced periods of drought followed by years with normal or above normal precipitation.

Cheatgrass dominated the understory in 1998 by contributing 56% of the herbaceous understory cover and 27% of the total vegetation cover on the site. Cheatgrass was sampled in 99 out of 100 quadrats and had a nested frequency of 345 out of a possible 400. With drought conditions in 2003, cheatgrass significantly declined in nested frequency and average cover and was sampled in only 38% of the quadrats. Bottlebrush squirreltail has been the most abundant perennial species in all surveys, but has steadily declined in frequency since 1991. Indian ricegrass, muttongrass, and bluebunch wheatgrass occur rather sporadically, but enough to provide some forage. The grasses are vigorous and currently not utilized. A variety of forbs have been sampled on the site as well. Seventeen species of forbs were sampled in 1998 and 23 in 2003. Several important perennial forbs that have been sampled include lobeleaf groundsel, longleaf phlox, and sulfur eriogonum. Annual species are present but limited.

1985 APPARENT TREND ASSESSMENT

As herbaceous vegetation and litter cover increase, soil condition will improve. With the apparent increase in grasses and forbs, vegetative trend appears upward for the time being. However, snakeweed and juniper appear to be slowly increasing in this area. Since deer use appears to be increasing, the added pressure on the more palatable species may favor these invaders and accelerate their invasion into the community. Chaining and seeding projects similar to this one could be done in adjacent areas and alleviate some of the browsing pressure to maintain the range in good condition for a longer period.

1991 TREND ASSESSMENT

Soil trend is slightly down because basal vegetation and litter cover are slightly lower than 1985, and bare ground increased to 32%. Browse trend is also slightly downward. Wyoming big sagebrush density increased due to the abundance of young plants in 1985, but percent decadence has also increased to 53%. The young age class declined significantly in 1991. Broom snakeweed decreased by 84%. A positive for this site is the increase of bitterbrush density and the abundance of young plants in the population. Trend for the herbaceous understory is stable. Sum of nested frequency values for perennials remained stable since 1985.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Soil trend is slightly upward. Percent bare ground cover has declined while percent litter cover has increased. Some erosion is apparent near the end of the transect, but this is not accelerated and more of the soil is becoming protected from erosion. Much of the litter is fine fuels, provided chiefly from the cheatgrass, and could carry a fire throughout the site. The browse trend is slightly down. Percent decadence in the Wyoming big sagebrush population remains very high at 48%. A disturbing element of the Wyoming big sagebrush population is the increase in the percentage of decadent plants classified as dying and the continued decline in the number of young plants. If this trend continues, the population will decline. The herbaceous understory is slightly downward. Perennial grasses, the important component of the herbaceous understory on this site, shows a slow, but consistent decline in sum of nested frequency over all years.

TREND ASSESSMENT

soil - slightly up (4)

browse - slightly down (2)

herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Soil trend is down. Vegetation and litter cover show large declines, while bare ground cover doubled. Soil movement was evident in 2003 but not severe. Trend for browse is stable. Wyoming big sagebrush has a decreased rate of decadence, but the proportion of decadent plants classified as dying remained nearly the same as in 1998. Young plants make up only 1% of the population. Use remains moderate and vigor is generally normal throughout the population. Bitterbrush shows a slight decline in population density and increased decadence. Trend for the herbaceous understory is slightly down. Perennial grasses continue to decline in sum of nested frequency. Bottlebrush squirreltail, Indian ricegrass, and bluebunch wheatgrass all have lower nested frequency values since 1998. A slight increase in perennial forb sum of nested frequency is a positive sign especially during the current drought period. However, forbs combine to provide only 1% total cover.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 6

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	-	-	1	3	.00	.03
G	Agropyron spicatum	a-	a-	b ¹⁴	a ⁵	.44	.01
G	Bromus japonicus (a)	-	-	4	5	.03	.01
G	Bromus tectorum (a)	-	-	b ³⁴⁵	a ⁸⁰	11.17	.61
G	Oryzopsis hymenoides	a ³⁵	a ²⁴	b ⁵⁰	ab ³⁴	2.58	1.09
G	Poa fendleriana	20	17	19	38	.71	.56
G	Poa pratensis	-	-	1	2	.03	.03
G	Sitanion hystrix	c ¹⁸²	c ¹⁸⁰	b ¹¹⁴	a ⁶¹	3.65	1.26
G	Stipa lettermani	1	3	-	-	-	-
Total for Annual Grasses		0	0	349	85	11.20	0.62
Total for Perennial Grasses		238	224	199	143	7.42	3.00
Total for Grasses		238	224	548	228	18.62	3.62
F	Agoseris glauca	-	-	7	4	.01	.01
F	Alyssum alyssoides (a)	-	-	5	8	.01	.03
F	Antennaria rosea	-	-	6	1	.04	.00
F	Arabis demissa	ab ¹⁵	b ²⁷	a ⁶	a ³	.01	.01
F	Astragalus convallarius	ab ³	a-	b ⁸	ab ⁴	.15	.06
F	Astragalus spp.	-	-	4	-	.03	-
F	Castilleja chromosa	-	6	-	-	.00	-
F	Calochortus nuttallii	a ²	a-	a-	b ¹⁵	-	.06

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Chaenactis douglasii</i>	_b 35	_b 33	_a 6	_a 1	.04	.00
F	<i>Cymopterus</i> spp.	4	-	-	6	-	.01
F	<i>Descurainia pinnata</i> (a)	-	-	-	1	-	.00
F	<i>Epilobium brachycarpum</i> (a)	-	-	_b 31	_a 10	.09	.02
F	<i>Erigeron</i> spp.	-	-	-	1	-	.00
F	<i>Eriogonum shockleyi</i>	-	-	-	6	-	.03
F	<i>Eriogonum umbellatum</i>	3	2	6	3	.06	.01
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	6	-	.05
F	<i>Gilia</i> spp. (a)	-	-	-	6	-	.02
F	<i>Lappula occidentalis</i> (a)	-	-	-	1	-	.00
F	<i>Lactuca serriola</i>	-	-	2	-	.00	-
F	<i>Lotus utahensis</i>	-	-	1	2	.00	.01
F	<i>Machaeranthera canescens</i>	_{ab} 3	_a -	_b 10	_a -	.17	-
F	<i>Penstemon</i> spp.	-	-	1	-	.03	-
F	<i>Phlox longifolia</i>	_a 17	_b 42	_{ab} 41	_b 52	.15	.18
F	<i>Polygonum douglasii</i> (a)	-	-	_a 9	_b 24	.02	.05
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	2	-	.01
F	<i>Senecio multilobatus</i>	24	7	12	21	.07	.07
F	<i>Sphaeralcea coccinea</i>	29	24	22	22	.30	.25
F	<i>Trifolium</i> spp.	_a -	_a -	_a -	_b 9	-	.07
Total for Annual Forbs		0	0	45	58	0.12	0.19
Total for Perennial Forbs		135	141	132	150	1.10	0.81
Total for Forbs		135	141	177	208	1.22	1.00

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

BROWSE TRENDS --

Management unit 22 , Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
		B	Artemisia tridentata wyomingensis	90	88
B	Gutierrezia sarothrae	61	32	4.11	.36
B	Juniperus osteosperma	3	3	.78	1.37
B	Pinus edulis	1	2	-	-
B	Purshia tridentata	30	23	3.14	4.05
B	Ribes cereum cereum	1	0	-	-
Total for Browse		186	148	21.86	23.65

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 6

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	18.85
Gutierrezia sarothrae	-	.10
Juniperus osteosperma	.60	1.39
Purshia tridentata	-	2.83

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 6

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.7
Purshia tridentata	2.7

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 6

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	107	95

Average diameter (in)	
'98	'03
5.0	4.6

BASIC COVER --

Management unit 22 , Study no: 6

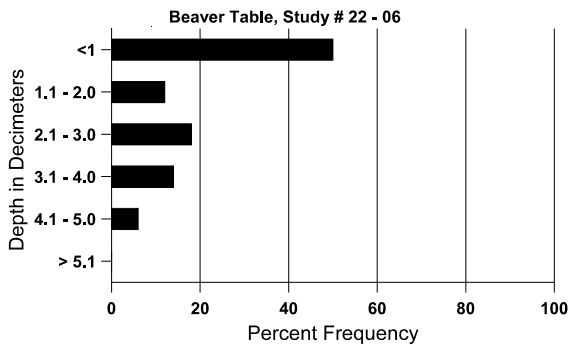
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	6.50	5.25	41.77	28.00
Rock	14.50	10.25	9.70	8.77
Pavement	11.50	12.25	11.98	6.87
Litter	40.75	39.25	47.04	33.61
Cryptogams	.25	.75	.02	.81
Bare Ground	26.50	32.25	18.15	37.97

SOIL ANALYSIS DATA --

Management unit 22, Study no: 6, Study Name: Beaver Table

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
17.1	64.0 (16.4)	6.6	36.7	22.7	40.6	2.2	10.6	73.6	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 6

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	39	6	-	-
Cow	-	-	-	2 (5)
Deer	43	31	47 (116)	71 (175)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	8333	266	2133	4000	2200	-	49	2	26	11	15/20
91	9999	-	400	4266	5333	-	33	19	53	16	17/26
98	5420	20	100	2740	2580	1380	43	8	48	13	19/26
03	5740	-	20	3940	1780	1180	49	8	31	7	20/26
<i>Gutierrezia sarothrae</i>											
85	7266	2333	2800	4466	-	-	0	0	0	0	9/8
91	1132	-	66	733	333	-	0	0	29	6	9/6
98	7640	360	2400	5240	-	-	0	0	0	0	13/11
03	1600	60	420	1080	100	700	0	0	6	0	7/6
<i>Juniperus osteosperma</i>											
85	199	200	66	133	-	-	0	0	-	0	69/45
91	199	-	66	133	-	-	0	0	-	0	78/68
98	60	20	20	40	-	-	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	-	0	-/-
<i>Leptodactylon pungens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	5/3
<i>Opuntia spp.</i>											
85	133	-	-	133	-	-	0	0	0	0	5/12
91	465	-	333	66	66	-	14	14	14	43	4/6
98	0	-	-	-	-	-	0	0	0	0	7/19
03	0	-	-	-	-	-	0	0	0	0	6/9
<i>Pinus edulis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	20	20	-	-	-	0	0	-	0	-/-
03	40	-	40	-	-	-	0	0	-	0	-/-
<i>Purshia tridentata</i>											
85	866	-	133	733	-	-	38	62	0	0	22/11
91	1265	-	866	133	266	-	58	26	21	11	33/53
98	780	40	300	480	-	-	36	18	0	0	27/46
03	600	-	-	440	160	20	10	83	27	13	27/36

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Ribes cereum cereum											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	100	-	-	100	-	-	0	0	-	0	12/16
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 22-7-03

Study site name: Sheep Rock.

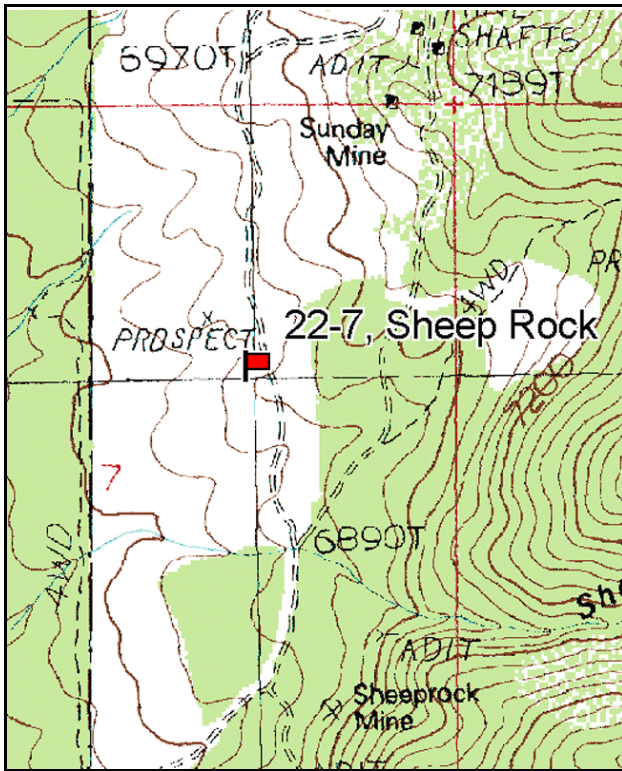
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

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

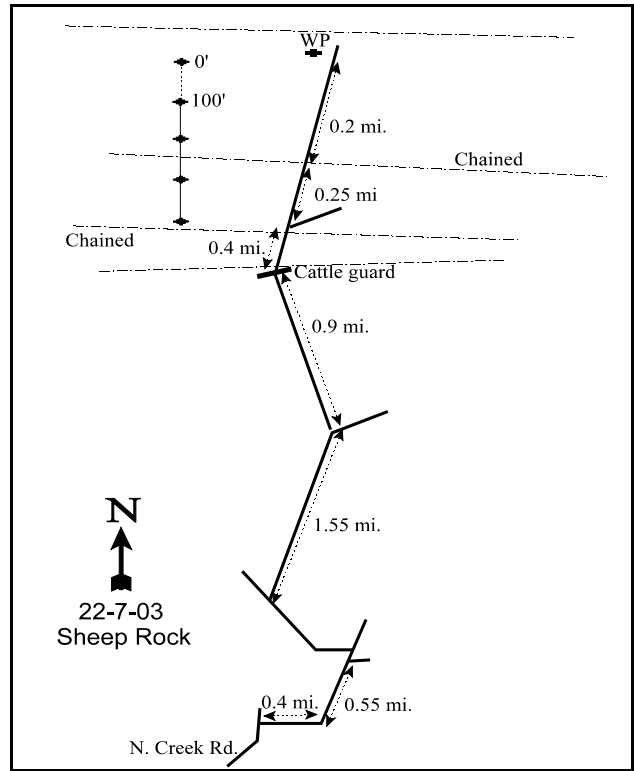
LOCATION DESCRIPTION

From the junction of SR 153 and North Creek Road (1200 E.) east of Beaver, proceed north on North Creek Road 5.0 miles to a fork. Keep to the right on the pavement and continue 0.4 miles to another fork. Turn left and drive 0.55 miles, crossing a bridge, to a fork in the road with a sheeprock sign. Turn left and after 100 yards take a sharp bend to the left to stay on the good road. Drive about 200 yards and keep to the right at another fork. Continue 0.175 miles and again keep right at a fork. Go 1.55 miles to a cattleguard and 0.15 miles beyond it to a fork. Turn to the left instead of crossing a cattleguard into a chained area. Drive 0.9 miles further to cross a cattleguard and enter the chained area. Go 0.4 miles to a fork and stay left. After 0.25 miles you will again enter directly into the chained area. Continue 0.2 miles into the chaining to a witness post on the left side of the road. The frequency baseline starts 195 feet west of the witness post. The 0-foot baseline stake is a short rebar with browse tag #7058 attached.



Map Name: Beaver

Township 28S, Range 6W, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4249988 N, 362980 E

DISCUSSION

Sheep Rock - Trend Study No. 22-7

This study is located near the mouth of Sheep Rock Canyon on the gentle (5-10%) west sloping foothills of the Tushar Mountains at an elevation of 6,900 feet. The study samples a Forest Service chaining and seeding project completed in the fall of 1981. The 2-way chaining treatment effectively removed the pinyon-juniper overstory and the site is dominated by seeded perennial grasses. Fire has also been an influence as the site burned after the chaining. The fire consumed many of the downed pinyon-juniper snags and continued up the mountain into the untreated woodland. The lack of adequate browse species is the most notable effect of the past wildfire. One-quarter mile to the west is the BLM boundary and a 25-year old chaining. In some winters, deer spend much of the season at lower elevations. Judging from data collected at the nearby DWR Sheep Rock deer pellet group transect, use has been generally low on this site. With its abundance of valuable early season grasses, the area makes an excellent early spring range for mule deer and winter range for elk. A pellet group transect read on the site in 1998 estimated 12 deer days use/acre (30 ddu/ha) and 52 cow days use/acre (128 cdu/ha). Pellet group transect data collected in 2003 estimated 5 deer and 85 cow days use/acre (13 ddu/ha and 210 cdu/ha) on the site. Cattle use was from the 2002 grazing season while the few deer pellets sampled were from spring.

Soils are sandy loam in texture with a slightly acidic pH (6.5). Average effective rooting depth was just over 11 inches in 1998. Average soil temperature was estimated at 47°F at a depth of 15 inches in 1998, increasing to 66.6°F in 2003. The increase in soil temperature between years is mostly a function of soil moisture within the profile. With drought conditions prior to and including the 2003 survey, soil moisture was low resulting in increased soil temperature. Perennial grasses and their associated litter provide the majority of the ground cover on this site, although both of these categories were much lower in 2003 compared to earlier readings. Pavement is also abundant on the surface estimated at 21% in 1998 and 26% in 2003. Bare ground was very low in 1985 and 1998, but moderate in 1991 and 2003. Soils were given a stable to slightly eroding rating in 2003 from an erosion condition class assessment. Rill formation and pedestalling provide evidence of some erosion on the site.

With the exception of pinyon and juniper, browse has been limited on this site over the life of the transect. Preferred species such as mountain big sagebrush, serviceberry, curlleaf mahogany, true mountain mahogany, and bitterbrush are present in the area but at very low densities. Most of these species were not sampled in the transect other than being measured for height and crown. Gambel oak averaged about 300 stems/acre between 1998 and 2003 and shows only light use, good vigor, and no decadence. Point-center quarter data from 1998 and 2003 estimated combined pinyon-juniper density at around 60 trees/acre.

By far the most abundant and productive class of vegetation is the grasses. Grasses, annual and perennials combined, provided 85% of the total vegetation cover on the site in 1998. With drought conditions in 2003, grasses combined to provide only 43% of the total vegetation cover. Cheatgrass was very abundant in 1998, but significantly declined in frequency and average cover in 2003. The decline in cheatgrass is expected with dry conditions, but a significant decline in perennial grass cover in 2003 was not. Perennial grasses provided 30% average cover in 1998, but only 13% in 2003. Perennial grasses also declined in sum of nested frequency by 28% between 1998 and 2003. Declines in nested frequency and cover of perennial grasses in 2003 is due to livestock use and drought conditions resulting in poor production that did not allow grasses to recover from grazing. The most abundant perennial species are smooth brome, crested wheatgrass, and intermediate wheatgrass. The native Sandberg bluegrass increased in frequency in 2003.

In 1985, the only forbs identified were two seeded species, alfalfa and small burnet. At that time it was felt that the abundance of the highly preferred alfalfa would be an important indicator of range trend in the future. Alfalfa occurs only sparingly on the site now. This is the result of the effects of selective grazing as well as a

couple of drought cycles since alfalfa was seeded onto the site. The most abundant perennial forb in 1998 and 2003 was American vetch, and is of moderate to high palatability for wildlife and livestock. Annual forbs have become increasingly more abundant with each reading. Annual species include pale alyssum, little flower collinsia, annual stickseed, and little polecat.

1985 APPARENT TREND ASSESSMENT

The chaining and seeding was successful and trend appears upward for herbaceous species. Soils appear stable and protected by a variety of grasses. The grasses appear to be increasing in density, but not so much as to compete with the upcoming browse component. Several species of valuable deer browse are present and as they increase, the area will be even better for deer, although it is now excellent elk range.

1991 TREND ASSESSMENT

The trend for soil is down since vegetative basal cover has decreased to only 3%. Percent bare ground also increased from 9% to 26%. The large increase in percent bare ground and decreases in vegetational basal cover, pavement, and rock would indicate possible movement of soils across the soil surface. The browse trend is basically stable, but preferred species are very limited. Bitterbrush and Gambel oak have identical density estimates to 1985. The grasses of the herbaceous understory have a higher nested frequency value, but forbs are very scarce. Even with a slight decrease for forbs, they are still so scarce they are of little use on this site. Trend for herbaceous understory is up.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - up (5)

1998 TREND ASSESSMENT

Soil trend is upward. There is abundant vegetation and litter cover to protect from erosion at this time. Additionally, percent bare ground has decreased from 26% in 1991 to 7% in 1998. The browse trend is stable, but browse remains limited on the site. Gambel oak slightly increased in density in 1998, and 20 young mountain big sagebrush plants/acre were estimated as well. Photographs show that the pinyon and juniper trees are increasing in size over time. The herbaceous understory trend is upward. Sum of nested frequency for perennial grasses and forbs increased from 546 in 1991 to 749 in 1998. Although cheatgrass is present on the site, it should remain under control with the very competitive perennial species on the site.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - up (5)

2003 TREND ASSESSMENT

Trend for soil is down. Percent bare soil doubled, and vegetation and litter cover are significantly lower compared to 1998 levels. Perennial grass cover decreased from 30% to 13% due to drought conditions not allowing grasses to recover from the previous grazing season. Rills and pedestalling provide evidence of some erosion on the site. Trend for browse is stable, but as with the previous readings, preferred browse species remain limited on the site. Mountain big sagebrush slightly increased in density (20 to 100 plants/acre), while Gambel oak slightly declined. The site is dominated by seeded grasses crested and intermediate wheatgrass, and smooth brome. Trend for the herbaceous understory is down. Perennial grasses

show significant declines in both nested frequency and average cover. A significant decline occurred in the nested frequency of intermediate wheatgrass and smooth brome which are less drought tolerant than crested wheatgrass. Cover of intermediate wheatgrass and smooth brome dropped from 10% and 12% in 1998 respectively to about 3% in 2003. Perennial forbs have also declined in sum of nested frequency since 1998. The magnitude of the decline in perennial grass cover on this site was the largest for the management unit in 2003. Weedy annual forbs were very abundant in 2003. The one positive change in the understory in 2003 was the significant decline in cheatgrass.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 7

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	_a 89	_b 136	_b 170	_{ab} 139	8.96	4.84
G	Agropyron intermedium	_b 173	_c 240	_b 174	_a 118	9.92	2.76
G	Agropyron spicatum	-	-	2	-	.03	-
G	Bromus inermis	_a 95	_b 135	_c 219	_{ab} 104	9.84	2.63
G	Bromus tectorum (a)	-	-	_b 298	_a 99	11.51	1.31
G	Elymus junceus	_b 29	_{ab} 11	_a 4	_a 1	.33	.03
G	Poa secunda	_a 3	_a 2	_b 40	_c 82	.91	2.80
G	Sitanion hystrix	_b 22	_b 18	_a 4	_a -	.01	-
Total for Annual Grasses		0	0	298	99	11.51	1.31
Total for Perennial Grasses		411	542	613	444	30.01	13.08
Total for Grasses		411	542	911	543	41.53	14.39
F	Agoseris glauca	-	-	4	4	.01	.03
F	Alyssum alyssoides (a)	-	-	_a 63	_b 105	.16	1.63
F	Arabis spp.	-	3	5	-	.01	-
F	Arenaria spp.	-	-	-	1	-	.00
F	Astragalus convallarius	-	-	1	-	.03	-
F	Astragalus spp.	-	-	2	10	.00	.36
F	Camelina microcarpa (a)	-	-	_b 17	_a 2	.03	.03
F	Calochortus nuttallii	-	-	2	4	.00	.01
F	Chaenactis douglasii	-	-	1	-	.00	-
F	Collinsia parviflora (a)	-	-	_a 56	_b 212	.11	4.73
F	Crepis acuminata	-	-	1	3	.03	.03
F	Cymopterus spp.	-	-	1	1	.00	.00
F	Descurainia pinnata (a)	-	-	-	7	-	.03

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Draba spp. (a)	-	-	12	13	.02	.03
F	Erodium cicutarium (a)	-	-	-	3	-	.03
F	Eriogonum racemosum	-	-	3	3	.03	.03
F	Gilia spp. (a)	-	-	a-	b53	-	.62
F	Holosteum umbellatum (a)	-	-	3	15	.01	.05
F	Lappula occidentalis (a)	-	-	a32	b76	.10	2.67
F	Leucelene ericoides	-	-	5	-	.15	-
F	Medicago sativa	b35	a-	a-	a1	-	.03
F	Microsteris gracilis (a)	-	-	a20	b175	.16	1.93
F	Orobanche fasciculata	-	-	2	-	.00	-
F	Phacelia spp.	-	1	-	-	-	-
F	Phlox longifolia	-	-	2	10	.01	.05
F	Polygonum douglasii (a)	-	-	5	-	.01	-
F	Ranunculus testiculatus (a)	-	-	a5	b65	.06	1.30
F	Sanguisorba minor	1	-	-	-	-	-
F	Streptanthus cordatus	-	-	-	5	-	.06
F	Tragopogon dubius	-	-	2	-	.00	-
F	Unknown forb-perennial	b20	a-	a-	a-	-	-
F	Vicia americana	a-	a-	c105	b67	2.28	1.44
Total for Annual Forbs		0	0	213	726	0.67	13.07
Total for Perennial Forbs		56	4	136	109	2.59	2.06
Total for Forbs		56	4	349	835	3.26	15.13

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

BROWSE TRENDS --

Management unit 22 , Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata vaseyana	1	3	.63	.06
B	Gutierrezia sarothrae	0	1	-	.15
B	Juniperus osteosperma	2	4	1.79	1.72
B	Quercus gambelii	4	2	1.79	1.78
Total for Browse		7	10	4.21	3.73

CANOPY COVER, LINE INTERCEPT --
 Management unit 22 , Study no: 7

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	.56
Juniperus osteosperma	2.31
Quercus gambelii	1.79

POINT-QUARTER TREE DATA --
 Management unit 22 , Study no: 7

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	47	36
Pinus edulis	15	25

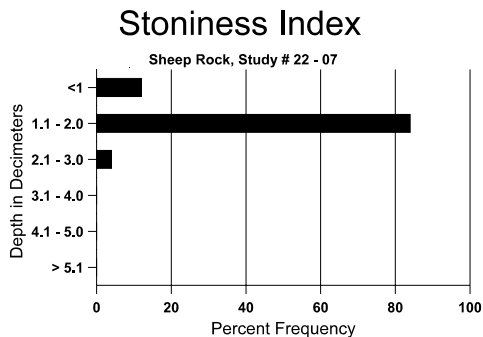
Average diameter (in)	
'98	'03
5.4	4.5
4.1	3.3

BASIC COVER --
 Management unit 22 , Study no: 7

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	10.50	3.00	48.07	36.65
Rock	1.50	2.50	3.09	3.19
Pavement	28.75	16.25	21.02	25.52
Litter	50.25	52.25	50.47	32.25
Cryptogams	0	0	.05	.01
Bare Ground	9.00	26.00	7.12	17.78

SOIL ANALYSIS DATA --
 Management unit 22, Study no: 7, Study Name: Sheep Rock

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.2	66.6 (10.2)	6.5	54.0	28.4	17.6	3.0	10.0	172.8	0.9



PELLET GROUP DATA --
 Management unit 22 , Study no: 7

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	6	14	-	-
Elk	1	-	-	-
Deer	4	4	12 (30)	5 (13)
Cattle	28	17	52 (128)	85 (210)

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	35/19
03	0	-	-	-	-	-	0	0	-	0	25/28
Artemisia tridentata vaseyana											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	27/38
03	100	-	20	80	-	-	20	0	-	0	24/38
Cercocarpus ledifolius											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	37/48
Cercocarpus montanus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	27/30
03	0	-	-	-	-	-	0	0	-	0	22/32
Chrysothamnus nauseosus hololeucus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	35/66
03	0	-	-	-	-	-	0	0	-	0	39/64

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus											
85	866	-	133	733	-	-	0	0	-	0	13/11
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	266	-	-	266	-	-	0	0	-	0	10/11
98	0	-	-	-	-	-	0	0	-	0	12/12
03	20	-	-	20	-	-	0	0	-	0	11/13
Juniperus osteosperma											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	66	-	66	-	-	0	0	-	0	38/36
98	40	-	-	40	-	20	0	0	-	0	-/-
03	80	-	-	80	-	-	0	0	-	0	-/-
Pinus edulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	40	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
85	66	-	66	-	-	-	0	0	0	0	-/-
91	66	-	-	-	66	-	0	100	100	100	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	19/47
Quercus gambelii											
85	133	-	133	-	-	-	0	0	0	0	-/-
91	133	-	133	-	-	-	100	0	0	0	-/-
98	380	-	100	260	20	-	0	0	5	0	44/30
03	260	-	-	260	-	60	0	0	0	0	56/30

Trend Study 22-8-03

Study site name: Muley Point.

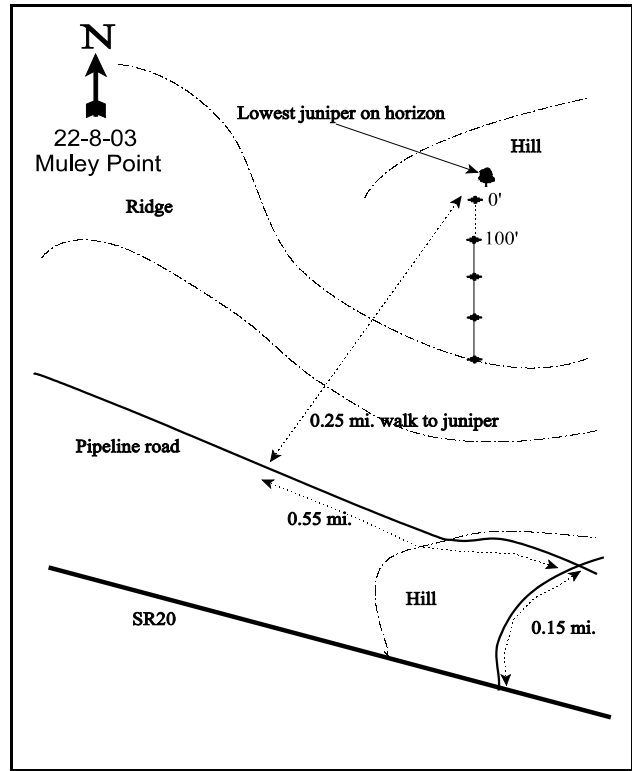
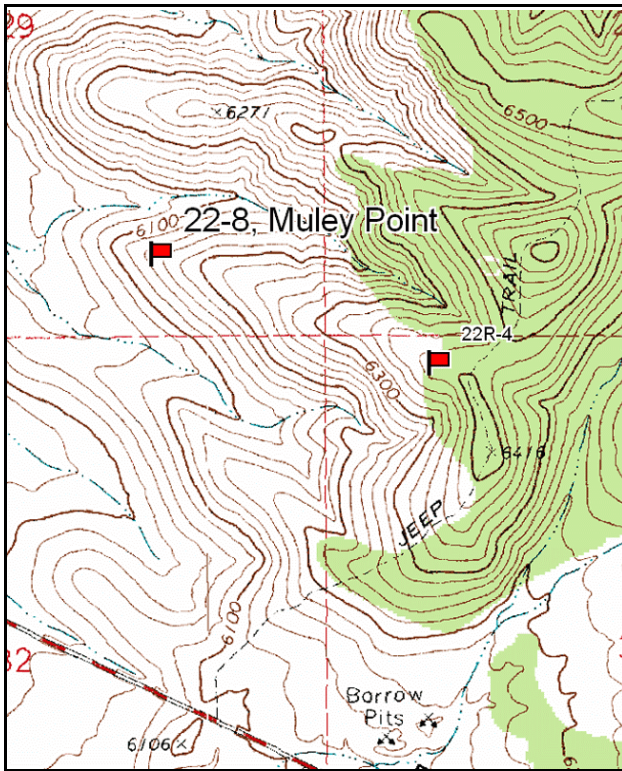
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From exit #95 on I-15 (junction with SR 20), go to the east side of the freeway, then go 1.2 miles east from the cattleguard on SR 20 to a small wooden H in the fence on the left. Go north through the gate for 0.15 miles to a 4-way intersection. Turn left on the pipeline road and go 0.55 miles then stop. On the ridge to the north locate the lowest juniper on the skyline. Walk to the juniper which is about 1/4 mile away. The baseline starts 10 feet south of the juniper. The 0-foot stake consists of a 3-foot rebar with browse tag #7051 attached.



Map Name: Buckhorn Flat

Diagrammatic Sketch

Township 31S, Range 7W, Section 29

GPS: NAD 27, UTM 12S 4215186 N, 353663 E

DISCUSSION

Muley Point - Trend Study No. 22-8

The Muley Point trend study is located on a ridge overlooking an expansive sagebrush valley. The transect lies about one mile east of Interstate 15 and three-fourths of a mile north of Highway 20. The study is on BLM administered land at an elevation of 6,200 feet. On the site, and for many miles around, the vegetation is dominated by dense, low growing Wyoming big sagebrush. The site has a moderately steep slope ranging from 17%-25% and aspect is to the southwest. The winter range on the adjacent Panguitch unit (28) is increasingly threatened by the elimination of sagebrush and conversion to agricultural fields where deer are excluded. This in effect, concentrates deer use on the remainder of the public land on unit 22 (Beaver). Pinyon-juniper density gradually increases to the east as you approach the mountains and gain elevation. Moderately heavy deer use occurs in the winter as evidenced by pellet group transect data. Deer use was estimated at 80 days use/acre (198 ddu/ha) in 1998 and 83 days use/acre (205 ddu/ha) in 2003. A few cattle pats were sampled in 2003 that were from the previous grazing season. Most of the deer pellet groups were from the winter use.

Soils have a sandy clay loam texture and a neutral pH (7.3). The average effective rooting depth was estimated at 11 inches in 1998. Soil temperature averaged 62°F at 13 inches in 1998 and nearly 70°F in 2003 indicating a dry soil profile. Plant development may be limited due to relatively low amounts of phosphorous (5.8 ppm). The soil surface is heavily armored by rock and pavement cover which provide about 60% average cover combined. Rock and pavement are also present throughout the soil profile. The rocks appear to be from basaltic parent material with some exhibiting calcite deposits. Erosion is minimal with little bare ground cover. Most of the bare soil occurs in shrub interspaces. Litter cover is only fair on this site ranging from 20-30%. There appears to be a hardpan or compacted soil layer about 12 inches below the soil surface which could be limiting to root development. Soils were rated as stable from an erosion condition class assessment completed in 2003.

Although two subspecies of big sagebrush are present on the site but Wyoming big sagebrush is dominate and the only sagebrush to occur in the density strips. Basin big sagebrush is more abundant below the transect within the drainage channels. Density of Wyoming big sagebrush was estimated at 3,340 plants/acre in 1998 and 3,140 in 2003. Recruitment by the young age class was moderate in 1998 (11%) but low in 2003 (1%). Although reproduction was low in 2003, most of the population displayed surprisingly good vigor especially with the drought conditions. Mature sagebrush plants averaged nearly two feet in height in 1998 and 2003. Utilization has been mostly moderate overall, but use varies depending on plant location. Plants closer to the ridgetop receive the heaviest use. Sagebrush plants were noted as having an abundant number of leaders in 2003, although growth was low averaging less than one inch of annual leader growth in mid-June. Percent decadence was extremely high in 1991 at 75%, but has been more moderate in other years. Photographs between sampling years indicate a thinning of the Wyoming big sagebrush population. Although pinyon and Utah juniper trees are sparse on the study area, they do provide some thermal cover and have all been highlined to about 5 feet.

The herbaceous understory continues to be rather sparse and stunted. Photographs from 1985 and 1991 show no or little cheatgrass was present on the site. In 1998 and 2003, cheatgrass was by far the most common grass and provided a dense carpet throughout the shrub interspaces. Frequency and cover of cheatgrass did decline in 2003 with the drought conditions, but it still remains abundant enough that with normal precipitation will present a serious fire hazard. Most of the other grasses and forbs are found growing under the protection of sagebrush canopies. Perennial grasses include Indian ricegrass, bottlebrush squirreltail, purple three-awn, galleta, and needle-and-thread grass. Indian ricegrass increased in frequency in 2003 while squirreltail declined. Several desirable perennial forbs occur on the site including scarlet globemallow and browse milkvetch. However, these species occur sporadically. Browse milkvetch significantly declined in

nested frequency and average cover in 2003 with drought.

1985 APPARENT TREND ASSESSMENT

Now that the surface is covered by a layer of erosion pavement and rock, the soil surface appears basically stable. The indicators also point to a static vegetative trend. Populations appear stable, and the plant composition is not likely to change for a long time unless there is increased browsing pressure from livestock and deer.

1991 TREND ASSESSMENT

The soil trend appears to be stable. However, vegetational basal cover is very low at 1%. Percent cover for the other basic categories has changed very little. The key browse species, Wyoming big sagebrush, has decreased in density by 40%, while percent decadence has more than doubled to 75%. With the high density of 8,132 plants/acre in 1985, this poor site in conjunction with the extended drought has caused a great deal of thinning within the community. The population should stabilize at a somewhat lower density, but this trend should be monitored closely. Trend for browse is down. The narrative for the herbaceous understory is similar. The sum of nested frequency for both grasses and forbs has dropped substantially since 1985. The only event that can help improve this site is an end this prolonged drought.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - down (1)

1998 TREND ASSESSMENT

The soil trend continues to be stable with little erosion apparent. Percent rock and pavement cover has slightly declined over all years, while percent bare ground has stayed relatively similar. The browse trend is downward. Wyoming big sagebrush percent decadence has declined from a high of 75% in 1991 to 37% in 1998, although this is still higher than the 1985 estimate of 28%. The population is slowly declining with low numbers of seedling or young plants encountered in 1998. Thirty-nine percent of the decadent age class was classified as dying, an increase from 16% in 1991. The dense carpet of cheatgrass in the shrub interspaces provides excessive competition for sagebrush seedling establishment. The herbaceous understory trend is slightly down. Although perennial herbaceous understory sum of nested frequency has increased, the dense cheatgrass carpet that was not present in the past is a severe fire hazard which could ultimately eliminate the Wyoming big sagebrush population and the value of this area as deer winter range. Perennial grasses and forbs need to increase in abundance to decrease the possibility of a devastating fire.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Trend for soil is stable. Vegetation, litter, and bare ground cover all declined in 2003 while rock and pavement cover increased. An increase in rock and pavement cover indicates some soil movement on the site, but erosion is not currently severe. Trend for browse is stable. Wyoming big sagebrush density declined slightly due to a decreasing young age class, but percent decadence remains stable and the proportion of decadent, dying plants decreased. Vigor throughout the population has not changed although heavy use

increased to 24%. Trend for the herbaceous understory is slightly down. Perennial grasses and forbs have lower sum of nested frequency values since 1998. The main positive factor in the understory is the decline in cheatgrass cover and frequency. However, this is due to drought conditions and will likely reverse in the future with better precipitation.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 8

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Aristida purpurea	a-	b11	b26	ab6	.32	.15
G	Bromus tectorum (a)	-	-	b342	a238	13.36	4.50
G	Hilaria jamesii	a-	a-	ab8	b9	.19	.07
G	Oryzopsis hymenoides	a44	ab67	ab77	b101	2.42	3.80
G	Sitanion hystrix	c179	b101	ab91	a57	1.56	.63
G	Stipa comata	11	-	4	1	.04	.01
Total for Annual Grasses		0	0	342	238	13.36	4.50
Total for Perennial Grasses		234	179	206	174	4.53	4.68
Total for Grasses		234	179	548	412	17.90	9.18
F	Astragalus cibarius	ab18	b21	b37	a2	5.86	.01
F	Astragalus spp.	-	2	-	-	-	-
F	Chaenactis douglasii	c21	bc15	ab4	a-	.02	-
F	Cryptantha spp.	-	3	-	-	-	-
F	Descurainia pinnata (a)	-	-	2	3	.03	.01
F	Eriogonum cernuum (a)	b39	a10	a1	b41	.00	.37
F	Erodium cicutarium (a)	-	-	-	1	-	.00
F	Gilia spp. (a)	-	-	a-	b28	-	.26
F	Holosteum umbellatum (a)	-	-	-	3	-	.00
F	Leucelene ericoides	a-	a-	b10	b12	.12	.37
F	Phlox hoodii	-	-	-	1	-	.00
F	Phlox longifolia	-	-	4	4	.01	.01
F	Sphaeralcea coccinea	a4	a4	b20	b21	.31	.38
F	Unknown forb-perennial	b14	a-	a-	a-	-	-
Total for Annual Forbs		39	10	3	76	0.03	0.66
Total for Perennial Forbs		57	45	75	40	6.34	0.78
Total for Forbs		96	55	78	116	6.38	1.44

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

BROWSE TRENDS --

Management unit 22 , Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
		B	Artemisia tridentata wyomingensis	81	71
B	Chrysothamnus viscidiflorus stenophyllus	0	1	-	-
B	Opuntia whipplei	1	0	.00	-
Total for Browse		82	72	14.77	14.80

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 8

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	13.88

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 8

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	0.93

BASIC COVER --

Management unit 22 , Study no: 8

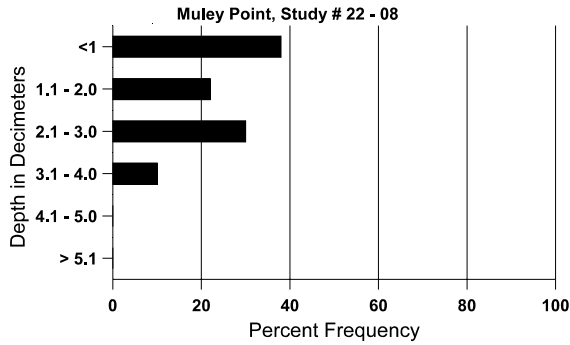
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	2.00	1.00	33.02	28.21
Rock	16.25	17.75	17.63	17.90
Pavement	46.25	42.25	33.62	42.55
Litter	24.25	28.25	29.89	19.68
Cryptogams	0	0	.01	.22
Bare Ground	11.25	10.75	11.50	6.22

SOIL ANALYSIS DATA --

Management unit 22, Study no: 8, Study Name: Muley Point

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
11.2	69.8 (10.9)	7.3	52.0	27.4	20.6	1.3	5.8	156.8	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22, Study no: 8

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	29	14	-	-
Cow	-	-	-	1 (2)
Deer	53	18	80 (198)	83 (205)

BROWSE CHARACTERISTICS --

Management unit 22, Study no: 8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	8132	133	1200	4666	2266	-	42	0	28	6	17/22
91	4865	333	66	1133	3666	-	41	19	75	15	17/19
98	3340	40	380	1720	1240	860	63	1	37	14	22/28
03	3140	-	40	1880	1220	720	64	24	39	13	23/31
Chrysothamnus viscidiflorus stenophyllus											
85	66	-	-	66	-	-	0	0	-	0	9/4
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	6/9

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Coryphantha vivipara</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	11/24
<i>Opuntia whipplei</i>											
85	200	-	-	200	-	-	0	0	-	0	7/7
91	66	-	-	66	-	-	0	0	-	0	8/11
98	20	-	-	20	-	-	0	0	-	0	7/12
03	0	-	-	-	-	-	0	0	-	0	5/12

Trend Study 22-9-03

Study site name: Rocks Reseeding.

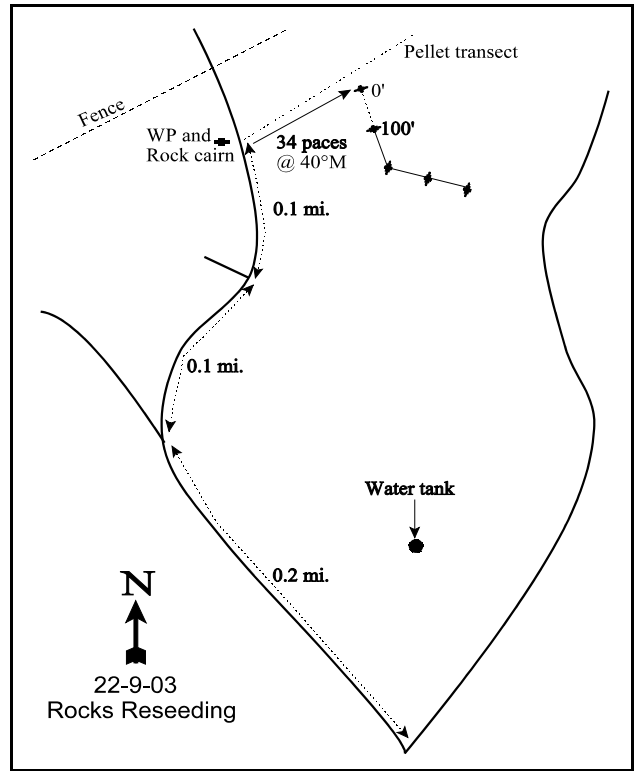
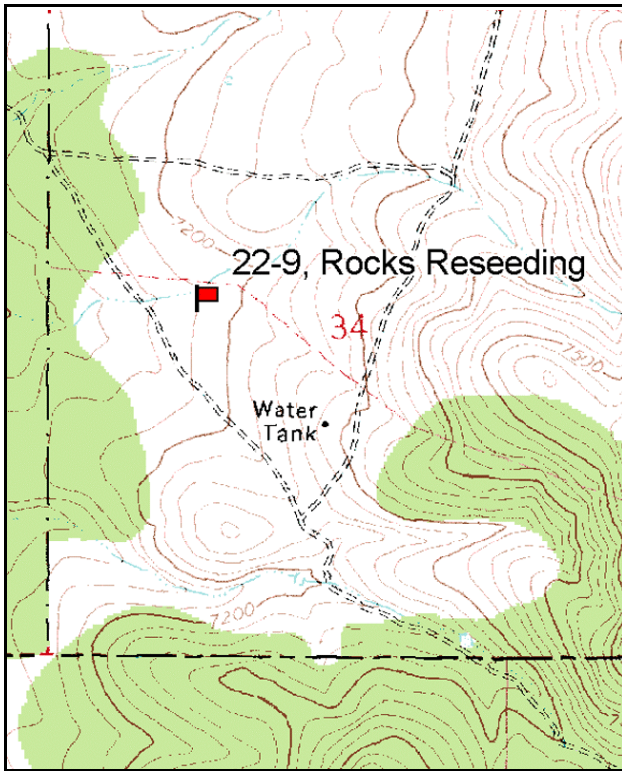
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 163 degrees magnetic. Lines 3-4 116° M.

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

LOCATION DESCRIPTION

Begin on I-15 at exit #100, 9 miles south of Beaver. On the east side of the freeway there is a frontage road and a road going straight east. Go east 6.3 miles up Fremont Wash to a faint road to the left. Go 0.6 miles up the road which has several switchbacks to the top to a gate. Continue straight for 0.7 miles to a four-way intersection. Go straight 0.65 miles to a fork. Take the middle fork (right) for 1.0 mile and turn left under a stock pond. Go up a steep hill 0.1 miles to a fork, turn left, and go 0.2 miles to another fork. Stay right and go another 0.1 mile to a fork. Keep right and continue 0.1 miles to a witness post on the left side of the road. The witness post marks the start of a pellet group transect. From the witness post, walk 34 paces at 41 degrees magnetic along the transect. There are small rebar every 30 feet. The baseline starts 10 feet south of the fifth small rebar (150 feet from the fencepost). The frequency baseline is marked by 2-3 foot rebar and the 0-foot stake is tagged #7050. The 200, 300 and 400 foot stakes are half-high fenceposts.



Map Name: Kane Canyon

Diagrammatic Sketch

Township 30S, Range 6W, Section 34

GPS: NAD 27, UTM 12S 4223919 N, 366456 E

DISCUSSION

Rocks Reseeding - Trend Study No. 22-9

This study is located on USFS administered land that has basically been developed for livestock grazing. The site has an elevation of 7,200 feet with a westerly aspect and a 4-6% slope. The area was Dixie harrowed in 1962, followed by large areas being seeded with mostly crested wheatgrass. There were numerous water developments and fencing projects completed. A water trough is located about 1/3 of a mile from the site. There is a healthy stand of mountain big sagebrush and antelope bitterbrush with a low density of Utah juniper scattered throughout the community. Point-centered quarter data estimated 60 juniper trees/acre in 2003. A pellet group transect read on site in 1998 estimated light use at 18 deer days use/acre (44 ddu/ha) and 20 cow days use/acre (49 cdu/ha). Pellet group transect data in 2003 estimated 23 deer, 6 elk, and 19 cow days use/acre (56 ddu/ha, 15 edu/ha, and 47 cdu/ha). This transect lies in the Circleville cattle allotment which is on a 3 year rest rotation system. In the first year, cattle graze the area from June 1 to July 24. In the second year, cattle graze from July 24 through October 15. The pasture is then rested in the third year.

Soil analysis indicates texture to be a clay loam with a neutral pH (6.6). Soils have moderate depth with an average effective rooting depth estimated at 13 inches. Rock and pavement cover are moderate on the soil surface and appear to be from basaltic parent material. Moderately high pedestalling provides the most evidence of past soil erosion, but at the present time, erosion is slight. An erosion condition class assessment rated soils as stable in 2003. Bare ground increased from 21% to 30% between 1998 and 2003, while litter cover declined from 43% to 27% over the same time period.

The browse component is a mixture of mountain big sagebrush and antelope bitterbrush. Bitterbrush is the most preferred species and the mature plants have been moderate to heavily browsed. Density of bitterbrush numbered 1,440 plants/acre in 1998 and 1,080 in 2003. The proportion of the population classified as young has steadily declined since the first reading. Percent decadence was low in 1985 and 1998 at around 10%, although very high in 1991 and 2003 at nearly 60%. Bitterbrush annual leaders averaged 2.2 inches of growth in 2003. Mountain big sagebrush density was estimated at 3,420 plants/acre in 1998 and 2,880 plants/acre in 2003. The main difference in density between 1998 and 2003 was a decline in the number of young in 2003. Utilization has been mostly light to moderate in all surveys, and vigor has been generally good. Percent decadence was moderate in 1985 and 1991 at around 30%. It has declined to 8% in 1998 and then went up slightly to 17% in 2003. Annual leader growth for sagebrush averaged 1.6 inches by June 2003.

Crested wheatgrass is by far the dominant herbaceous species on the site for all readings. Crested wheatgrass provided nearly 100% of the grass cover in both 1998 and 2003. It was found in 88% of the quadrats for all years it was sampled. In 2003, crested wheatgrass had received minimal use at the time of sampling. Other perennial grasses sampled on the site included bluebunch wheatgrass, mutton bluegrass, galleta, and prairie junegrass. All of these species occur in very low numbers. Forbs have been sparse in all years. Annual forbs increased in 2003, while perennials were stable. Longleaf phlox was the most common perennial forb in all surveys. Foothill deathcamas, desert Indian paintbrush, and milkvetch all have shown signs of utilization in the past.

1985 APPARENT TREND ASSESSMENT

There is some soil loss from the site, but protection provided by the vegetative cover helps to curtail erosion. The rest-rotation grazing system should allow the grasses to remain vigorous and productive and also allow some buildup of litter. Grazing pressure on the area by cattle should be closely monitored to insure they do not feed excessively on the bitterbrush during dry years, which is already utilized by deer and is a key species that should remain in the community. Vegetative trend appears up until the density of juniper becomes too high.

1991 TREND ASSESSMENT

There has obviously been some soil movement on the site with rock and pavement cover declining from 27% to 19% and percent bare ground more than doubling to 27%. Vegetative basal cover and litter cover have both declined. Trend for soil is down. Trend for browse is mixed as mountain big sagebrush increased and bitterbrush decreased. Bitterbrush's biotic potential (number of seedlings) has decreased along with the percentage of individuals in the young age class. Another critical parameter is that percent decadence for bitterbrush has risen from 9% to 56%. The biotic potential for sagebrush is still high at 70% and the young age class is also high at 21%. Trend for browse is stable. Trend for the herbaceous understory is down for both grasses and forbs even with the rest-rotation grazing system in place. The extended drought has seized control of this grazing program. The forbs have never been very abundant on this site, with many of them having disappeared since the last survey.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

1998 TREND ASSESSMENT

The soil trend is stable with a slight increase in percent rock and pavement cover and a slight decrease in percent bare ground. Erosion is currently negligible. The browse trend is slightly upward with a decrease in percent decadence and an increase in the percentage of plants with good vigor for both key browse species. The bitterbrush population is recovering from high percent decadence in 1991 and appears to be healthy. The herbaceous understory trend is stable with a slight decrease in grass sum of nested frequency and a slight increase in forb sum of nested frequency.

TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is slightly down. A decrease in litter cover and resultant increase in bare ground provides less protective cover for soils. Soils show slight erosion. Trend for the browse component is slightly down. Mountain big sagebrush and bitterbrush both show some losses, and fewer young in their populations. Both species have increased decadence, with a high increase for bitterbrush. Both species have maintained generally good vigor, although 76% of the bitterbrush sampled displayed heavy use. Trend for the herbaceous understory is stable. Crested wheatgrass shows a slight decline in nested frequency but the loss is not significant. All other perennial species, both grasses and forbs, remains very low.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 9

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Agropyron cristatum</i>	_{ab} 294	_a 258	_b 301	_{ab} 265	22.16	15.03
G	<i>Agropyron spicatum</i>	_b 77	_b 60	_a 9	_a 3	.56	.02
G	<i>Aristida purpurea</i>	-	-	2	1	.03	.03
G	<i>Bromus tectorum</i> (a)	-	-	-	1	-	.00
G	<i>Hilaria jamesii</i>	-	-	3	-	.03	-
G	<i>Koeleria cristata</i>	_{ab} 4	_b 8	_a -	_{ab} 4	-	.01
G	<i>Oryzopsis hymenoides</i>	4	-	1	1	.03	.03
G	<i>Poa fendleriana</i>	_c 51	_b 20	_a 3	_a 1	.15	.00
G	<i>Poa secunda</i>	-	-	-	3	-	.09
Total for Annual Grasses		0	0	0	1	0	0.00
Total for Perennial Grasses		430	346	319	278	22.96	15.22
Total for Grasses		430	346	319	279	22.96	15.22
F	<i>Agoseris glauca</i>	-	-	1	1	.03	.00
F	<i>Alyssum alyssoides</i> (a)	-	-	-	2	-	.00
F	<i>Arabis demissa</i>	_b 8	_a -	_{ab} 3	_{ab} 3	.00	.03
F	<i>Astragalus convallarius</i>	2	-	3	-	.15	-
F	<i>Astragalus</i> spp.	1	-	6	5	.33	.01
F	<i>Castilleja chromosa</i>	3	-	-	-	-	-
F	<i>Calochortus nuttallii</i>	-	-	-	3	-	.00
F	<i>Chaenactis douglasii</i>	3	-	-	1	-	.00
F	<i>Collinsia parviflora</i> (a)	-	-	_a 1	_b 19	.00	.04
F	<i>Crepis acuminata</i>	-	-	-	1	-	.03
F	<i>Cryptantha</i> spp.	-	-	-	1	-	.00
F	<i>Cymopterus</i> spp.	_a -	_a -	_{ab} 2	_b 11	.01	.03
F	<i>Delphinium nuttallianum</i>	-	-	5	6	.04	.01
F	<i>Descurainia pinnata</i> (a)	-	-	2	-	.00	-
F	<i>Draba</i> spp. (a)	-	-	2	2	.00	.00
F	<i>Erigeron</i> spp.	4	-	-	-	-	-
F	<i>Eriogonum racemosum</i>	-	-	2	-	.03	-
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	5	-	.01
F	<i>Lactuca serriola</i>	-	-	1	-	.00	-
F	<i>Lomatium</i> spp.	2	1	4	-	.01	-
F	<i>Microsteris gracilis</i> (a)	-	-	_a 9	_b 166	.02	1.63
F	<i>Navarretia intertexta</i> (a)	-	-	-	1	-	.00
F	<i>Phlox longifolia</i>	51	37	32	30	.18	.11

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Ranunculus testiculatus (a)	-	-	-	8	-	.01
F	Trifolium spp.	3	-	-	1	-	.00
F	Vicia americana	-	-	3	-	.03	-
F	Zigadenus paniculatus	-	-	3	-	.00	-
Total for Annual Forbs		0	0	14	203	0.03	1.71
Total for Perennial Forbs		77	38	65	63	0.84	0.27
Total for Forbs		77	38	79	266	0.88	1.99

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

BROWSE TRENDS --

Management unit 22 , Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata vaseyana	84	74	14.66	12.76
B	Juniperus osteosperma	5	5	.15	.48
B	Pinus edulis	1	1	-	.15
B	Purshia tridentata	48	42	12.26	9.76
Total for Browse		138	122	27.07	23.15

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 9

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	13.66
Juniperus osteosperma	.60	2.04
Pinus edulis	-	.16
Purshia tridentata	-	10.83

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 9

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.6
Purshia tridentata	2.2

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 9

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	54	60

Average diameter (in)	
'98	'03
4.8	4.6

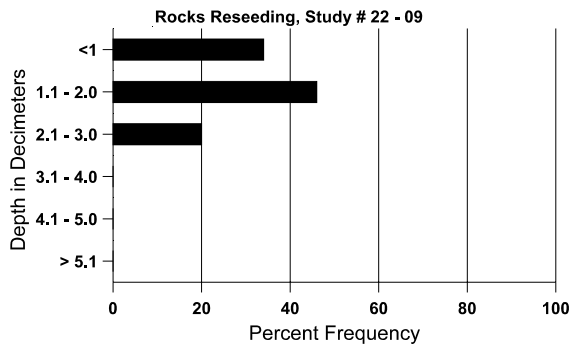
BASIC COVER --
Management unit 22 , Study no: 9

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	10.25	8.25	39.93	40.48
Rock	12.50	11.75	11.52	10.52
Pavement	14.00	6.75	11.13	9.10
Litter	50.00	45.50	42.81	27.09
Cryptogams	0	1.00	.45	.15
Bare Ground	13.25	26.75	21.22	30.40

SOIL ANALYSIS DATA --
Management unit 22, Study no: 9, Study Name: Rocks Reseeding

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.1	63.8 (13.2)	6.6	38.0	31.4	30.6	2.5	9.8	185.6	0.7

Stoniness Index



PELLET GROUP DATA --
Management unit 22 , Study no: 9

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	23	4	-	-
Elk	2	-	1 (2)	6 (15)
Deer	21	7	18 (45)	23 (56)
Cattle	18	9	20 (49)	19 (47)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 9

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	1933	2733	200	1200	533	-	48	3	28	0	28/27
91	2199	1533	466	1000	733	-	36	6	33	15	25/31
98	3420	340	900	2240	280	460	18	1	8	2	27/37
03	2880	20	340	2040	500	240	21	8	17	3	25/31
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	66	-	66	-	-	-	0	0	0	0	-/-
91	266	200	200	-	66	-	50	25	25	0	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Juniperus osteosperma</i>											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	133	-	133	-	-	-	0	0	-	0	-/-
98	100	20	60	40	-	-	0	0	-	0	-/-
03	100	-	40	60	-	-	0	0	-	0	-/-
<i>Opuntia whipplei</i>											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	6/8
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Pinus edulis</i>											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Purshia tridentata</i>											
85	1465	1200	466	866	133	-	23	59	9	0	35/28
91	1199	266	200	333	666	-	33	56	56	11	26/30
98	1440	100	100	1200	140	100	57	3	10	0	41/53
03	1080	20	60	380	640	40	22	76	59	13	38/47

Trend Study 22-10-03

Study site name: Doubleup Hollow .

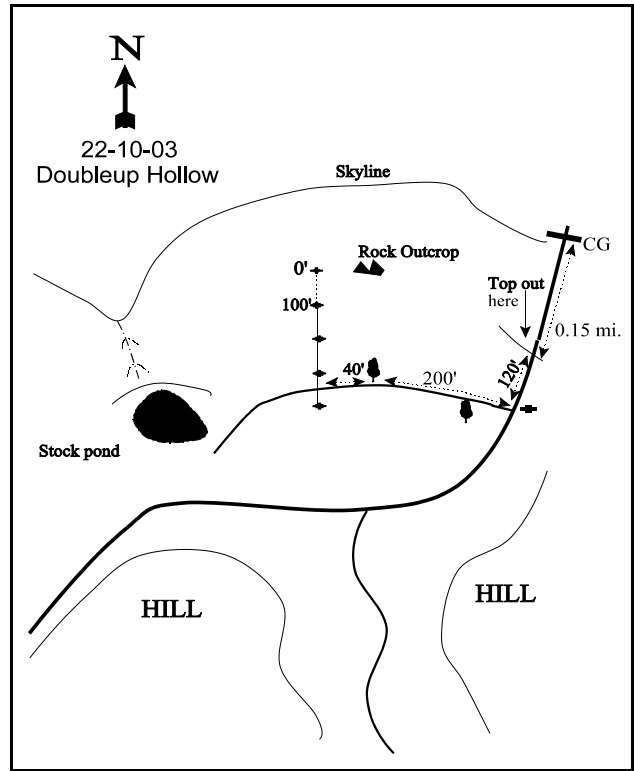
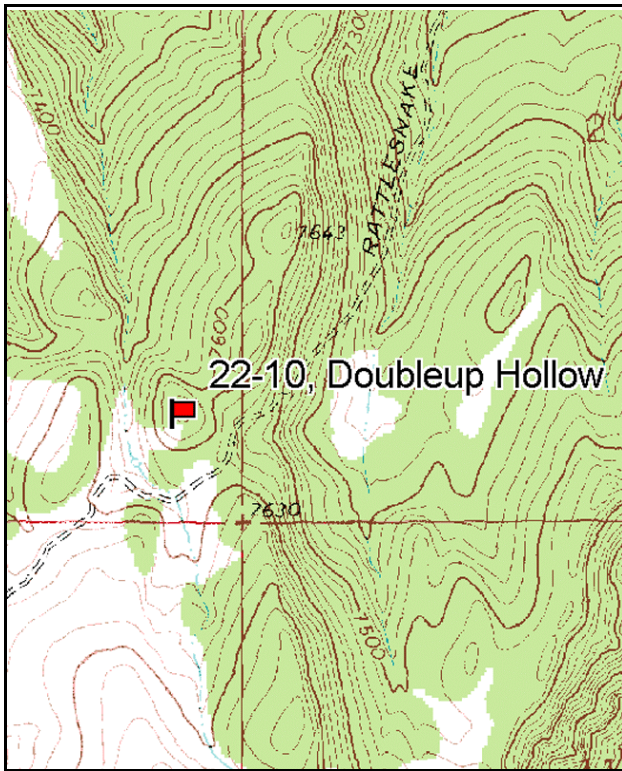
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

Start from the cattleguard in front of the Chevron Station on the west side of the I-15 interchange at the south end of Beaver. Turn left onto the frontage road and go 0.7 miles south, then 1.6 miles west. Go past the turnoff to the Beaver International Airport 0.2 mile to a corner then 0.2 miles south to an intersection. Turn right, paralleling a fenceline and proceed 1.7 miles west to an intersection. Turn left onto a major dirt road and follow this main road (also known as the Rattlesnake Trail) for 6.7 miles, keeping to the right at all forks. At the livestock pond, keep right again and go 1.45 miles to the cattleguard. Continue 0.15 miles to a half high fencepost. From the fencepost, go 300 feet on a faint road forking off to the right. The 300-foot stake is just off of the faint road on the right side of the road. The 300 ft stake is rebar tagged #7075.



Map Name: Greenville Bench

Diagrammatic Sketch

Township 31S, Range 8W, Section 3

GPS: NAD 27, UTM 12S 4221812 N, 347658 E

DISCUSSION

Doubleup Hollow - Trend Study No. 22-10

This study samples a moderately high deer winter range on the north end of the Black Mountains. It is located on BLM administered land southwest of Beaver. Because this site lies at the upper elevations of the area, it could have year round use by resident deer, depending on the weather. The vegetation in the hollow is a mixture of open patches of sagebrush interspersed with pinyon, juniper, and curlleaf mountain mahogany. The area slopes moderately (10-15%) to the south at an elevation of 7,600 feet. This site receives light use with only 18 deer days use/acre (44 ddu/ha) estimated in 1998 and 29 deer days use/acre (71 ddu/ha) being estimated from pellet group transect data collected in 2003. In the past, hedging on the browse plants reflected use by both deer and livestock, but there was no livestock sign encountered in 1998 or 2003.

Large rock outcrops and the high percentage of rocks and pavement on the surface indicates the rockiness of the subsurface soil horizons. The upper soil is grayish brown, fine-textured, and loosely compacted. Soil analysis indicates a clay loam texture with a neutral pH (6.6). Effective rooting depth was estimated at nearly 13 inches in 1998. At a depth of approximately 10-12 inches there is an apparent hardpan or compacted layer. Phosphorous levels in the soil profile measure 7.1 ppm and may be limiting as 10 ppm is thought to be minimal for normal plant development. Vegetation and litter cover aid in soil stabilization and keep erosion to a minimum. Bare soil has been very low in all years. The soils were rated stable from an erosion condition class index in 2003.

The browse component is abundant and dominated by bitterbrush and mountain big sagebrush. These two species contributed about 3/4 of the total browse cover on the site in both 1998 and 2003. Bitterbrush is the most preferred species although utilization has shifted from moderate-heavy in 1985 and 1991 to light-moderate in 1998 and 2003. Percent decadence has been fairly low for all readings and was estimated at 16% in 2003. The proportion of young plants in the population was moderate in 1998 (13%) and 2003 (9%). Vigor has been mostly normal throughout the bitterbrush population for all surveys. In 1998 and 2003, bitterbrush showed abundant flowering, although annual leaders were noted as being few in 2003. Bitterbrush annual leader growth averaged 1.6 inches in 2003. In the past, the sagebrush was identified as both black sagebrush and mountain big sagebrush. In 2003, all sagebrush were classified as mountain big sagebrush. In 1985, it was reported that the sagebrush was producing a large amount of seed, which did not become established due to dry conditions. Density of sagebrush was estimated at about 4,000 plants/acre in 1998 and 2003. Reproduction was low in both years, while use was light to moderate. Percent decadence increased from 25% in 1998 to 40% in 2003. Poor vigor was displayed in 11% of the population in 1998 and 14% in 2003. Annual leader growth for sagebrush averaged 1.6 inches in 2003.

Other forage species present but in lower numbers include curlleaf mountain mahogany, Gambel oak, and snowberry. Point-center quarter data from 2003 estimated 28 Utah juniper trees/acre and 132 pinyon trees/acre. In 1998, line intercept canopy cover for Utah juniper was estimated at 2% and 8% for pinyon. In 2003, pinyon canopy cover increased to just over 11%, while juniper remained about the same.

The herbaceous understory has fair diversity yet poor production. Bottlebrush squirreltail has been the most abundant perennial species in all years, but it has also declined with each reading. Less abundant perennial grasses include bluebunch wheatgrass, blue grama, a *Carex*, prairie junegrass, Indian ricegrass, and mutton bluegrass. Most of the perennial herbaceous plants are found growing under the protection of shrubs. Cheatgrass is scattered throughout, but it is small statured. It significantly decreased in nested frequency in 2003. Forbs are rather scarce. All forbs combined to provide less than 1% average cover on the site in 1998 and 2003.

1985 APPARENT TREND ASSESSMENT

The soil appears stable and well-protected from erosion. However, the rocks on the surface are easily moved by disturbances such as trampling and trails. Erosion channels are easily formed. Large sagebrush openings still occupy much of the surrounding land, but these openings are apparently getting smaller. The relative abundance of the various browse species is slowly changing and the increase of pinyon and juniper indicates an overall slightly downward trend. The composition of grasses and forbs is fair and appears stable.

1991 TREND ASSESSMENT

The soil trend is slightly downward with slight declines in basal vegetation cover and litter cover, and a slight increase in bare ground. Browse trend for the key species is down. Sagebrush and bitterbrush experienced losses in their respective populations with corresponding increases in their decadence rate. The proportion of the plants displaying poor vigor increased for both species, and percent young declined. Sum of nested frequency for both grasses and forbs has also declined indicating a slightly downward trend.

TREND ASSESSMENT

soil - slightly down (2)

browse - down (1)

herbaceous understory - slightly down (2)

1998 TREND ASSESSMENT

The soil trend is stable with only slight changes in percent rock, pavement, and bare ground. Erosion is only slight with adequate vegetation and litter cover to protect the soil. The browse trend is stable. The decrease in bitterbrush is mostly because of the much larger sample size giving more accurate estimates of shrub densities which characteristically have discontinuous and/or clumped distributions. Also, the number of dead plants in the population can only explain about 18% of the decrease. Utilization by wildlife or livestock is significantly lower at this time than previously reported. Percent decadence and the percentage of plants exhibiting good vigor have improved since 1991 for both bitterbrush and sagebrush. Sagebrush cover for sagebrush is moderately high at an estimated 24% and may negatively affect the herbaceous understory production. The herbaceous understory trend is stable. Perennial grass sum of nested frequency has slightly declined while perennial forb sum of nested frequency has increased, offsetting the losses in the grasses.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Erosion remains minimal, and basic cover categories have changed very little. Trend for browse is stable. Mountain big sagebrush and bitterbrush have fairly stable populations. Use remains light to moderate for both. Percent decadence increased for both species, but the proportion of the population displaying poor vigor remains about the same as in 1998. Sagebrush may decline in the future unless reproduction improves as there is a moderate amount of decadent, dying plants in the population. Trend for the herbaceous understory is down. Continued declines in nested frequency for perennial species is a definite concern on this site which has had a sparse understory from the beginning. The abundance of browse, including the increasing density of pinyon and juniper trees, coupled with periods of drought have negatively impacted the herbaceous component.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 10

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	6	11	18	7	.35	.16
G	Bouteloua gracilis	6	12	6	-	.01	-
G	Bromus tectorum (a)	-	-	_b 96	_a 65	1.78	.68
G	Carex spp.	6	6	17	12	.26	.21
G	Koeleria cristata	8	6	3	11	.00	.07
G	Oryzopsis hymenoides	9	7	10	-	.02	-
G	Poa fendleriana	1	5	9	4	.30	.06
G	Poa secunda	-	-	-	-	-	.00
G	Sitanion hystrix	_c 140	_{bc} 113	_{ab} 78	_a 70	1.53	1.01
Total for Annual Grasses		0	0	96	65	1.78	0.68
Total for Perennial Grasses		176	160	141	104	2.49	1.53
Total for Grasses		176	160	237	169	4.27	2.21
F	Arabis demissa	1	6	12	3	.05	.00
F	Astragalus spp.	2	-	1	1	.00	.00
F	Chaenactis douglasii	_b 23	_a 7	_{ab} 6	_a -	.07	-
F	Cryptantha spp.	12	11	12	1	.08	.00
F	Cymopterus spp.	-	-	7	4	.01	.03
F	Descurainia pinnata (a)	-	-	3	9	.00	.19
F	Epilobium brachycarpum (a)	-	-	_b 9	_a -	.05	-
F	Erigeron pumilus	4	-	4	-	.06	-
F	Eriogonum umbellatum	-	-	-	3	-	.03
F	Gayophytum ramosissimum(a)	-	-	_a -	_b 35	-	.09
F	Lupinus argenteus	_a -	_a -	_b 21	_a -	1.44	-
F	Lygodesmia spinosa	1	4	-	2	-	.00
F	Machaeranthera canescens	_b 10	_a -	_{ab} 4	_a -	.01	-
F	Microsteris gracilis (a)	-	-	6	-	.01	-
F	Penstemon spp.	4	-	4	6	.04	.21
F	Petradoria pumila	-	-	4	1	.38	.03
F	Phlox longifolia	3	2	2	3	.01	.03
F	Senecio multilobatus	1	2	-	-	-	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
	Total for Annual Forbs	0	0	18	44	0.06	0.28
	Total for Perennial Forbs	61	32	77	24	2.18	0.36
	Total for Forbs	61	32	95	68	2.25	0.64

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

BROWSE TRENDS --

Management unit 22 , Study no: 10

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	3	0	.03	-
B	Artemisia tridentata vaseyana	87	82	23.73	16.68
B	Cercocarpus ledifolius	1	2	.41	.41
B	Gutierrezia sarothrae	1	3	-	.00
B	Juniperus osteosperma	2	2	1.70	.38
B	Mahonia repens	1	3	.01	.03
B	Opuntia spp.	3	3	-	-
B	Pediocactus simpsonii	0	1	-	-
B	Pinus edulis	2	4	6.09	11.06
B	Purshia tridentata	50	47	13.92	11.08
B	Symphoricarpos oreophilus	5	5	1.29	1.16
	Total for Browse	155	152	47.20	40.82

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 10

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	13.88
Cercocarpus ledifolius	-	.35
Juniperus osteosperma	2.40	2.09
Pinus edulis	8.39	11.30
Purshia tridentata	-	11.96
Symphoricarpos oreophilus	-	1.25

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 10

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.6
Purshia tridentata	1.6

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 10

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	26	28
Pinus edulis	125	132

Average diameter (in)	
'98	'03
4.5	5.4
4.3	5.4

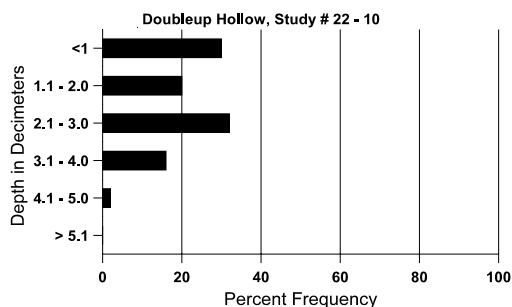
BASIC COVER --
Management unit 22 , Study no: 10

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.75	3.25	45.72	40.59
Rock	9.75	14.25	12.25	10.68
Pavement	25.25	20.50	20.12	13.58
Litter	56.75	53.00	49.04	51.86
Cryptogams	0	1.00	.19	.45
Bare Ground	4.50	8.00	6.00	7.14

SOIL ANALYSIS DATA --
Management unit 22, Study no: 10, Study Name: Doubleup Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.7	64.8 (10.9)	6.6	44.0	27.4	28.6	2.7	7.1	204.8	0.8

Stoniness Index



PELLET GROUP DATA --
 Management unit 22 , Study no: 10

Type	Quadrat Frequency	
	'98	'03
Rabbit	27	20
Elk	2	-
Deer	36	8

Days use per acre (ha)	
'98	'03
-	-
-	-
18 (44)	29 (71)

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
85	4933	66	600	2733	1600	-	28	1	32	18	11/16
91	3265	-	66	1733	1466	-	29	8	45	35	8/21
98	120	-	-	60	60	-	0	0	50	33	10/13
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Artemisia tridentata vaseyana</i>											
85	2399	133	266	1133	1000	-	53	11	42	6	20/17
91	2265	-	66	1066	1133	-	50	0	50	38	20/24
98	3900	220	120	2820	960	1240	22	0	25	11	22/30
03	4100	-	40	2400	1660	1620	22	3	40	14	24/28
<i>Cercocarpus ledifolius</i>											
85	0	200	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	48/53
03	40	-	20	20	-	-	0	0	-	0	55/52
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	333	-	-	333	-	-	0	0	-	0	10/8
98	20	-	20	-	-	-	0	0	-	0	-/-
03	100	-	-	100	-	-	0	0	-	0	9/10
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	-/-
03	40	-	20	20	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Mahonia repens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	120	-	20	100	-	-	0	0	-	0	-/-
03	140	-	-	140	-	-	0	0	-	0	3/6
Opuntia spp.											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	80	-	20	60	-	-	0	0	0	0	5/14
03	140	-	-	80	60	-	0	0	43	43	7/13
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	4/4
Pinus edulis											
85	133	-	133	-	-	-	0	0	-	0	-/-
91	133	-	133	-	-	-	0	0	-	0	-/-
98	60	-	60	-	-	-	0	0	-	0	-/-
03	100	-	60	40	-	20	0	0	-	0	-/-
Purshia tridentata											
85	4265	466	1266	2933	66	-	39	45	2	2	24/26
91	2599	66	333	1800	466	-	64	23	18	5	27/51
98	1540	180	200	1260	80	200	32	1	5	1	34/45
03	1360	-	120	1020	220	180	28	3	16	6	34/50
Quercus gambelii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	34/26
Symphoricarpos oreophilus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	160	-	-	160	-	-	13	0	-	0	12/25
03	260	-	120	140	-	20	38	0	-	0	22/43

Trend Study 22-11-03

Study site name: 'B' Hill.

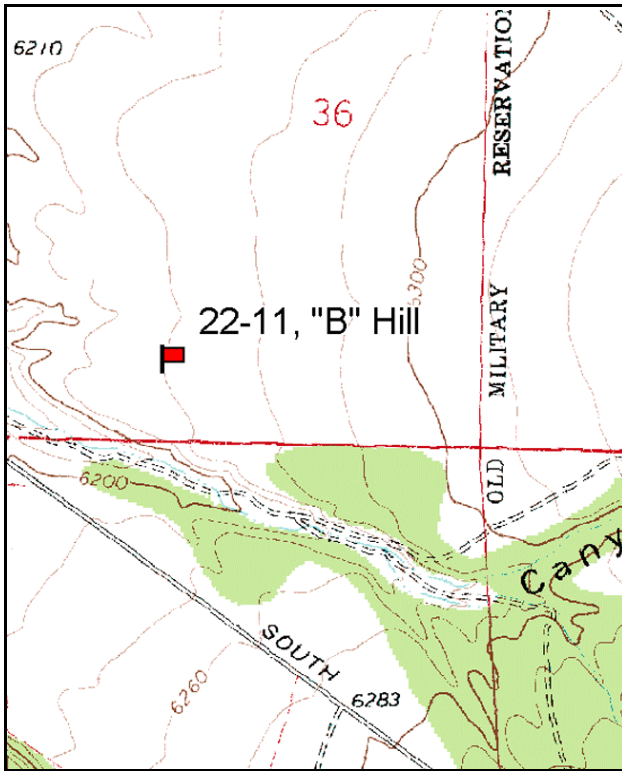
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

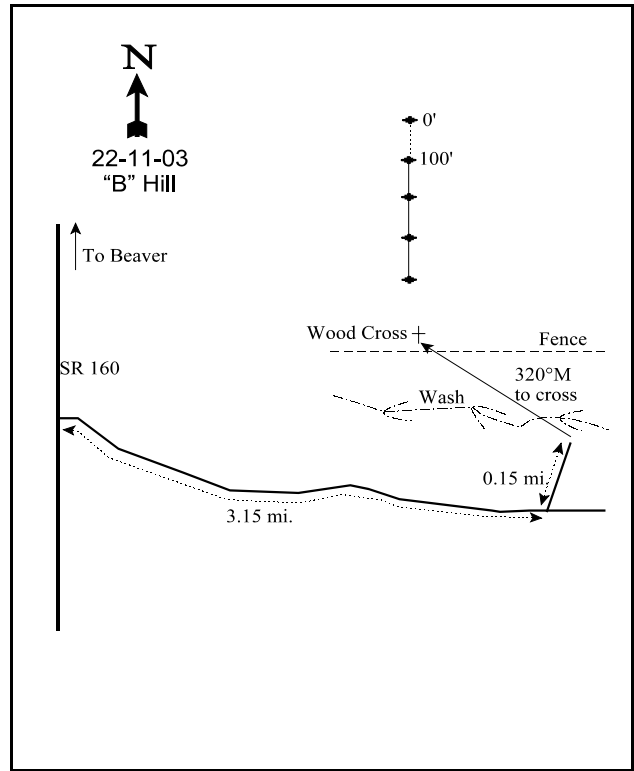
LOCATION DESCRIPTION

Starting from Beaver High School on Main Street, go south 1.6 miles. On the east side of the road there is a rock monument commemorating the "Lee's Ranch Indian Raid". Turn east at the monument onto South Creek Road. Go 3.15 miles up South Creek Road staying on the main road. Turn left and go down to the bottom of the wash where it meets another road. From this intersection, walk up the hill to the north at 320 degrees magnetic to the wooden cross braces. From the left wood post, go 100 feet at 15 degrees magnetic to the 400-foot stake. The study is marked by 2 ½ foot rebar that are 100 feet apart. The 0-foot baseline stake is marked by a short rebar tagged #7059.



Map Name: Kane Canyon

Township 29S, Range 7W, Section 36



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4233071 N, 360209 E

DISCUSSION

'B' Hill - Trend Study No. 22-11

This study is located on a section of DWR land which is part of the critical and limited deer winter range south of Beaver and east of I-15. Historically, deer concentrate here in the South Creek area during the winter with the accompanying problems of spring crop depredation and overuse on the range. The range type is sagebrush-grass. A pinyon-juniper eradication project and aerial seeding was done in 1959. Some locations were harrowed and drilled. The wash just to the south of the study area contains an open stand of Utah juniper and provides the only cover near the flat. The site is nearly level with only a slight slope to the west and an elevation of 6,200 feet. The DWR "B" Hill pellet group transect, which samples a slightly higher elevation area near the study site, averaged 53 deer days use/acre (131 ddu/ha) from 1980-1985 (Jense et al. 1985), and 55 deer days use/acre (136 ddu/ha) from 1986-1990 (Jense et al. 1991). The pellet transect was not read in 1992. From 1993-1997, deer use averaged 17 days use/acre (42 ddu/ha) (Evans et al. 1997). A pellet group transect read on the trend study site estimated 5 deer days use/acre and 13 cow days use/acre (12 ddu/ha and 32 cdu/ha) in 1998, and 14 deer and 4 cow days use/acre (35 ddu/ha and 9 cdu/ha) in 2003.

Due to the levelness of the terrain, runoff and the hazard of erosion is low. Soils were given a stable rating from an erosion condition class assessment completed in 2003. The soil surface and profile are very rocky and there are current signs of pedestalling around some of the plants. Soil analysis indicates a sandy clay loam texture with a neutral pH (7.1). Average effective rooting depth was estimated at just over 13 inches. Average soil temperature was estimated at 39.6°F at 14 inches in depth in 1998. Soil temperature averaged nearly 68°F in 2003 indicating a much drier soil profile due to drought conditions. Phosphorous levels in the soil profile measured only 4.6 ppm and may be limiting to vegetative development as 10 ppm is considered minimal for normal plant growth. There appears to be a hardpan about one foot below the surface. Bare ground has been quite high in all years and was estimated at 27% in 2003. Vegetation and litter cover are only fair on this site.

Wyoming big sagebrush is the key browse species on the site, although the population density is moderately low. Sagebrush density was estimated at 1,200 plants/acre in 1998 and 1,040 in 2003. The percentage of plants in poor vigor increased from 0% in 1985 and 1991 to 13% in 1998 and 15% in 2003. The growth form of Wyoming big sagebrush is somewhat stunted as evidenced by an average height of less than two feet. The decadence rate was fairly low in 1991 and 1998 at just over 20%, but increased to 40% in 2003. No decadent plants were sampled during the initial reading in 1985. The proportion of young plants in the population was high enough from 1985-1998 to replace the decadent, dying individuals. In 2003, recruitment by young plants declined to 4%, resulting in there being fewer young than the number of plants classified as decadent and dying. This may result in a slight decline in sagebrush numbers by the next reading. Utilization of big sagebrush was moderate in 1985 and 1991. In 1998 and 2003, the number of plants displaying heavy and moderate use increased. Annual sagebrush leader growth averaged 1.3 inches when the transect was read in June of 2003. There are a few Nevada ephedra and bitterbrush scattered around the site as well.

The most common grasses are crested wheatgrass and Russian wildrye. Crested wheatgrass has maintained a stable nested frequency value over all readings. While Russian wildrye declined between 1991 and 1998, but increased significantly between 1998 and 2003. Western wheatgrass, intermediate wheatgrass, and Indian ricegrass are also important species present on the site, but these occur in low densities. Sum of nested frequency for all perennial grasses remained stable between 1998 and 2003, although the value is lower in these years compared to the 1985 and 1991 surveys. Forbs are sparse and add very little in terms of forage production and ground cover on this site. Scarlet globemallow and heath aster had fair abundance in 1991, but both species have steadily declined since.

1985 APPARENT TREND ASSESSMENT

Soils appear stable due mostly to the relatively level terrain. The vegetative condition has the potential to improve if livestock grazing is eliminated for a few years. Increased enforcement of regulations and fence repairs should help curtail the trespass problems. There is a lack of diversity in the vegetative community, but competition with seeded species should keep annuals and other invaders from increasing. A rest from livestock grazing would allow the sagebrush and various grasses present to regain vigor, reproduce, and build up litter.

1991 TREND ASSESSMENT

The soil trend for the site is down even with the increase in basal vegetative cover. Litter cover has decreased to 20% and percent bare ground has doubled to 40%. There is only one key browse species present, Wyoming big sagebrush, which has demonstrated declining numbers, including fewer young, and increased decadence. Trend for browse is slightly down. The trend for both grasses and forbs is slightly up with increased nested frequency values.

TREND ASSESSMENT

soil - down (1)

browse - slightly down (2)

herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

The soil trend is slightly upward with a decrease in percent bare ground cover since 1991. Percent rock and pavement cover combined have declined as well. There are some signs of pedestalling, but the levelness of the site prevents excessive erosion from occurring. The browse trend is stable. Wyoming big sagebrush density has increased slightly since 1991, but still remains relatively low. Currently, it only accounts for 3% cover. Percent decadence has remained the same while the percentage of plants reported in poor vigor has increased to 13%. The herbaceous understory trend is downward. Perennial herbaceous understory sum of nested frequency is currently lower than what was reported in any other year. Grasses still dominate the site with individual species having shifted slightly in abundance over the years.

TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - down (1)

2003 TREND ASSESSMENT

Soil trend is stable. Bare ground remains high, but is stable at just under 30%. Litter and herbaceous vegetation cover both slightly declined in 2003, but the ratio of protective cover (vegetation, litter, and cryptogams) to bare ground remains the same as that in 1998. Trend for browse is slightly down. Wyoming big sagebrush declined in total density as well as the proportion of young. Percent decadence increased to 40%, and it is likely that the sagebrush population will continue to decline in the future because there are more decadent and dying plants in the population than young to replace them. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses is slightly lower than in 1998, but crested wheatgrass remained stable in 2003, and Russian wildrye increased.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 11

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	205	198	211	209	18.53	11.03
G	Agropyron intermedium	_a 4	_a 14	_b 37	_a 3	.38	.15
G	Agropyron smithii	_b 88	_c 140	_a 40	_a 36	.53	.33
G	Aristida purpurea	-	3	-	-	-	-
G	Bromus tectorum (a)	-	-	15	2	.45	.00
G	Elymus junceus	_b 152	_b 168	_a 96	_{ab} 126	3.58	6.71
G	Oryzopsis hymenoides	26	28	14	11	.58	.45
G	Poa fendleriana	7	-	4	-	.03	-
G	Sitanion hystrix	-	-	2	-	.00	-
G	Stipa comata	3	7	4	6	.18	.31
Total for Annual Grasses		0	0	15	2	0.45	0.00
Total for Perennial Grasses		485	558	408	391	23.84	18.98
Total for Grasses		485	558	423	393	24.29	18.98
F	Astragalus ciliaris	_b 11	_{ab} 2	_b 8	_a -	.13	-
F	Cryptantha spp.	2	2	-	-	-	-
F	Cymopterus spp.	-	-	1	-	.00	-
F	Descurainia pinnata (a)	-	-	-	5	-	.04
F	Gilia spp. (a)	-	-	-	1	-	.00
F	Leucelene ericoides	_a 33	_b 66	_a 30	_a 13	.29	.11
F	Orobancha fasciculata	-	-	1	-	.00	-
F	Phlox longifolia	_a -	_b 12	_{ab} 3	_a -	.01	-
F	Ranunculus testiculatus (a)	-	-	_b 16	_a 2	.03	.00
F	Schoenocrambe linifolia	-	-	2	-	.00	-
F	Sisymbrium altissimum (a)	-	-	2	2	.03	.00
F	Sphaeralcea coccinea	_b 131	_b 131	_a 57	_a 47	.41	.33
Total for Annual Forbs		0	0	18	10	0.06	0.05
Total for Perennial Forbs		177	213	102	60	0.86	0.44
Total for Forbs		177	213	120	70	0.92	0.50

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

BROWSE TRENDS --

Management unit 22 , Study no: 11

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	44	38	3.05	3.05
B	Ephedra nevadensis	0	1	-	.03
B	Gutierrezia sarothrae	4	0	.03	-
B	Opuntia spp.	0	1	-	-
Total for Browse		48	40	3.08	3.08

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 11

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	2.28
Opuntia spp.	.01

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 11

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.3

BASIC COVER --

Management unit 22 , Study no: 11

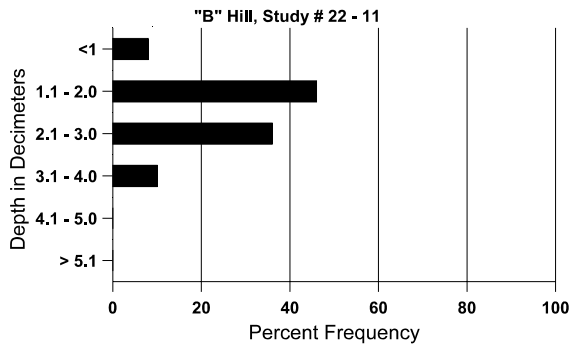
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	8.25	14.50	36.55	23.72
Rock	3.50	2.75	6.62	5.07
Pavement	34.00	22.00	12.07	32.39
Litter	34.50	19.50	22.30	18.14
Cryptogams	0	1.50	7.95	1.96
Bare Ground	19.75	39.75	29.41	27.14

SOIL ANALYSIS DATA --

Management unit 22, Study no: 11, Study Name: "B" Hill

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
13.3	67.6 (12.1)	7.1	52.0	23.4	24.6	1.9	4.6	211.2	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 22, Study no: 11

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	16	10	-	-
Deer	15	8	5 (12)	14 (35)
Cattle	2	1	13 (32)	4 (9)

BROWSE CHARACTERISTICS --

Management unit 22, Study no: 11

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	933	-	133	800	-	-	71	7	0	0	20/22
91	866	-	66	600	200	-	69	8	23	0	24/27
98	1200	20	240	700	260	40	13	18	22	13	18/31
03	1040	-	40	580	420	80	31	35	40	15	21/29
Ephedra nevadensis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	11/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	120	-	20	100	-	-	0	0	-	0	8/9
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	3/2
<i>Purshia tridentata</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	28/57

Trend Study 22-12-03

Study site name: Big Cedar Cove.

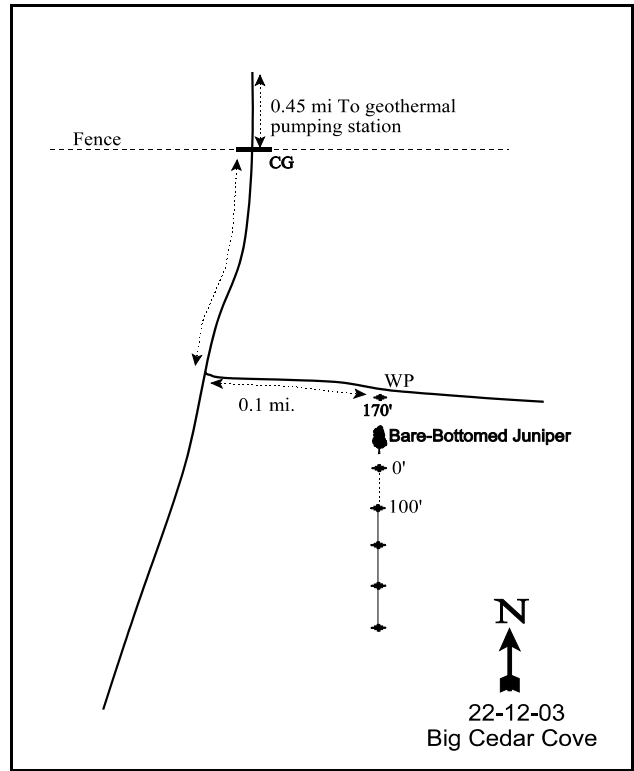
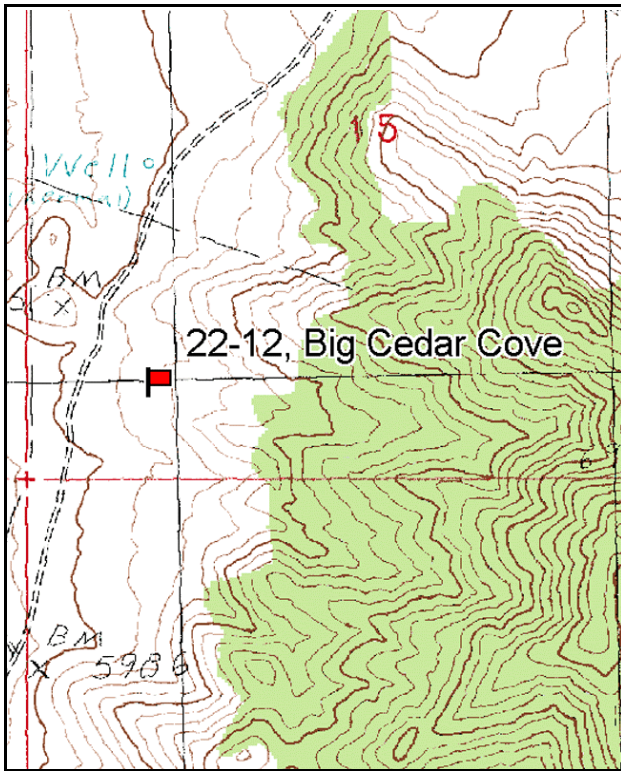
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From mile marker 4 on SR257 north of Milford, go 0.4 miles north. Turn right at Roosevelt Hot Springs Road (Blundell Geothermal Plant) and drive 2.65 miles to a major fork. Continue straight and go 5.0 miles. Just across the cattleguards turn right and go 1.0 miles to a 4-way fork. Turn right and continue 0.45 miles (past Phillips Oil well-head on the right) to another cattleguard. Go another 0.20 miles to a junction. Turn left and drive 0.1 miles. Stop here. The transect starts 170 feet south of the road beside a highlined juniper tree. The 0-foot baseline stake is a steel rebar three feet tall with a browse tag #7079 attached.



Map Name: Bearskin Mountain

Diagrammatic Sketch

Township 27S, Range 9W, Section 15

GPS: NAD 27, UTM 12S 4257958 N, 337935 E

DISCUSSION

Big Cedar Cove - Trend Study No. 22-12

This trend study is located on the sagebrush-grass range that covers the gentle slopes of the foothills on the west side of the Mineral Mountains. The site slopes (9%) to the southwest at an elevation of 6,000 feet. The site, along with most of the land on the Mineral Mountains, is administered by the BLM. The area is grazed by cattle in the spring, but the scarcity of water may limit use. Deer use on the site was light in both 1998 and 2003 at an estimated 12 days use/acre (30 ddu/ha) and 27 days use/acre (66 ddu/ha) respectively. Livestock use was also light in both years at 6 cow days use/acre (15 cdu/ha) in 1998, and 4 cow days use/acre (10 cdu/ha) in 2003. Light use of the site by antelope and wild horses is also likely. A geothermal plant is located nearby and has the potential to impact deer in the area through habitat loss and increased disturbance and human activity.

Soil analysis indicates a sandy loam texture with a neutral pH (6.7). The soil is relatively deep and coarse with nearly half of the soil surface covered with pavement and rocks. Effective rooting depth was estimated at 19 inches in 1998. Average soil temperature was estimated at 45.4°F at 17 inches in depth in 1998, and 62.8°F at 11 inches in depth. Higher soil temperatures in 2003 were mostly the result of less moisture in the soil profile due to drier conditions than in 1998. Vegetative growth may be limited due to relatively low amounts of phosphorous (7.5 ppm). Pedestalling is moderate around the bunchgrasses and shrubs. In 1998, the soil was said to be slightly eroding as it showed signs of sheet erosion. Soils were given a stable rating from an erosion condition class assessment completed on site in 2003.

A dense stand of Wyoming big sagebrush dominates the site. Density was estimated at about 4,000 plants/acre in 1985 and 1991, but slightly lower in 1998 and 2003 at around 3,400 plants/acre. The number of young in the population has declined with each reading, with no young being sampled in 2003. Percent decadence has been moderate to high in all readings ranging from about 35% in 1985 and 1998 to just over 50% in 1991 and 2003. The number of decadent plants classified as dying was high in both 1991 (~1,600 plants/acre) and 2003 (~840 plants/acre). With no young being sampled in 2003, the sagebrush population will likely show some losses by the next reading. Utilization on sagebrush was moderate in 1985 and 1991, but mostly light in 1998 and 2003. Sagebrush vigor was good in 1985 and 1998, but plants displaying poor vigor increased to 39% of the population in 1991 and 25% in 2003. Both of these readings, coincidentally occurred during drought years. Average growth of annual sagebrush leaders was estimated at 1.3 inches in June of 2003. Ephedra occurs on the site but provides only a small portion of the browse cover. Ephedra density was estimated at 320 plants/acre in 1998 and 200 plants/acre in 2003. The difference in density between years was due to the loss of most of the young age class in 2003. Ephedra has been moderate to heavily hedged in all surveys.

The shrub interspaces are occupied by various increasers such as narrowleaf low rabbitbrush, broom snakeweed, prickly phlox, and young pinyon pine. Broom snakeweed density was estimated at 10,080 plants/acre in 1998, but decreased by 50% in 2003. Snakeweed often declines during dry weather cycles as was the case in 2003. Pinyon and juniper are slowly increasing on the site. Point-center quarter data estimated 39 pinyon and 16 Utah juniper trees/acre in 1991, 54 pinyon and 19 Utah juniper trees/acre in 1998, and 68 pinyon and 21 juniper trees/acre in 2003.

Grasses are the dominant component in the understory. Perennial grasses occur mainly under the protection of sagebrush crowns. Sandberg bluegrass has been the most abundant perennial grass in all readings with galleta, bottlebrush squirreltail, purple three-awn, and needle-and-thread grass occurring in lower numbers. Cheatgrass was the most abundant of all the herbaceous species in 1998 and 2003. Even with drought conditions in 2003, cheatgrass maintained nearly stable frequency and cover values. Although abundant, most cheatgrass plants on this site are small statured resulting in only a moderate fire hazard. Cheatgrass

contributed 13% of the total vegetation cover on the site in 1998 and 2003. Forbs are scarce, and provide very little ground cover or forage on the site.

1985 APPARENT TREND ASSESSMENT

All of the soil trend parameters indicate a stable condition. Vegetative trend may be slowly declining as the populations of various undesirable plants, including pinyon pine and cheatgrass seem to be on the increase.

1991 TREND ASSESSMENT

The soil trend is slightly down due to litter cover decreasing by 18% and bare ground increasing by over 50%. The key browse species, Wyoming big sagebrush, shows only a slight increase in population (3%), a decreased reproductive potential, and increased decadence. Plants with poor vigor have increased to 39%. These factors all indicate a slightly downward trend. The trend for grasses and forbs are up due to increased nested frequency values, but it is still in very poor condition, especially for the forbs.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - up (5)

1998 TREND ASSESSMENT

The soil trend continues to be slightly downward with a slight increase in percent bare ground, rock, and pavement cover. Due to a recent rainstorm in 1998, cryptogams were more easily identified and common, including mosses, lichens, and mushrooms. The browse trend is considered stable. The Wyoming big sagebrush population still exhibits relatively high percent decadence, but appears to be recovering from poor conditions reported in 1991. The decline in young plants is cause for concern. Although the broom snakeweed density has greatly increased, these are small plants and provide very little cover to the site. Broom snakeweed density can fluctuate highly depending on precipitation patterns, and this population will likely show great increases and decreases in the future. The herbaceous understory trend is stable. The perennial herbaceous understory sum of nested frequency has changed very little since 1991.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Soil trend is stable. Average cover of litter and bare ground declined in 2003 while vegetation cover remains moderate. Erosion is low. Trend for browse is slightly down. Wyoming big sagebrush has a stable density, but no young were sampled in 2003 and percent decadence and poor vigor increased. Also, almost half of the decadent age class was classified as dying which may result in a lower population by the next reading. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses slightly declined, but perennial forbs increased.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 12

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Aristida purpurea</i>	13	17	19	17	.66	.31
G	<i>Bromus tectorum</i> (a)	-	-	_b 308	_a 284	4.59	4.50
G	<i>Hilaria jamesii</i>	56	61	65	42	1.18	.31
G	<i>Oryzopsis hymenoides</i>	-	4	5	3	.19	.06
G	<i>Poa secunda</i>	_a 68	_b 116	_b 137	_b 140	3.09	2.23
G	<i>Sitanion hystrix</i>	41	75	68	75	1.93	2.40
G	<i>Stipa comata</i>	11	29	14	9	.16	.18
Total for Annual Grasses		0	0	308	284	4.59	4.50
Total for Perennial Grasses		189	302	308	286	7.22	5.52
Total for Grasses		189	302	616	570	11.81	10.02
F	<i>Agoseris glauca</i>	3	7	-	4	-	.01
F	<i>Alyssum alyssoides</i> (a)	-	-	-	6	-	.01
F	<i>Arabis demissa</i>	2	-	2	-	.00	-
F	<i>Astragalus</i> spp.	-	4	7	-	.06	-
F	<i>Castilleja chromosa</i>	-	-	3	-	.03	-
F	<i>Calochortus nuttallii</i>	1	5	1	-	.00	-
F	<i>Crepis</i> spp.	-	4	-	-	-	-
F	<i>Delphinium nuttallianum</i>	-	5	-	-	-	-
F	<i>Draba</i> spp. (a)	-	-	-	11	-	.02
F	<i>Erigeron pumilus</i>	3	5	10	-	.59	-
F	<i>Gilia</i> spp. (a)	-	-	_a -	_b 26	-	.09
F	<i>Lomatium</i> spp.	-	1	2	-	.01	-
F	<i>Lupinus argenteus</i>	-	-	1	-	.00	-
F	<i>Microsteris gracilis</i> (a)	-	-	1	-	.00	-
F	<i>Navarretia intertexta</i> (a)	-	-	12	27	.05	.08
F	<i>Phlox longifolia</i>	_a -	_b 31	_b 23	_a 9	.11	.01
F	<i>Phlox</i> spp.	-	-	_a -	_b 87	-	.47
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	3	-	.00
F	<i>Sphaeralcea coccinea</i>	-	-	-	-	.00	-
F	<i>Zigadenus paniculatus</i>	3	-	-	-	-	-
Total for Annual Forbs		0	0	13	73	0.05	0.21
Total for Perennial Forbs		12	62	49	100	0.83	0.49
Total for Forbs		12	62	62	173	0.89	0.71

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

BROWSE TRENDS --

Management unit 22 , Study no: 12

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	1	0	-	-
B	Artemisia tridentata wyomingensis	87	87	16.49	14.27
B	Chrysothamnus viscidiflorus stenophyllus	36	36	1.00	1.76
B	Ephedra nevadensis	7	8	.74	1.72
B	Gutierrezia sarothrae	61	52	3.37	3.38
B	Juniperus osteosperma	1	0	-	-
B	Leptodactylon pungens	1	6	-	-
B	Opuntia spp.	7	6	-	-
B	Pinus edulis	3	4	.58	1.56
B	Ribes cereum cereum	1	0	-	-
Total for Browse		205	199	22.21	22.70

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 12

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	16.78
Chrysothamnus viscidiflorus stenophyllus	1.14
Ephedra nevadensis	1.25
Gutierrezia sarothrae	4.46
Juniperus osteosperma	.03
Opuntia spp.	.13
Pinus edulis	.73

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 12

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.3

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 12

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	19	21
Pinus edulis	54	68

Average diameter (in)	
'98	'03
4.7	5.7
2.7	1.7

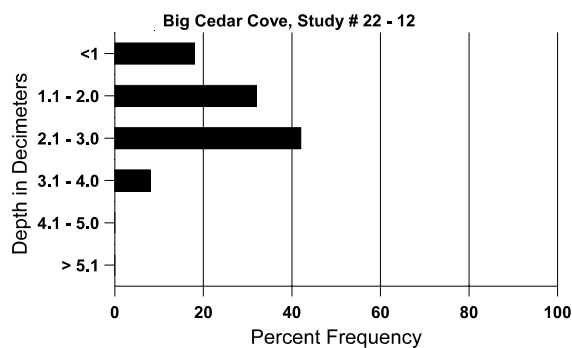
BASIC COVER --
Management unit 22 , Study no: 12

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.00	6.00	31.45	34.36
Rock	2.00	3.25	5.42	2.76
Pavement	37.50	35.75	43.72	42.49
Litter	51.25	42.25	36.46	22.28
Cryptogams	0	0	1.37	.29
Bare Ground	6.25	12.75	13.13	8.24

SOIL ANALYSIS DATA --
Management unit 22, Study no: 12, Study Name: Big Cedar Cove

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
18.8	62.8 (10.5)	6.7	62.7	20.7	16.6	1.8	7.5	96.0	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 22 , Study no: 12

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	28	21	-	-
Deer	21	9	12 (30)	27 (66)
Cattle	1	2	6 (15)	4 (11)

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 12

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Artemisia tridentata wyomingensis</i>											
85	3999	133	866	1733	1400	-	63	12	35	0	21/26
91	4132	-	666	1266	2200	-	65	15	53	39	17/20
98	3480	100	40	2140	1300	600	30	2	37	11	22/34
03	3420	-	-	1640	1780	440	18	.58	52	25	21/34
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	1799	-	133	1000	666	-	37	0	37	15	8/10
91	1466	-	66	600	800	-	23	5	55	50	9/11
98	900	-	-	800	100	20	0	0	11	7	11/18
03	900	-	-	740	160	-	0	0	18	7	11/17
<i>Ephedra nevadensis</i>											
85	266	-	66	200	-	-	100	0	0	0	15/11
91	532	-	266	266	-	-	100	0	0	0	15/14
98	320	40	160	140	20	-	44	25	6	25	20/27
03	200	20	20	160	20	-	50	20	10	10	22/34
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	533	-	133	200	200	-	0	0	38	63	9/7
98	10080	160	2000	8000	80	80	0	0	1	.39	8/9
03	5040	20	-	4320	720	1040	0	0	14	21	11/16

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Juniperus osteosperma											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Leptodactylon pungens											
85	66	-	-	66	-	-	0	0	-	0	9/5
91	200	-	-	200	-	-	0	0	-	0	7/5
98	20	-	20	-	-	-	0	0	-	0	9/10
03	160	-	-	160	-	-	25	0	-	0	7/5
Mahonia repens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	6/11
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	140	-	-	140	-	-	0	0	-	0	6/10
03	140	-	-	140	-	-	0	0	-	0	6/18
Pinus edulis											
85	66	-	-	66	-	-	0	0	-	0	69/71
91	66	-	-	66	-	-	0	0	-	0	116/75
98	60	-	40	20	-	-	0	0	-	0	-/-
03	80	-	80	-	-	-	0	0	-	0	-/-
Ribes cereum cereum											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	120	-	-	120	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 22-13-03

Study site name: Minersville Reservoir .

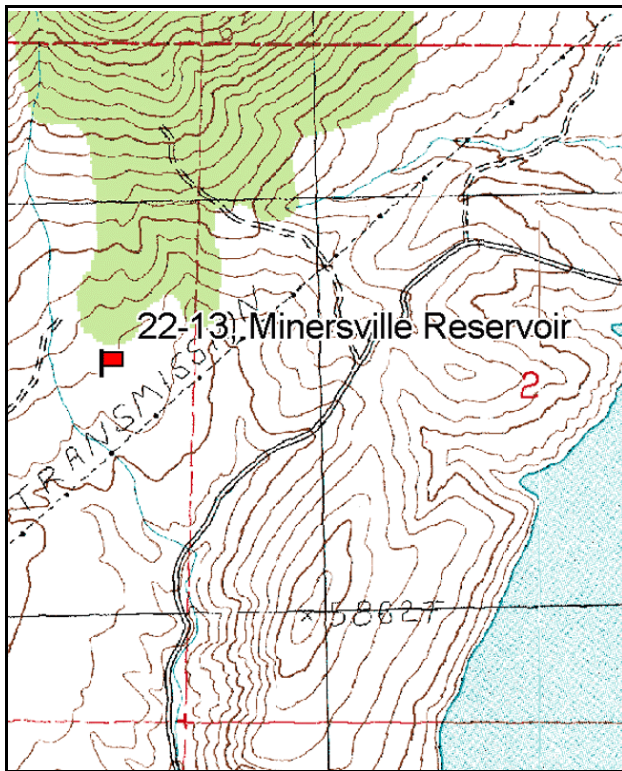
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 172 degrees magnetic.

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

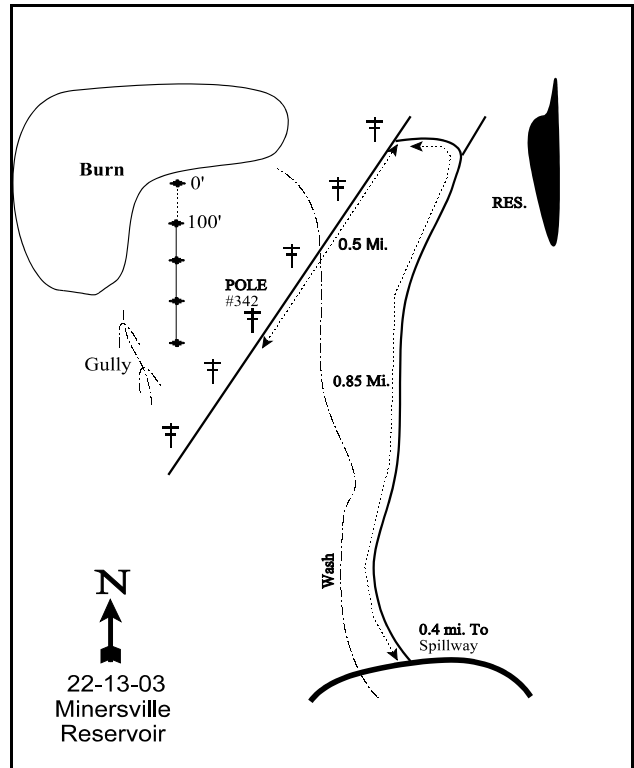
LOCATION DESCRIPTION

From Beaver go west on SR 21 to Minersville Reservoir. From the Minersville Reservoir sign south of the reservoir, drive 1.35 miles further west on SR 21 to an intersection with a dirt road. Turn right and go 0.85 miles. Take a left onto the road that takes you under the powerlines. Go 0.4 miles down across a wash and up a small hill to powerpole #342 (single pole). From the pole, the 0' stake is ~600 feet at 317 degrees magnetic. The 0-foot baseline stake is marked by browse tag #7185. The 0', 100' and 200' stakes are rebar; the 300' and 400' stakes are green, half-high fenceposts.



Map Name: Minersville

Township 30S, Range 9W, Section 3



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4232572 N, 338474 E

DISCUSSION

Minersville Reservoir - Trend Study No. 22-13

This study was established to monitor trend on a small area of critical deer winter range located about 3/4 of a mile west of Minersville Reservoir. The site slopes (percent slope 6-8%) to the south-southeast at an elevation of 5,700 feet. Historically, the site sampled an open sagebrush flat with scattered Utah juniper. However, the site burned in 1998 right after it was surveyed that summer. Following the burn, the site was aerially seeded and smooth-chained to cover the seed in October of 1998. The seed mix consisted of 9 grass and 4 forb species including several wheatgrass species, Indian ricegrass, small burnet, alfalfa, Lewis flax, and Palmer penstemon. A second aerial seeding was done in February 1999 which included 2 crested wheatgrass varieties, forage kochia, and Wyoming big sagebrush. Some kochia has established in the area but none was sampled on the trend study site. Use by both livestock and mule deer was reported to be moderate in 1985. In 1991, 17 deer days use/acre (42 ddu/ha) was determined with little sign of livestock being observed. Abundant coyote sign was observed in both years. A pellet group transect read on site in 1998 estimated 62 deer days use/acre (153 ddu/ha) and 3 cow days use/acre (8 cdu/ha). Data from 2003 estimated 9 deer days use/acre (23 ddu/ha) and 20 cow days use/acre (50 cdu/ha). Decreasing deer use in 2003 is not surprising with the loss of most of the Wyoming big sagebrush population following the fire. Prior to the burn, thermal and escape cover were provided by dense junipers on the hillside north of the study site. Following the burn, only a few pockets of unburned trees remain in the area.

Soil analysis indicates a sandy clay loam texture with a slightly acidic pH (6.3). A caliche layer occurs at a depth of about 10-12 inches. Effective rooting depth averaged 11 inches in 1998. Average soil temperature was estimated at 65.6°F at 10 inches in 1998 and 67°F in 2003. Ground cover characteristics showed significant changes between 1998 and 2003. These changes are the result of the burn as well as very dry conditions in 2002 and 2003. The biggest change on the soil surface following the burn was the loss of litter cover and the corresponding increase in bare ground. Vegetation cover also declined in 2003 but not to the same magnitude as litter. Prior to the burn, some signs of erosion were apparent, but erosion did not appear to be accelerated. In 2003, soils were rated as stable from an erosion condition class assessment. There are some moderately large active gullies near the site. The main factor limiting vegetative growth is the low amount of annual precipitation (10 to 12 inches) caused by the rain shadow effect of mountain ranges to the east and west.

Wyoming big sagebrush was the key species prior to the 2003 survey. The sagebrush population was moderately dense, but had low reproduction and high decadence. The pre-burn sagebrush population displayed mostly light use. In 2003, only 2 Wyoming big sagebrush plants were sampled on the site resulting in an estimated population density of only 40 plants/acre. Sagebrush density will likely remain very low on the site as no young were sampled in 2003. A few scattered fourwing saltbush and ephedra were also sampled on the site in 2003.

At the time of the 1998 survey, the understory consisted almost exclusively of grasses. In 1998, cheatgrass provided 2/3 of the grass cover and was said to provide enough fine fuels to carry a very destructive fire which would wipe out the Wyoming big sagebrush population. This statement was obviously realized as the site burned only a few weeks after the transect was read in 1998. Cheatgrass significantly declined in nested frequency and average cover on the site in 2003 likely due to the dry conditions prior to sampling. Before the site burned, the most abundant perennial grasses were warm season species including purple three-awn, galleta, and blue grama. These species were again sampled after the burn in 2003, as well as several others including crested and intermediate wheatgrass, Indian ricegrass, bottlebrush squirreltail, sand dropseed, and Russian wildrye. Sum of nested frequency for perennial grasses declined between 1991 and 1998, but increased between 1998 and 2003. Forbs have been sparse in all readings. Alfalfa was sampled in 3 quadrats in 2003 as it was seeded on the site as part of the post-burn rehabilitation. An annual *Gilia* was the most

abundant forb in 2003.

1985 APPARENT TREND ASSESSMENT

The vegetative trend appears to be declining. There is very little regeneration of the sagebrush, while junipers appear to be slowly invading the site. This area is generally not considered suitable for treatment and seeding because of the rocky soil surface and low precipitation. The soil trend appears stable.

1991 TREND ASSESSMENT

The soil trend is down with a 75% decrease in vegetative basal cover and a 38% increase in bare ground. The trend for the key browse species, Wyoming big sagebrush, appears stable. Density increased by 8%, but decadence remains high and slightly increased to 45%. Twenty-three percent of the population displays poor vigor. Even though the reproductive potential increased due to the number of seedlings counted in 1991, no young sagebrush were encountered and it is not known how many of the seedlings will survive. Grass and forb trend is improving due to increased nested frequencies, but it still is considered in very poor condition.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - slightly up (4)

1998 TREND ASSESSMENT

The soil trend is down with increased bare ground and a decline in rock and pavement. This indicates that some soil movement may have occurred on the site. Litter cover also declined in 1998. The browse trend is down. Decadence in the Wyoming big sagebrush population continues to increase (51%) and the number of young in the population is not enough to replace the decadent, dying individuals. Population density of sagebrush declined by 31%. The herbaceous understory trend is slightly downward. Cheatgrass is the dominate grass and constitutes a great fire hazard which could ultimately cause the loss of the Wyoming big sagebrush. Also, sum of nested frequency of perennials has declined from 272 in 1991 to 208 in 1998.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Trend for soil is down. Litter cover is less than half of the amount sampled in 1998, and bare ground doubled. Vegetation cover also declined in 2003. These changes are the result of the burn as well as dry conditions in 2003. The result of these changes is that the soil surface has less protection and erosion potential has increased. Trend for browse is down. Wyoming big sagebrush was the key browse on the site but density has declined by 99% following the burn. No young plants were sampled in 2003 and so a short recovery period is not likely. Trend for the herbaceous understory is slightly up. The seeding treatment added several perennial species to the community including crested and intermediate wheatgrass, and alfalfa. These species are not highly abundant, but they provide valuable forage and soil stability values to the site. Native warm season grasses remain the most abundant species on the site, and forbs are still scarce.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 13

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	a-	a-	a-	b32	-	1.04
G	Agropyron intermedium	a-	a-	a-	b32	-	1.10
G	Agropyron spicatum	-	-	-	-	-	.01
G	Aristida purpurea	56	59	33	37	1.61	1.17
G	Bouteloua gracilis	a-	b16	b19	ab12	.29	.21
G	Bromus inermis	-	-	-	1	-	.04
G	Bromus tectorum (a)	-	-	b356	a62	15.16	.44
G	Elymus junceus	-	-	-	7	-	.38
G	Hilaria jamesii	c138	ab90	a72	bc109	2.92	8.55
G	Oryzopsis hymenoides	-	2	11	2	.32	.07
G	Sitanion hystrix	a34	b76	b65	a11	1.95	.52
G	Sporobolus cryptandrus	a-	a-	a-	b16	-	.66
G	Vulpia octoflora (a)	-	-	a-	b8	-	.05
Total for Annual Grasses		0	0	356	70	15.16	0.49
Total for Perennial Grasses		228	243	200	259	7.10	13.77
Total for Grasses		228	243	556	329	22.27	14.26
F	Alyssum alyssoides (a)	-	-	1	-	.00	-
F	Calochortus nuttallii	a1	a5	a6	b18	.01	.07
F	Eriogonum cernuum (a)	-	-	-	2	-	.06
F	Gilia spp. (a)	-	-	a-	b108	-	4.85
F	Leucelene ericoides	-	-	-	14	-	.60
F	Medicago sativa	-	-	-	6	-	.05
F	Phlox longifolia	a3	b23	a2	a2	.01	.01
F	Salsola iberica (a)	-	-	-	4	-	.01
F	Sisymbrium altissimum (a)	-	-	-	2	-	.03
F	Sphaeralcea coccinea	-	1	-	6	-	.30
F	Unknown forb-perennial	3	-	-	6	-	.30
Total for Annual Forbs		0	0	1	116	0.00	4.95
Total for Perennial Forbs		7	29	8	52	0.01	1.34
Total for Forbs		7	29	9	168	0.02	6.30

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

BROWSE TRENDS --

Management unit 22 , Study no: 13

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
		B	Artemisia tridentata wyomingensis	81	2
B	Chrysothamnus viscidiflorus stenophyllus	2	0	-	-
B	Ephedra nevadensis	0	1	.00	.15
B	Juniperus osteosperma	1	0	.06	-
B	Opuntia spp.	2	0	.03	-
B	Pinus edulis	0	0	.38	-
Total for Browse		86	3	9.31	0.15

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 13

Species	Percent Cover	
	'98	'03
Ephedra nevadensis	-	.20
Juniperus osteosperma	.80	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 13

Species	Average leader growth (in)
	'03
Atriplex canescens	8.9
Artemisia tridentata wyomingensis	1.7

POINT-QUARTER TREE DATA --

Management unit 22 , Study no: 13

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	15	0
Pinus edulis	8	0

Average diameter (in)	
'98	'03
3.1	-
3.4	-

BASIC COVER --

Management unit 22 , Study no: 13

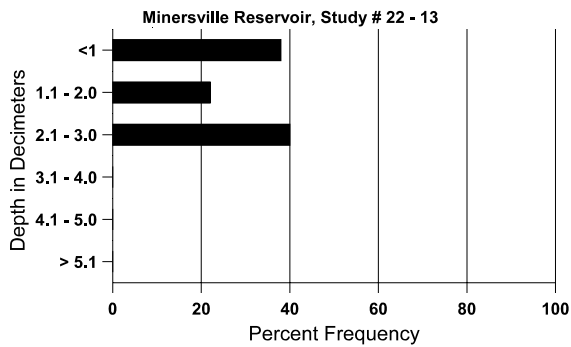
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	8.00	1.75	30.53	20.13
Rock	7.00	12.00	11.05	17.53
Pavement	45.50	31.25	25.52	17.97
Litter	31.75	41.75	34.77	14.30
Cryptogams	0	0	.01	0
Bare Ground	7.75	13.25	18.45	36.10

SOIL ANALYSIS DATA --

Management unit 22, Study no: 13, Study Name: Minersville Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.3	67.0 (11.3)	6.3	54.0	21.4	24.6	1.0	7.1	121.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 13

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	13	5	-	-
Horse	-	3	-	5 (13)
Elk	-	1	-	-
Deer	36	6	62 (153)	9 (23)
Cattle	1	7	3 (7)	20 (50)

BROWSE CHARACTERISTICS --
 Management unit 22 , Study no: 13

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	3665	-	66	2066	1533	-	15	2	42	0	26/26
91	4000	533	-	2200	1800	-	15	3	45	23	24/25
98	2780	20	140	1220	1420	1040	17	0	51	14	24/31
03	40	-	-	40	-	-	0	50	0	0	9/8
<i>Atriplex canescens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	28/36
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	133	-	-	133	-	-	0	50	-	0	8/7
98	40	-	-	40	-	-	0	0	-	0	13/19
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Echinocereus engelmannii</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	5/7
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Ephedra nevadensis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	13/16
<i>Gutierrezia sarothrae</i>											
85	133	-	-	-	133	-	0	0	100	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	13/23
<i>Juniperus osteosperma</i>											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	100	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	6/11
03	0	-	-	-	-	-	0	0	-	0	8/19

Trend Study 22-14-03

Study site name: Antelope Mountain .

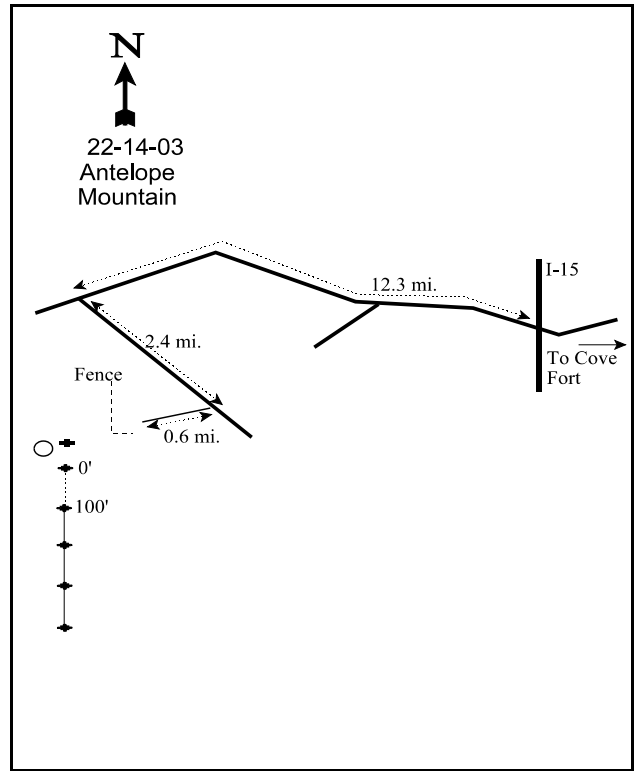
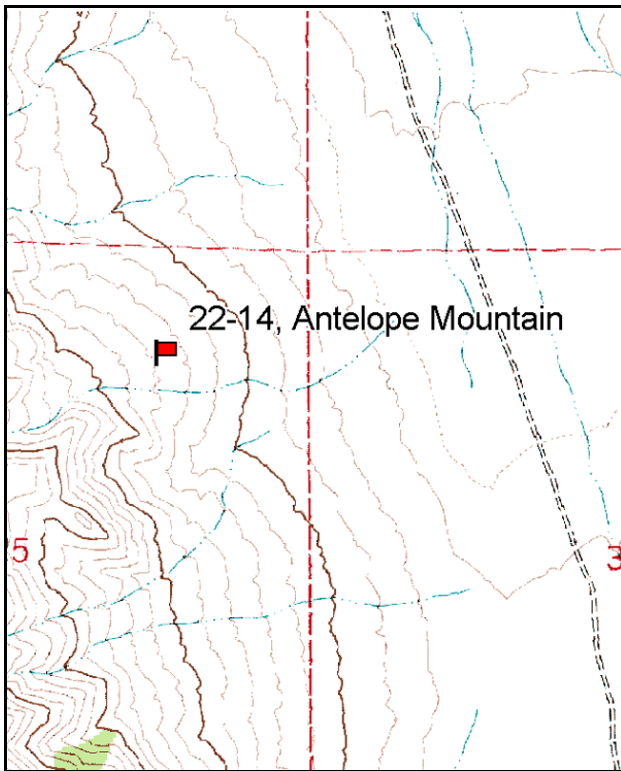
Vegetation type: Burned seeded grass .

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the Cove Fort exit on I-15 (a few miles north of the Junction with I-70), proceed 12.3 miles west on a gravel road staying right at one major fork. Turn left at the intersection and continue for 2.4 miles to the southwest corner of a fence. Turn right and go 0.6 miles up this faint road. This road no longer exists. Take a bearing of 233 degrees magnetic from the old fence corner to the site. Then walk or drive off road to a witness post near a large rock. The 0-foot frequency baseline stake is 20 feet east of this rock. The baseline is marked by steel rebar posts.



Map Name: Pinnacle Pass

Diagrammatic Sketch

Township 25S, Range 9W, Section 25

GPS: NAD 27, UTM 12S 4275150 N, 342436 E

DISCUSSION

Antelope Mountain - Trend Study No. 22-14

This study is located on the northeast end of the Mineral Mountains. The transect was placed on a moderately steep (20-25%) alluvial fan that slopes to the east at an elevation of 5,700 feet. When the study was established in 1985, the range type was big sagebrush-grass. A fire burned the entire area in 1996 and the site was then seeded and chained. At the time of the 1991 sampling, there was little sign of recent livestock use and winter deer use was light at an estimated 14 days use/acre (35 ddu/ha). Two antler drops from mature bucks were found on the site, but use appeared to be more concentrated a few hundred yards up slope at the head of a large draw. After the fire, a pellet group transect read on site in 1998 estimated 13 deer days use/acre (32 ddu/ha) and 6 cow days use/acre (15 cdu/ha). In 2003, the pellet group transect estimated 39 elk, 5 deer, and 25 cow days use/acre (96 edu/ha, 12 ddu/ha, and 61 cdu/ha). This site has more value for elk than deer due to the loss of the browse component following the 1996 fire.

Soil analysis indicates texture to be a loam, clay loam with a neutral pH (7.1). Soil depth is moderate and pale brown in color. The effective rooting depth was estimated at 13 inches in 1998, and average soil temperature was 41°F measured at a depth of 13 inches. Soil temperature was much higher in 2003 averaging 68°F at 10 inches in depth. Higher soil temperatures in 2003 are a reflection of drought conditions and a dry soil profile. Vegetative growth may be limited due to a low amount of phosphorous (6.0 ppm) in the soil, where 10 ppm is considered minimal for normal plant development. This soil type is excessively drained and is further limited by a low water-holding capacity. Permeability is rapid and the hazard of erosion is moderate. An erosion condition class assessment completed in 2003 rated soils as stable. After the fire, percent bare ground cover increased to 19% and the combined percent cover from rock and pavement increased to 61%. Bare ground declined to less than 3% average cover in 2003, and rock and pavement cover declined as well.

Prior to the fire in 1996, mountain big sagebrush was the dominant species with the majority being lightly to moderately hedged and fairly vigorous mature plants. Thirty-five percent of the population was classified as decadent in 1985, while only 6% were categorized as young. In 1991, the population dropped 21% with young plants accounting for only 4% of the population and percent decadence increasing to 59%. No mountain big sagebrush plants were sampled in 1998 or 2003 following the burn. As stated above, this site now has more value for elk and livestock due to the dominate herbaceous component and lack of browse for wintering deer. Broom snakeweed was the most abundant browse on the site in 1998 and 2003 with an estimated density of about 1,000 plants/acre in both years. Broom snakeweed exhibited abundant seed heads in 1998, but seedling and young plants were few in 1998 and 2003. A few cliffrose were found around the site in previous years, but these were no longer there in 1998 or 2003. A few tipped over juniper skeletons are still present on the site, but it appears most trees were consumed in the burn.

Prior to the fire, Sandberg bluegrass, galleta, and bluebunch wheatgrass were the most abundant herbaceous species on the site. Following the burn and the associated rehabilitation efforts, the dominant species on the site in 1998 were crested wheatgrass and intermediate wheatgrass. Bluebunch wheatgrass and galleta remained in moderate densities. In 2003, both crested and intermediate wheatgrass significantly declined in nested frequency, while bluebunch wheatgrass and galleta remained stable. Sandberg bluegrass had the highest nested frequency value in 2003 as is significantly increased from a value of 9 in 1998 to 180 in 2003. Cheatgrass was present on the site in 1998, but wasn't a major contributor in the understory. In 2003 however, cheatgrass became the dominant herbaceous species as it provided 40% of the total vegetation cover on the site and was sampled in 98 of the 100 quadrats. Forbs continue to be quite sparse. In 1998, alfalfa, pale alyssum, Utah locoweed, and storksbill were the most abundant forbs. Overall, grass utilization was light although some intermediate wheatgrass did exhibit heavy use. Alfalfa was heavily utilized by grasshoppers which were extremely abundant in 1998. Small burnet was lightly utilized as well. In 2003, alfalfa and scarlet globemallow were the only perennial forbs sampled, and storksbill significantly increased to become

the most abundant forb. In 2003, alfalfa had been moderate to heavily utilized by Mormon crickets which were abundant on the site.

1985 APPARENT TREND ASSESSMENT

The range condition and trend appears to be very similar to the situation on site 22-13. Sagebrush reproduction is limited although the plants are generally vigorous. Seedling establishment may be limited by the rocky and dry soil conditions. The soil trend appears stable.

1991 TREND ASSESSMENT

The soil trend is stable due to the protective covering of erosion pavement and rock. Litter cover has increased slightly since the last reading and bare ground dropped by 56%. The trend for mountain big sagebrush is down due to a lower population density, an increase in the number of decadent plants, and increased heavy use (5% to 37%). Also, the number of plants that are in poor vigor increased (10% to 29%), and the number of young in the population declined. Trend for grasses and forbs is up due to increased sum of nested frequency values for perennial species.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - up (5)

1998 TREND ASSESSMENT

The soil trend is downward with an increase in percent bare ground, rock, and pavement cover due to the wildfire in 1996. Erosion appears moderate at this time and is mostly due to the steepness of the slope and low protective ground cover. The key browse species, Wyoming big sagebrush, was wiped out by the fire. Broom snakeweed is currently the most abundant shrub on the site. The browse trend is down. The herbaceous understory trend is stable. Although perennial herbaceous understory sum of nested frequency is lower in 1998, the herbaceous understory appears to have established well considering the effect of the fire. Cheatgrass abundance is low and the perennial species should be able to keep it that way.

TREND ASSESSMENT

soil - slightly down (2)

browse - down (1)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is up. Vegetation cover increased and bare ground decreased. The negative aspect to the increase in vegetation cover is that most of it came from cheatgrass. Although cheatgrass is undesirable from a vegetation point of view, it does provide fair soil protection. The browse component does not have a trend because no key species are present on the site. Broom snakeweed remains stable on the site at about 1,000 plants/acre. With the loss of the browse component, this site has lost most of its value as deer winter range and has become more important for elk. Trend for the herbaceous understory is stable. Perennial grasses increased in sum of nested frequency while perennial forbs declined. Overall, perennial species remained stable in sum of nested frequency. The forb component remains sparse, while grasses, both exotic and native species, have become the dominant component on this site.

TREND ASSESSMENT

soil - up (5)

browse - no trend (n/a)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 14

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	<i>Agropyron cristatum</i>	a-	a-	c ₁₅₈	b ₁₀₈	6.78	3.00
G	<i>Agropyron intermedium</i>	a-	a-	c ₉₄	b ₄₉	3.18	.83
G	<i>Agropyron spicatum</i>	a ₁₁	c ₁₀₃	b ₅₈	b ₅₁	3.55	3.21
G	<i>Aristida purpurea</i>	-	-	2	-	.01	-
G	<i>Bromus tectorum</i> (a)	-	-	a ₄₇	b ₃₃₃	.37	11.92
G	<i>Hilaria jamesii</i>	b ₁₃₄	b ₁₀₅	a ₅₃	a ₅₇	2.12	1.71
G	<i>Oryzopsis hymenoides</i>	-	1	-	-	-	-
G	<i>Poa secunda</i>	b ₁₆₁	c ₂₁₁	a ₉	bc ₁₈₀	.03	3.19
G	<i>Vulpia octoflora</i> (a)	-	-	a-	b ₁₅	-	.02
Total for Annual Grasses		0	0	47	348	0.37	11.94
Total for Perennial Grasses		306	420	374	445	15.69	11.95
Total for Grasses		306	420	421	793	16.07	23.90
F	<i>Alyssum alyssoides</i> (a)	-	-	b ₃₇	a ₁	.08	.00
F	<i>Astragalus utahensis</i>	a-	b ₃₅	b ₂₆	a-	1.00	.01
F	<i>Comandra pallida</i>	b ₂₆	b ₃₉	a-	a-	-	-
F	<i>Draba</i> spp. (a)	-	-	1	-	.00	-
F	<i>Erodium cicutarium</i> (a)	-	-	a ₂₃	b ₁₅₂	.95	4.26
F	<i>Erigeron pumilus</i>	a ₄	b ₂₀	a-	a-	-	-
F	<i>Leucelene ericoides</i>	-	-	1	-	.00	-
F	<i>Medicago sativa</i>	a-	a-	c ₄₆	b ₁₇	4.86	.60
F	<i>Phlox longifolia</i>	a-	b ₁₉	a ₃	a-	.03	-
F	<i>Sanguisorba minor</i>	-	-	5	-	.10	-
F	<i>Sphaeralcea coccinea</i>	-	-	5	5	.18	.12
F	<i>Zigadenus paniculatus</i>	c ₁₉	b ₈	a-	a-	-	-
Total for Annual Forbs		0	0	61	153	1.03	4.27
Total for Perennial Forbs		49	121	86	22	6.20	0.72
Total for Forbs		49	121	147	175	7.23	5.00

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

BROWSE TRENDS --

Management unit 22 , Study no: 14

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Chrysothamnus nauseosus albicaulis	1	2	-	.44
B	Ephedra nevadensis	1	3	-	-
B	Gutierrezia sarothrae	27	30	1.62	.21
B	Opuntia spp.	1	0	-	-
B	Tetradymia canescens	1	0	-	-
Total for Browse		31	35	1.62	0.65

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 14

Species	Percent Cover
	'03
Chrysothamnus nauseosus albicaulis	.33
Gutierrezia sarothrae	.85

BASIC COVER --

Management unit 22 , Study no: 14

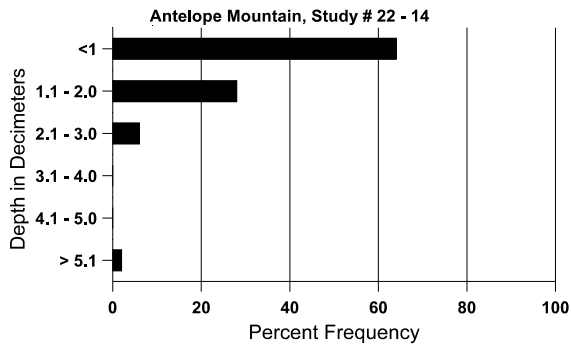
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	6.25	5.00	25.04	33.26
Rock	25.50	31.75	21.07	24.05
Pavement	27.50	22.75	39.57	15.56
Litter	32.25	36.25	39.48	33.09
Cryptogams	0	0	.66	.07
Bare Ground	8.50	4.25	19.08	2.73

SOIL ANALYSIS DATA --

Management unit 22, Study no: 14, Study Name: Antelope Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.9	68.0 (10.4)	7.1	36.0	37.4	26.6	2.2	6.0	201.6	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 14

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	4	17	-	-
Elk	-	12	-	39 (96)
Deer	16	6	13 (32)	5 (12)
Cattle	1	3	6 (15)	25 (61)

BROWSE CHARACTERISTICS --

Management unit 22 , Study no: 14

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana											
85	4132	-	266	2400	1466	-	35	5	35	10	18/18
91	3266	-	133	1200	1933	-	55	37	59	29	20/26
98	0	-	-	-	-	140	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Chrysothamnus nauseosus albicaulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	17/26
03	40	-	-	40	-	20	0	0	-	0	24/40

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus											
85	4799	200	1200	2933	666	-	7	0	14	6	6/5
91	266	-	-	133	133	-	0	0	50	75	10/10
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Ephedra nevadensis											
85	66	-	-	66	-	-	100	0	-	0	16/12
91	66	-	-	66	-	-	0	0	-	0	17/25
98	20	-	-	20	-	-	100	0	-	0	18/14
03	60	-	-	60	-	-	0	100	-	0	19/26
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	5732	-	1600	3466	666	-	0	0	12	6	7/11
98	1000	-	80	900	20	20	0	0	2	0	10/17
03	980	-	20	920	40	80	0	0	4	0	7/9
Juniperus osteosperma											
85	133	-	133	-	-	-	50	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Opuntia spp.											
85	66	-	-	66	-	-	0	0	-	0	5/9
91	66	-	-	66	-	-	0	0	-	100	6/10
98	20	-	-	20	-	-	0	0	-	0	3/8
03	0	-	-	-	-	-	0	0	-	0	8/19
Tetradymia canescens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	9/12
03	0	-	-	-	-	-	0	0	-	0	28/33

Trend Study 22-15-03

Study site name: South Creek.

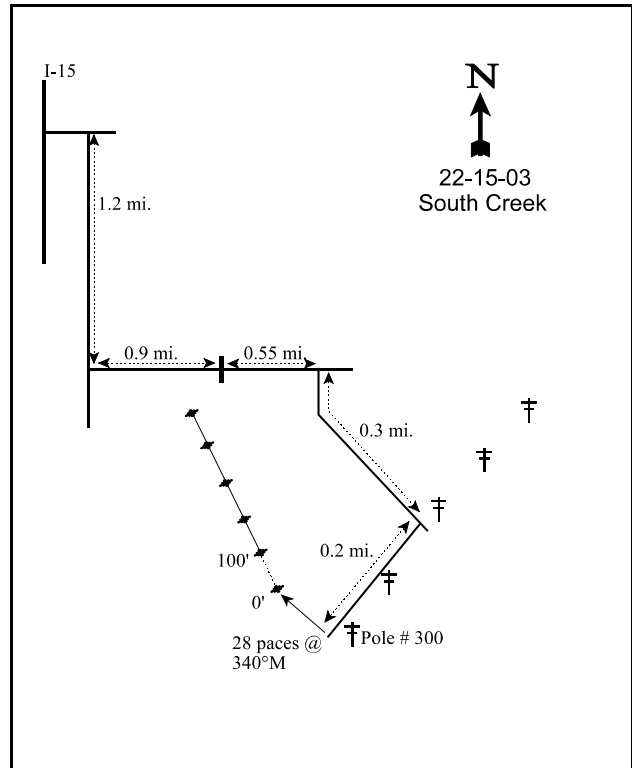
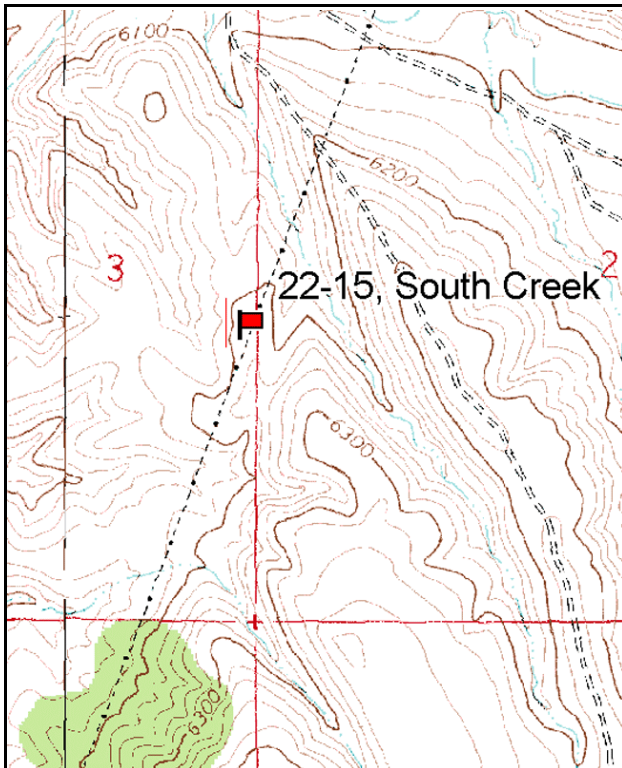
Vegetation type: Wyoming Big Sage/Grass.

Compass bearing: frequency baseline 328 degrees magnetic.

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

LOCATION DESCRIPTION

From I-15 take exit 109 and go past the Texaco station and turn right (south) onto campground road. Go 1.2 miles to where the pavement ends and a road takes off at an angle to the southeast. Take this road and go 0.9 miles to a cattleguard. Go straight another 0.55 miles. Turn right onto a faint road down a draw for 0.3 miles. At this point there is another faint road on the right along the powerlines. Go down the road for 0.2 miles to power pole #300 (the second set of power poles). From power pole #300, the 0' stake is 28 paces at 340 degrees magnetic. The 0-foot stake is marked with browse tag #474.



Map name: Kane Canyon

Diagrammatic sketch

Township 31S, Range 7W, Section 3

GPS: NAD 27, UTM 12S 4231955 N, 358161 E

DISCUSSION

South Creek - Trend Study No. 22-15

This study was formerly known as Fremont Wash, but was renamed in 2003. The transect is located on critical winter range south of Beaver and was established in August of 1998. The area is managed by the BLM. The study slopes to the west at 8% with an elevation of 6,200 feet. The general area consists of Wyoming big sagebrush and grass with scattered junipers surrounding the site. Limited escape and thermal cover is located in juniper covered draws to the east and west. A pellet group transect read on site estimated 68 deer days use/acre, 1 elk day use/acre, and 41 cow days use/acre (168 ddu/ha, 2 edu/ha, 101 cdu/ha) in 1998. The pellet groups encountered varied in age from a few months old to possibly approaching a year. Pellet group transect data collected in 2003 estimated 29 deer and 19 cow days use/acre (71 ddu/ha and 47 cdu/ha) on the immediate site. Cattle pats sampled in 2003 were from the previous grazing season while most of the deer pellets were from winter use. An old (~6 years) deer antler shed was found on the site in 1998.

Soil analysis indicates texture to be sandy clay loam with a neutral pH (7.0). Phosphorous levels measured only 7.1 ppm and may be limiting to vegetative growth as 10 ppm is thought minimal for normal plant development. The mild slope and high proportion of rock and pavement cover on the soil surface combine to keep erosion to a minimum. An erosion condition class assessment rated soils as stable in 2003. The deep draws to the east and west show extensive signs of decades of erosion. Rock and pavement on the site appear to be basaltic and granitic in origin. The average effective rooting depth is estimated at 10 inches with an average soil temperature of 67°F in 1998 and 71°F in 2003. The stoniness index indicates that many rocks and pavement are located within the upper 8 inches of the soil profile.

Wyoming big sagebrush is the key browse which provides nearly all of the browse cover on this site. The population consists mostly of mature and decadent plants. Density was estimated at 3,620 plants/acre in 1998, and 3,040 in 2003. The young age class was moderately abundant in 1998 as it made up 14% of the population, but declined to 6% in 2003. Percent decadence was moderately high in 1998 (33%) and 2003 (43%). Increasing decadence and declining reproduction is due in large part to drought conditions. These trends will likely not improve unless precipitation patterns return to normal or above normal conditions. There were very few plants with seed heads in 1998, but seed production was noted as good in 2003. Utilization on sagebrush was moderate to heavy in 1998 but mostly heavy in 2003. Annual sagebrush leaders had averaged 1.5 inches of growth by June of 2003. Other browse species encountered on the site in very low densities include Utah serviceberry, pricklypear cactus, pediocactus, and broom snakeweed.

The herbaceous understory was dominated by cheatgrass during the initial reading in 1998. Cheatgrass accounted for 54% of the herbaceous cover and 39% of the total vegetative cover in 1998. It was sampled in every quadrat. With drought prior to and including the 2003 reading, no cheatgrass was sampled on the site in 2003. The site also supports a good stand of warm and cool season grasses. The most abundant perennial grasses are galleta, blue grama, sand dropseed, purple three-awn, needle-and-thread grass, Indian ricegrass, and bottlebrush squirreltail. In 2003, 5 of the 7 perennial grass species declined in nested frequency with most of these being the warm season varieties. There was no apparent utilization of grasses in 1998 or 2003. Forbs are scarce with scarlet globemallow being the most abundant perennial. An annual *Gilia* and stickseed were fairly abundant in 2003.

1998 APPARENT TREND ASSESSMENT

The soil trend appears stable with little erosion currently occurring. The moderate slope and ample vegetation and litter cover provide protection for the soil. The browse trend appears slightly downward. There are many decadent and dead plants found throughout this population. Currently, 20% of the population is dead and 31% of the decadent plants were classified as dying. Competition from the cheatgrass may not allow

sagebrush seedlings to establish, thereby dying plants are not being replaced. The herbaceous trend appears stable, although cheatgrass needs to be controlled to allow the more desirable perennial species to become established.

2003 TREND ASSESSMENT

Trend for soil is slightly down. Decreases in vegetation and litter cover coupled with an increase in bare ground means less protective cover on the soil surface. However, erosion remains low and soils were given a stable rating from an erosion condition class assessment. Trend for browse is slightly down. Wyoming big sagebrush density declined 16% since 1998 and most of the key browse parameters show negative trends including decreased density and reproduction, and increased decadence and heavy use. Young recruitment is marginal and there is currently not enough young plants within the population to replace all of the decadent, dying individuals. All of these changes are due in large part to drought conditions and will likely not improve until precipitation patterns return to normal or above normal. Trend for the herbaceous understory is slightly down. Sum of nested frequency for perennial grasses declined by 21% in 2003 as 5 of the 7 species showed decreases individually. Total perennial grass cover declined slightly from 11% to about 8%. One positive change is that cheatgrass which was dominant in 1998 was not sampled in 2003. Forbs remain sparse.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --

Management unit 22 , Study no: 15

Type	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	Aristida purpurea	_b 88	_a 20	2.01	.37
G	Bouteloua gracilis	_a 61	_b 108	1.86	3.06
G	Bromus tectorum (a)	_b 466	_a -	12.83	-
G	Hilaria jamesii	_b 116	_a 99	2.55	1.20
G	Oryzopsis hymenoides	26	10	.25	.51
G	Sitanion hystrix	13	30	.20	.22
G	Sporobolus cryptandrus	_b 102	_a 60	2.83	1.63
G	Stipa comata	_b 55	_a 32	.79	.54
G	Vulpia octoflora (a)	8	-	.01	-
Total for Annual Grasses		474	0	12.84	0
Total for Perennial Grasses		461	359	10.51	7.55
Total for Grasses		935	359	23.36	7.55
F	Astragalus spp.	6	-	.01	-
F	Calochortus nuttallii	-	3	-	.00
F	Descurainia pinnata (a)	-	5	-	.03
F	Gilia spp. (a)	_a -	_b 147	-	5.53

Type	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
F	Lappula occidentalis (a)	_a 1	_b 44	.00	1.00
F	Lactuca serriola	-	4	-	.15
F	Microsteris gracilis (a)	1	-	.00	-
F	Sphaeralcea coccinea	39	33	.36	.44
Total for Annual Forbs		2	196	0.00	6.57
Total for Perennial Forbs		45	40	0.37	0.59
Total for Forbs		47	236	0.37	7.17

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

BROWSE TRENDS --

Management unit 22 , Study no: 15

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	1	0	-	-
B	Artemisia tridentata wyomingensis	89	83	9.00	13.61
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	.03	-
B	Opuntia spp.	2	0	-	-
B	Pediocactus simpsonii	0	2	-	.00
Total for Browse		92	85	9.02	13.61

CANOPY COVER, LINE INTERCEPT --

Management unit 22 , Study no: 15

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	10.81

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22 , Study no: 15

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.5

BASIC COVER --

Management unit 22 , Study no: 15

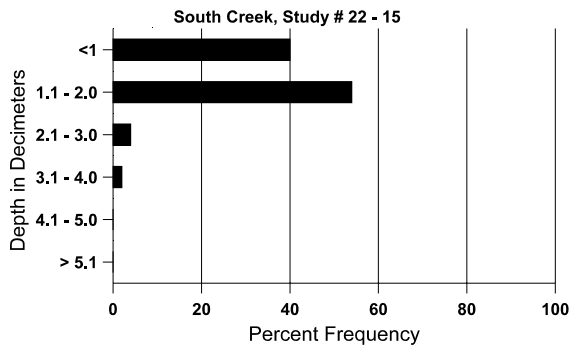
Cover Type	Average Cover %	
	'98	'03
Vegetation	42.79	28.52
Rock	4.00	5.46
Pavement	22.86	28.61
Litter	50.62	29.59
Cryptogams	.03	.02
Bare Ground	8.14	20.26

SOIL ANALYSIS DATA --

Management unit 22, Study no: 15, Study Name: South Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.2	71.7 (11.9)	7.0	53.4	22.0	24.6	1.8	7.1	134.4	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 22 , Study no: 15

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	8	3	-	-
Elk	1	-	1 (2)	-
Deer	47	8	68 (168)	29 (71)
Cattle	10	6	41 (101)	19 (47)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 15

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>											
98	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Artemisia tridentata wyomingensis</i>											
98	3620	120	500	1940	1180	880	45	25	33	10	21/30
03	3040	-	180	1560	1300	540	27	67	43	9	19/27
<i>Gutierrezia sarothrae</i>											
98	0	-	-	-	-	-	0	0	-	0	6/7
03	0	-	-	-	-	-	0	0	-	0	6/8
<i>Opuntia spp.</i>											
98	40	-	-	40	-	-	0	0	-	0	4/4
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Pediocactus simpsonii</i>											
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	0/2

Trend Study 22R-4-03

Study site name: Above Fremont Wash.

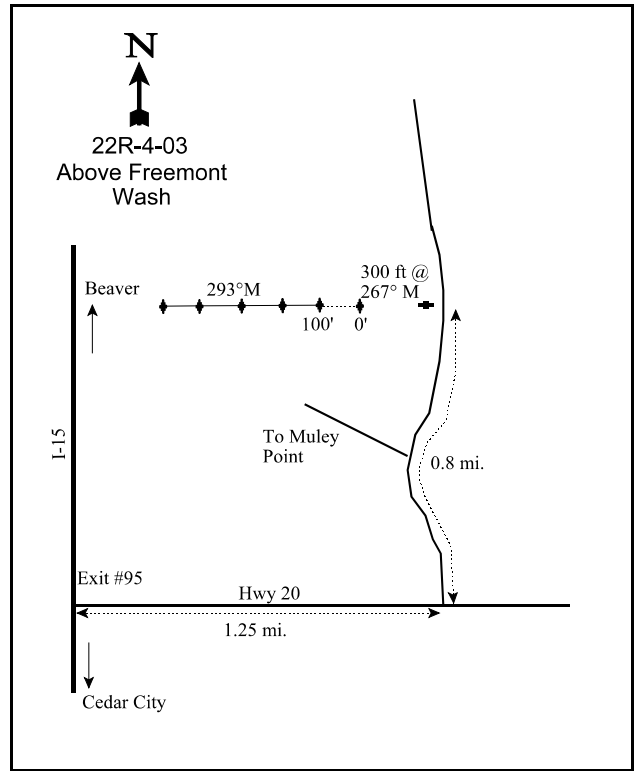
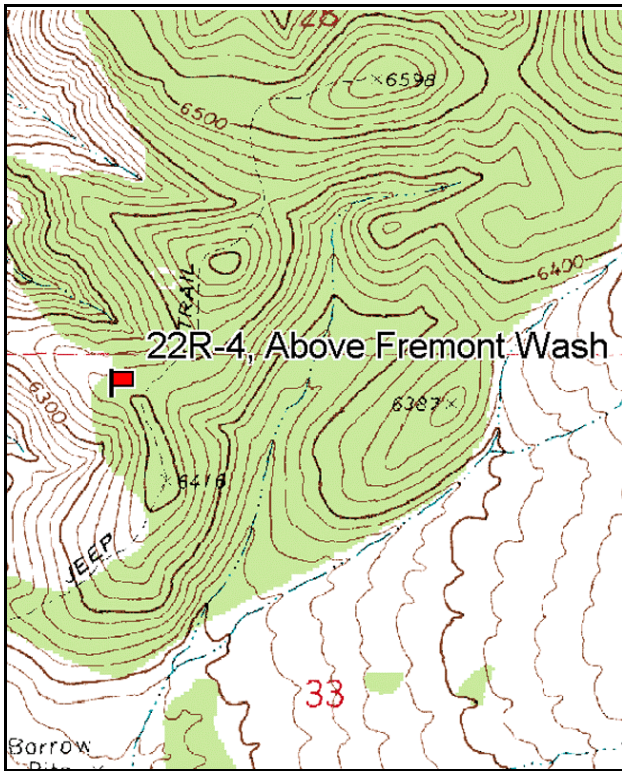
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 293 degrees magnetic.

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

LOCATION DESCRIPTION

South of Beaver on I-15 take exit # 95. Drive 1.25 miles east on Highway 20 to a road going north (left side of the road). Drive 0.8 miles to the witness post (the road to the Muley Point site will be past on the way). From the witness post, walk 300 feet at 267 degrees magnetic to the 0' stake. The 0' stake is marked by browse tag #406.



Map name: Buckhorn Flat

Diagrammatic Sketch

Township 31S, Range 7W, Section 33

GPS: NAD 27, UTM 12S 4214896 N 354393 E

DISCUSSION

Above Fremont Wash - Trend Study No. 22R-4

This study was established in 1999 to monitor critical deer winter range east of Interstate 15 and north of Highway 20. This transect is just east of transect 22-8 (Muley Point), but is slightly higher in elevation. The site is moderately steep (20-25%) and slopes to the southwest at an elevation of 6,400 feet. The range type is Wyoming big sagebrush-grass with scattered pinyon and juniper. Deer use on this site has been moderately high as evidenced by pellet group transect data collected on site in 1999 and 2003. Deer use was estimated at 73 days use/acre (180 ddu/ha) in 1999 and 62 days use/acre (152 ddu/ha) in 2003.

Soils are loam in texture and have a neutral pH (6.8). Soil depth is moderate with an effective rooting depth estimated at over 11 inches. Rock and pavement are abundant on the surface and throughout the upper layers of the soil profile. Erosion has not been severe during either reading, but some sign of overland flow was apparent in 1999. The abundance of rock and pavement on the surface and relatively low amounts of bare ground hint that erosion was moderate in the past. An erosion condition class assessment completed on site in 2003 rated soils as stable.

Wyoming big sagebrush is the key browse on the site. Density was estimated at 2,680 plants/acre in 1999 and 2,800 in 2003. This population consists almost entirely of mature and decadent plants with low reproduction in both surveys. The decadence rate was moderate in both 1999 and 2003 at 23% and 30% respectively, while the young age class made up 3% and 1% of the total population in the same years. Utilization on sagebrush was moderate to heavy in both 1999 and 2003, but the majority of the population has maintained normal vigor. Annual sagebrush leader growth had averaged 1.5 inches by June of 2003. Seed production was moderate. Other browse sampled on the site include broom snakeweed, and several cactus species. Point-center quarter data collected in 2003 estimated 31 pinyon and 17 juniper trees/acre on the site.

The herbaceous component is dominated by grasses. Cheatgrass was the dominant species in both 1999 and 2003 as it provided 61% and 82% of the grass cover in those years respectively. In 2003, cheatgrass made up 60% of the total vegetation cover on the site, was sampled in every quadrat, and almost doubled in average cover over 1999 estimates. This site has an obvious competition and fire hazard problem due to the abundance of cheatgrass. A fire would eliminate the key browse, Wyoming big sagebrush, and have a detrimental effect to the wintering deer herds in the area. The abundance of cheatgrass also creates a highly competitive environment for perennial grass and forb species as well as sagebrush. Cheatgrass dries out the upper layers of the soil profile early in the summer and makes it very difficult for the seedling and young plants of other species to acquire water and nutrients during the hot dry summer months. Perennial grasses have only fair abundance on this site. Warm season species include blue grama, galleta, and sand dropseed, while cool season species are represented by Indian ricegrass, bottlebrush squirreltail, and needle-and-thread grass. Sum of nested frequency for all perennial grasses combined is about half of the value of cheatgrass alone. Forbs are scarce. Annual species increased between 1999 and 2003, while perennials remained stable.

1999 APPARENT TREND ASSESSMENT

Trend for soil appears to be stable. Bare ground is low, while rock and pavement cover armor the soil surface. Vegetation and litter cover are moderately abundant and help minimize erosion. The browse component appears stable. The Wyoming big sagebrush population has moderate decadence (23%), low reproduction, and is dominated by mature plants. Use on sagebrush is moderate to heavy. The herbaceous component appears to be downward due to the dominance of cheatgrass. Perennial grasses have fair abundance, but all species combined, are less abundant in nested frequency and cover than cheatgrass alone. Forbs are scarce and insignificant in the vegetative community.

2003 TREND ASSESSMENT

Trend for soil is stable. Bare ground has only slightly increased since 1999. Vegetation cover also increased due to the abundance of cheatgrass, and rock and pavement are abundant and armor the soil surface. Erosion is low. Trend for browse is stable. Wyoming big sagebrush slightly increased in density and still displays moderate to heavy use. Reproduction declined but was already very low in 1999. Vigor improved somewhat in 2003, and percent decadence slightly increased to 30%. The main positive change with sagebrush in 2003 was the decrease in the proportion of the decadent age class classified as dying (81% to 21%). Trend for the herbaceous understory is stable but remains dominated by cheatgrass. Cheatgrass declined in nested frequency, but nearly doubled in average cover and poses a serious fire hazard for the site and surrounding area. Sum of nested frequency for perennial grasses and forbs remained stable between 1999 and 2003.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 22R, Study no: 4

Type	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
G	Agropyron spicatum	-	-	-	.00
G	Aristida purpurea	-	4	-	.06
G	Bouteloua gracilis	46	70	1.49	2.13
G	Bromus tectorum (a)	_b 453	_a 410	13.05	23.11
G	Hilaria jamesii	-	5	-	.06
G	Oryzopsis hymenoides	50	47	2.12	1.17
G	Sitanion hystrix	_a 1	_b 34	.00	.42
G	Sporobolus cryptandrus	_b 99	_a 38	4.73	1.00
G	Stipa comata	6	3	.06	.04
G	Vulpia octoflora (a)	_a -	_b 22	-	.06
Total for Annual Grasses		453	432	13.05	23.18
Total for Perennial Grasses		202	201	8.41	4.92
Total for Grasses		655	633	21.47	28.10
F	Collinsia parviflora (a)	_a -	_b 11	-	.02
F	Descurainia pinnata (a)	_a -	_b 8	-	.02
F	Draba spp. (a)	-	3	-	.00
F	Eriogonum cernuum (a)	2	1	.00	.00
F	Erigeron eatonii	3	1	.00	.00
F	Gilia spp. (a)	_a -	_b 49	-	.23
F	Lappula occidentalis (a)	-	1	-	.00
F	Leucelene ericoides	-	4	-	.03

Type	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
F	<i>Microsteris gracilis</i> (a)	a-	b12	-	.03
F	<i>Phlox austromontana</i>	-	5	-	.00
F	<i>Sphaeralcea coccinea</i>	17	10	.10	.14
Total for Annual Forbs		2	85	0.00	0.32
Total for Perennial Forbs		20	20	0.10	0.18
Total for Forbs		22	105	0.10	0.51

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

BROWSE TRENDS --

Management unit 22R, Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'99	'03	'99	'03
B	<i>Artemisia tridentata wyomingensis</i>	65	70	3.74	8.21
B	<i>Echinocereus</i> spp.	0	1	-	-
B	<i>Gutierrezia sarothrae</i>	0	1	-	-
B	<i>Juniperus osteosperma</i>	0	0	.15	.15
B	<i>Opuntia whipplei</i>	10	13	1.41	1.85
B	<i>Pinus edulis</i>	0	0	.03	-
Total for Browse		75	85	5.33	10.21

CANOPY COVER, LINE INTERCEPT --

Management unit 22R, Study no: 4

Species	Percent Cover	
	'99	'03
<i>Artemisia tridentata wyomingensis</i>	-	8.19
<i>Echinocereus</i> spp.	-	.15
<i>Juniperus osteosperma</i>	.80	.80
<i>Opuntia whipplei</i>	-	1.50

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22R, Study no: 4

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.5

POINT-QUARTER TREE DATA --
Management unit 22R, Study no: 4

Species	Trees per Acre	
	'99	'03
Juniperus osteosperma	31	17
Pinus edulis	31	31

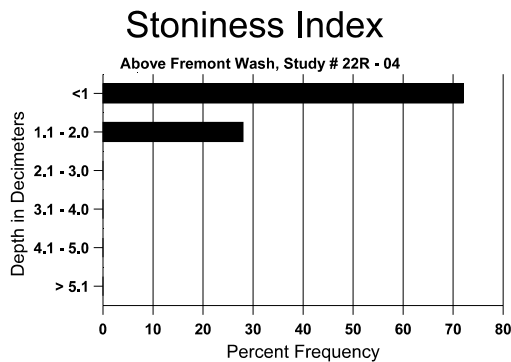
Average diameter (in)	
'99	'03
10.0	10.4
3.0	4.0

BASIC COVER --
Management unit 22R, Study no: 4

Cover Type	Average Cover %	
	'99	'03
Vegetation	32.45	40.91
Rock	18.97	15.79
Pavement	13.86	19.65
Litter	30.85	24.50
Cryptogams	.48	.01
Bare Ground	9.31	10.57

SOIL ANALYSIS DATA --
Management unit 22R, Study no: 4, Study Name: Above Fremont Wash

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.6	70.7 (8.8)	6.8	42.0	34.7	23.3	1.7	7.1	147.2	0.5



PELLET GROUP DATA --
 Management unit 22R, Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'03	'99	'03
Rabbit	27	17	-	-
Deer	21	27	73 (180)	62 (152)
Cattle	-	1	-	1 (3)

BROWSE CHARACTERISTICS --
 Management unit 22R, Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
99	2680	20	80	1980	620	820	31	53	23	19	17/26
03	2800	-	40	1920	840	620	41	58	30	6	18/26
<i>Echinocereus spp.</i>											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	5/14
<i>Gutierrezia sarothrae</i>											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	6/5
<i>Opuntia polyacantha</i>											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	6/22
<i>Opuntia whipplei</i>											
99	240	-	-	240	-	-	0	0	-	0	15/33
03	280	-	20	260	-	-	0	0	-	0	16/36

Trend Study 22R-1 & 2-03

Study site name: Tushar Mountain Goat # 1 & 2.

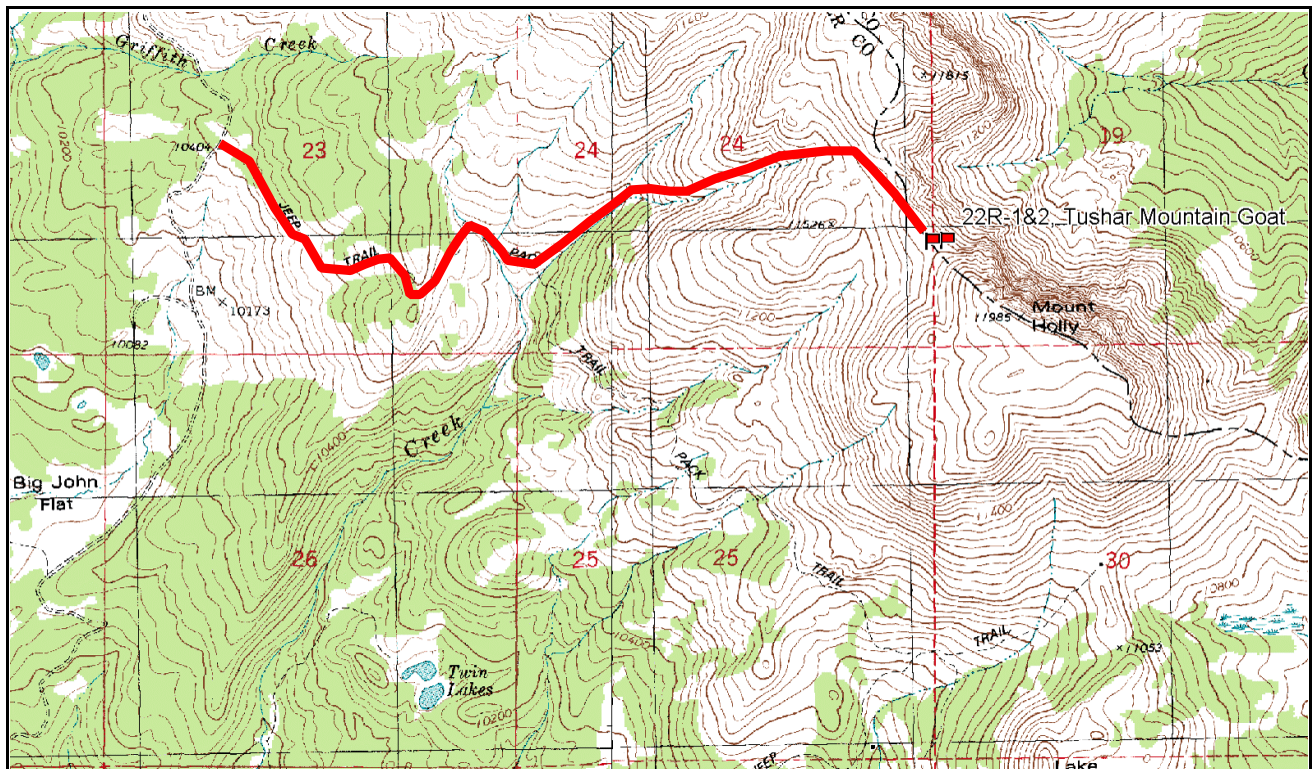
Vegetation type: Alpine Tundra.

Compass bearing: frequency baseline 0 degrees magnetic.

100 foot baseline. Quadrats read along baseline. See text for study methods.

LOCATION DESCRIPTION

From Beaver drive 16.3 miles up Beaver Canyon to the turnoff to Big John Flat. Turn left onto this road and continue 3.5 miles to Big John Flat. Continue 1.0 mile to a trail head and park here. The walk from the trail head to the study sites is 2.2 miles with an elevation gain of 1,166 feet. Site #1 is located on the east side of the saddle on a steeper slope. Site #2 is located in the middle of the saddle, west of study #1.



Map name: Delano Peak

Study # 1 GPS: NAD 27, UTM 12S 4245914 N 381134 E

Township 28S, Range 4W, Section 19 & 24 Study # 2 GPS: NAD 27, UTM 12S 4245913 N 381079 E

DISCUSSION

Tushar Mountain Goat - Trend Study No. 22R-1 & 2

These studies are located in an alpine community approximately 1/3 mile below Mount Holly at an elevation of 11,500 feet. Two transects were established in 1997 to monitor the effect of mountain goat utilization on the Tushar paintbrush (*Castilleja parvula* var. *parvula*), and to determine if mountain goats were having an effect on this population. The Tushar paintbrush is on the Utah endangered, threatened and sensitive species list and categorized as a federal status 3C species. This listing is defined as “taxa that have proven to be more abundant or widespread than was previously believed, and/or those that are not subject to any identifiable threat” (Atwood et al. 1991). The Tushar paintbrush is an endemic to south-central and west-central Utah in Beaver, Piute, and Garfield counties. It is found growing on alpine ridgetops and talus slopes above timberline on sandy, gravelly soils derived from igneous parent material (Welsh et al. 1993).

Transect 22R-1 was placed in a saddle below Mt. Holly and a second transect (22R-2) was placed downhill several hundred feet from the first. Mountain goats were on the study area in both 2001 and 2003 when the transects were surveyed. Transect 22R-1 is somewhat steep and rocky, dropping off to the east near the end of transect. Transect 22R-2 slopes toward the west at 3-5% and is less rocky. The vegetation in this alpine community is comprised primarily of low growing grasses and forbs. There were no browse species sampled on either of the transects. Grasses and forbs were grouped, while cover and nested frequency data was collected using 20, 1/4 m² quadrats read along a 100 foot baseline. Tushar paintbrush density was determined by counting the number of plants rooted within a 100 foot radius circular plot (.72 of an acre). Utilization was estimated on each plant sampled. Mountain goat pellet groups were also counted within the 100 foot radius circular plot.

Table 1 (follows this narrative) summarizes the data collected on transect 22R-1. This study is characterized by moderate vegetation cover, low litter cover, and a high amount of rock and pavement. Bare ground was relatively low in all readings. Perennial grass cover has ranged from 7%-18% over the 3 readings, while perennial forb cover was lowest in 2003 at 15%, and highest in 2001 at 27%. The density of the Tushar paintbrush was estimated at 73 plants/acre in 1997, 88 plants/acre in 2001, and 80 plants/acre in 2003. None of plants sampled in 1997 appeared to have been utilized, but most of the plants in 2001 had been either lightly or moderately used (83%). In 2003, 9% of the plants sampled showed heavy use, but overall use remained light to moderate (75%). Mountain goat pellet groups have increased sharply since the initial reading in 1997. Only 25 goat pellet groups were sampled in 1997, increasing to 56 in 2001 and 160 in 2003.

Table 2 (follows this narrative) summarizes the data collected on transect 22R-2. This transect is characterized by very high vegetation cover, moderate litter cover, with much lower amounts of rock, pavement, and bare ground. Perennial grass cover has ranged from 23%-48%, and was estimated at 36% in 2003. Perennial forb cover was lowest in 2003 at 15%, and highest in 2001 at 27%. The density of the Tushar paintbrush was estimated at 20 plants/acre in 1997, 8 plants/acre in 2001, and 13 plants/acre in 2003. As with 22R-1, none of the plants sampled in 1997 appeared to have been utilized. In 2001, 67% (4 of the 6 plants sampled) showed light use and a single plant showed moderate use. No plants were classified as being heavily used in either year. In 2003, 44% (5 out of 9) of the plants sampled were heavily utilized, while 22% showed moderate use. Thirty-three percent of the plants sampled had either no use or light use in 2003. Seven mountain goat pellet groups were sampled in 1997, increasing to 35 in 2001 and 82 in 2003.

It appears that study 22R-1 is more representative of preferred habitat for the Tushar paintbrush, while study 22R-2 would be best categorized as marginal. An examination of the habitat characteristics of these two transects is important. Study 22R-1 lies in a saddle on the ridgetop and has lower vegetation and litter cover and a higher amount of rock, pavement, and bare ground. As was stated in the 2001 report, paintbrush would have less competition on this transect compared to the lower transect (22R-2) which is located down off of the

ridgetop and is composed of a thick, uniform mat of low growing perennial grasses and forbs. Rock, pavement, and bare ground are much less abundant on transect 22R-2, thus competition between the paintbrush and other low growing species would be much greater. Higher competition results in fewer safe sites being available for the paintbrush to become established. Although mountain goat pellet groups have sharply increased since 1997 and utilization is increasing, use by these animals does not appear to be effecting the paintbrush population. The 2003 paintbrush density estimate on both transects was intermediate to the previous 2 surveys, although the number of pellet groups and level of use were the highest of the 3 readings.

It is our assessment that mountain goat use of the Tushar paintbrush, at least on these 2 transects within the immediate area, are not a threat to the paintbrush population. Furthermore, the amount of ground cover appears to have the most influence on paintbrush density. Thus, areas that are more open and rocky will likely contain more plants compared to areas where vegetation is thick and uniformly distributed. The paintbrush population does not appear to be very competitive and/or abundant where the vegetative and litter cover are relatively high.

Table 1- Data summary for study #22R-1

	1997	2001	2003
% Cover			
Vegetation	34.3	38.1	28.3
Litter	3.8	0.8	4.9
Rock - Pavement	74.3	68.9	63.3
Cryptogamic crusts	3.8	-	0.03
Bare ground	8.5	5.1	11.0
Perennial Grasses	7.0	17.7	7.8
Perennial Forbs	16.9	21.7	19.9
Nested Frequency (100 is maximum value)			
Vegetation	85	93	87
Litter	84	50	76
Rock	88	80	75
Pavement	93	94	100
Cryptogamic crusts	36	-	3
Bare ground	74	29	48
Perennial Grasses	61	76	68
Perennial Forbs	79	77	79
Tushar paintbrush (<i>Castilleja parvula</i> var. <i>parvula</i>)			
Density (plants/acre)	73	88	80
% plants showing:			
No use	100	17	16
Light use	0	54	56
Moderate use	0	29	19
Heavy use	0	0	9
Pellet Groups			
# of goat pellet groups	25	56	160

Table 2- Data summary for study #22R-2

	1997	2001	2003
% Cover			
Vegetation	39.6	76.2	56.1
Litter	13.1	8.8	31.8
Rock - Pavement	46.3	20.3	20.5
Cryptogamic crusts	5.2	0.03	0.4
Bare ground	6.1	0.4	0.4
Perennial Grasses	23.1	48.2	36.0
Perennial Forbs	18.2	26.5	15.0
Nested Frequency (100 is maximum value)			
Vegetation	98	100	98
Litter	92	90	87
Rock	74	38	40
Pavement	89	86	74
Cryptogamic crusts	64	4	9
Bare ground	61	9	16
Perennial Grasses	97	100	96
Perennial Forbs	82	92	83
Tushar paintbrush (<i>Castilleja parvula</i> var. <i>parvula</i>)			
Density (plants/acre)	20	8	13
% plants showing:			
No use	100	17	22
Light use	0	67	11
Moderate use	0	17	22
Heavy use	0	0	44
Pellet Groups			
# of goat pellet groups	7	35	82

SUMMARY

WILDLIFE MANAGEMENT UNIT 22 - BEAVER

Most of the range trend studies in the Beaver unit sample winter ranges. Two studies, Oak Basin (22-3) and Doubleup Hollow (22-10), sample transitional ranges that would receive big game use during mild winters. Two studies on top of the Tushar Mountains sample summer range for mountain goats (22R-1 and 22R-2). These studies are not typical range trend studies as the sampling methodology was created specifically to determine the effect of mountain goat use on the Tushar paintbrush, a sensitive species endemic to the area.

Only 2 trends were considered improving in the entire unit in 2003 which were the soil trend at Antelope Mountain (22-14) and the herbaceous trend at Minersville Reservoir (22-13). Both of these studies sample burned sites, and improving trends are the result of rehabilitation efforts. Other than the 2 studies discussed above, soil, browse, and herbaceous understory trends were split nearly evenly between stable and downward classifications throughout the rest of the unit in 2003.

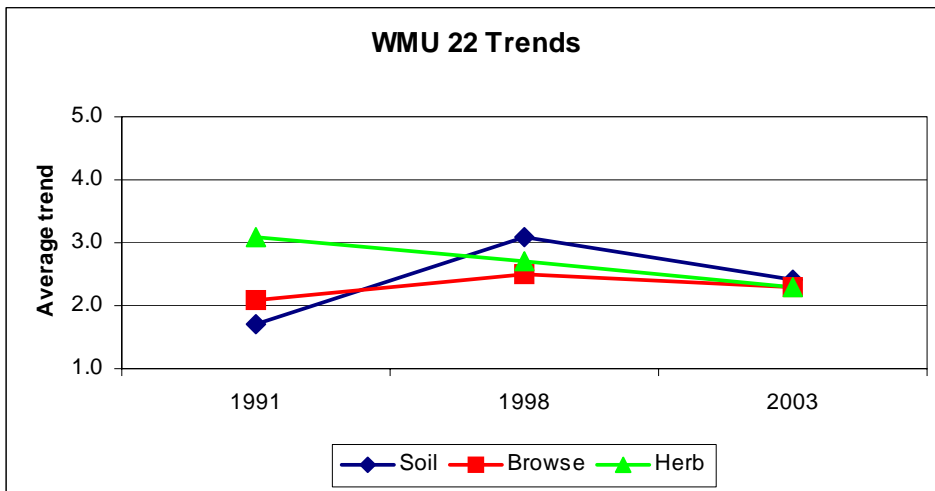
Stable soil trends are the result of basic ground cover parameters (% cover of vegetation, litter, and bare ground) being fairly constant, or the ratio of these categories to each other fluctuating very little since 1998. Downward soil trends can occur if 1 or more of these parameters show large changes since the previous survey, or if current erosion is evident. Big sagebrush, primarily the Wyoming and mountain subspecies, represents the key browse on most of the studies in the Beaver unit. Downward browse trends resulted due to 1 or more key factors including, but not limited to, population declines, increased decadence, reduced vigor, and lower reproduction. Of the 14 sites in the unit where big sagebrush is the key species, 10 sites had increased decadence and 12 sites had decreased recruitment from young plants in 2003. Wildfire also resulted in a downward trend at Minersville Reservoir (22-13) as the Wyoming big sagebrush population was lost following a burn in 1998. Downward herbaceous trends resulted from decreased nested frequency and cover values for perennial grasses and forbs in 2003. Decreases in perennial grass sum of nested frequency and cover occurred on 11 and 13 sites respectively in 2003. Perennial forbs had a lower sum of nested frequency value on 10 sites, while average cover decreased on 12 sites in 2003. Cheatgrass was sampled on 14 of the 16 sites in the unit in 1998 and 2003. Cheatgrass frequency declined on 11 of the 14 sites where it was sampled, while cheatgrass cover decreased on the 9 of the 14 sites.

Soil and vegetation trends are largely driven by precipitation. Utah has been in a drought for the past 5 years, and some of the areas within the Beaver unit reflect this. Weather station data at 4 locations was analyzed to look at precipitation trends for the Beaver unit since range trend studies were established in 1985. These stations occur at Milford, Minersville, Circleville, and Marysvale (Utah Climate Summaries 2004). Unfortunately, all of these weather station locations occur on the fringes of the unit. Precipitation data in the interior of the unit along the I-15 corridor was unavailable due to incomplete data sets. Precipitation data was averaged over the 4 weather stations listed above, and data indicate that from 1985-2002, total annual precipitation was normal or above normal in all years except 1999 and 2001-2002 (see precipitation graphs below). Perhaps more important than total annual precipitation is seasonal distribution of precipitation. Data were analyzed for the different seasons of the year including spring, and fall totals. Spring precipitation (April - June) is important for cool season perennial grasses and forbs, as well as shrub populations, as these species initiate growth during the spring. Weather data indicate that spring precipitation in the Beaver unit was very dry from 2001-2003 at 73%, 23%, and 65% or normal respectively (see precipitation graphs below). Dry springs also occurred in 1989 and 1996 with most other years being normal or above normal. Recent fall precipitation totals have oscillated back and forth with dry years in 1999 and 2001, and wetter than normal years in 2000 and 2002. Dry falls also occurred in 1988-89 and 1995. For this report, the period from 2000-2003 is the focus as it would most effect current range trends. Below normal spring precipitation from 2001-03 is the primary reason for the decline in perennial grasses and forbs as well as there being less cheatgrass on many of the studies sites in 2003. Even with lower cheatgrass frequency and cover values in 2003, cheatgrass

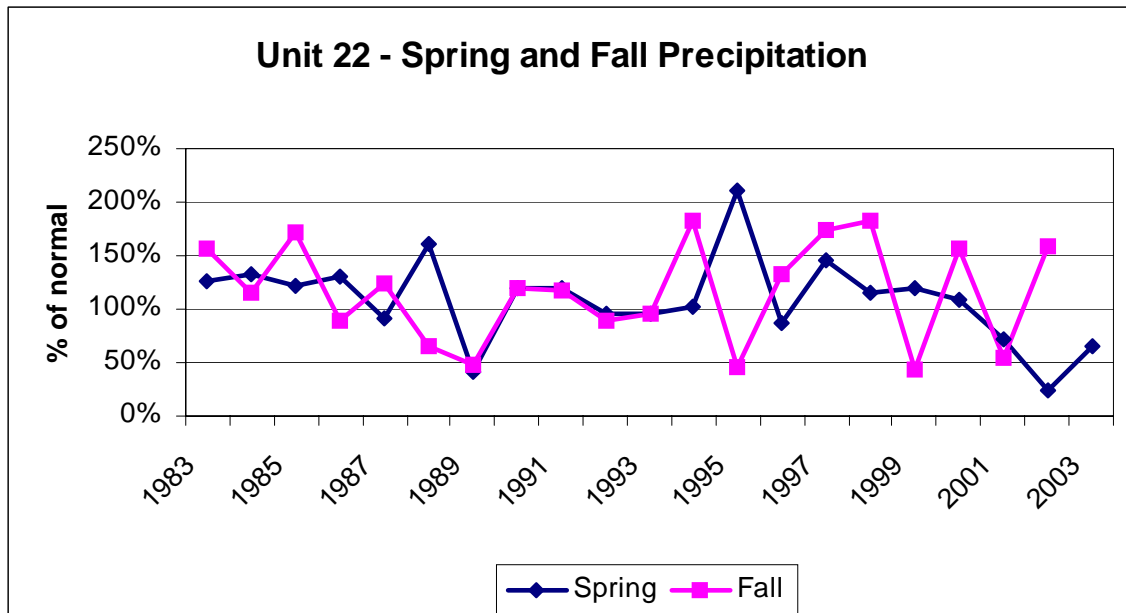
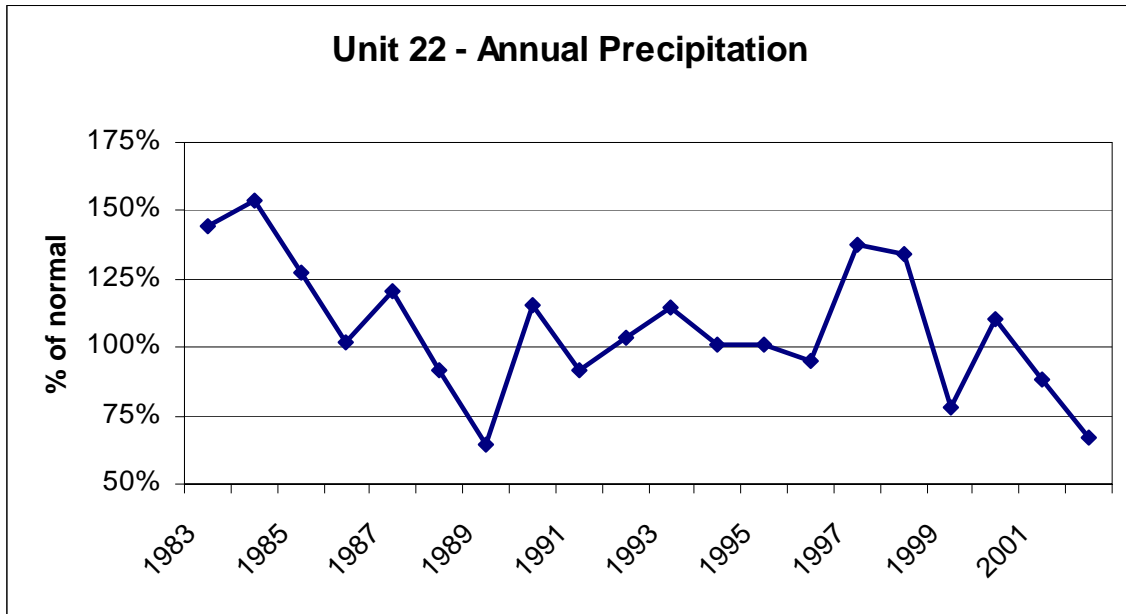
is highly competitive and still persists on the majority of the key areas. A return to normal precipitation patterns should help perennial species increase, but will also likely mean increased cheatgrass throughout the unit. Increased decadence and lower reproduction in the sagebrush populations are also linked to the dry conditions during the past several years. It is likely that these negative trends will continue until precipitation patterns improve.

Average Trends – WMU 22 Beaver

	1991	1998	2003
Soil	1.7	3.1	2.4
Browse	2.1	2.5	2.4
Herb	3.1	2.7	2.3
	14 sites	14 sites	16 sites



Precipitation graphs for the Beaver unit. Data is percent of normal precipitation averaged for 4 weather stations at Milford, Minersville, Circleville, and Marysville (Utah Climate Summaries 2004).



Trend Summary

	Category	1985	1991	1998	2003
22-1 Deer Flat	soil	est	2	3	3
	browse	est	4	3	2
	herbaceous understory	est	4	2	2
22-2 Piute Reservoir	soil	est	1	3	2
	browse	est	2	3	3
	herbaceous understory	est	2	4	3
22-3 Oak Basin	soil	est	1	4	1
	browse	est	1	5	3
	herbaceous understory	est	2	2	1
22-4 Wades Canyon	soil	est	2	4	3
	browse	est	2	1	3
	herbaceous understory	est	2	3	1
22-5 Bone Hollow	soil	est	2	3	3
	browse	est	2	2	1
	herbaceous understory	est	3	3	3
22-6 Beaver Table	soil	est	2	4	1
	browse	est	2	2	3
	herbaceous understory	est	3	2	2
22-7 Sheep Rock	soil	est	1	5	1
	browse	est	3	3	3
	herbaceous understory	est	5	5	1
22-8 Muley Point	soil	est	3	3	3
	browse	est	1	1	3
	herbaceous understory	est	1	2	2

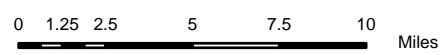
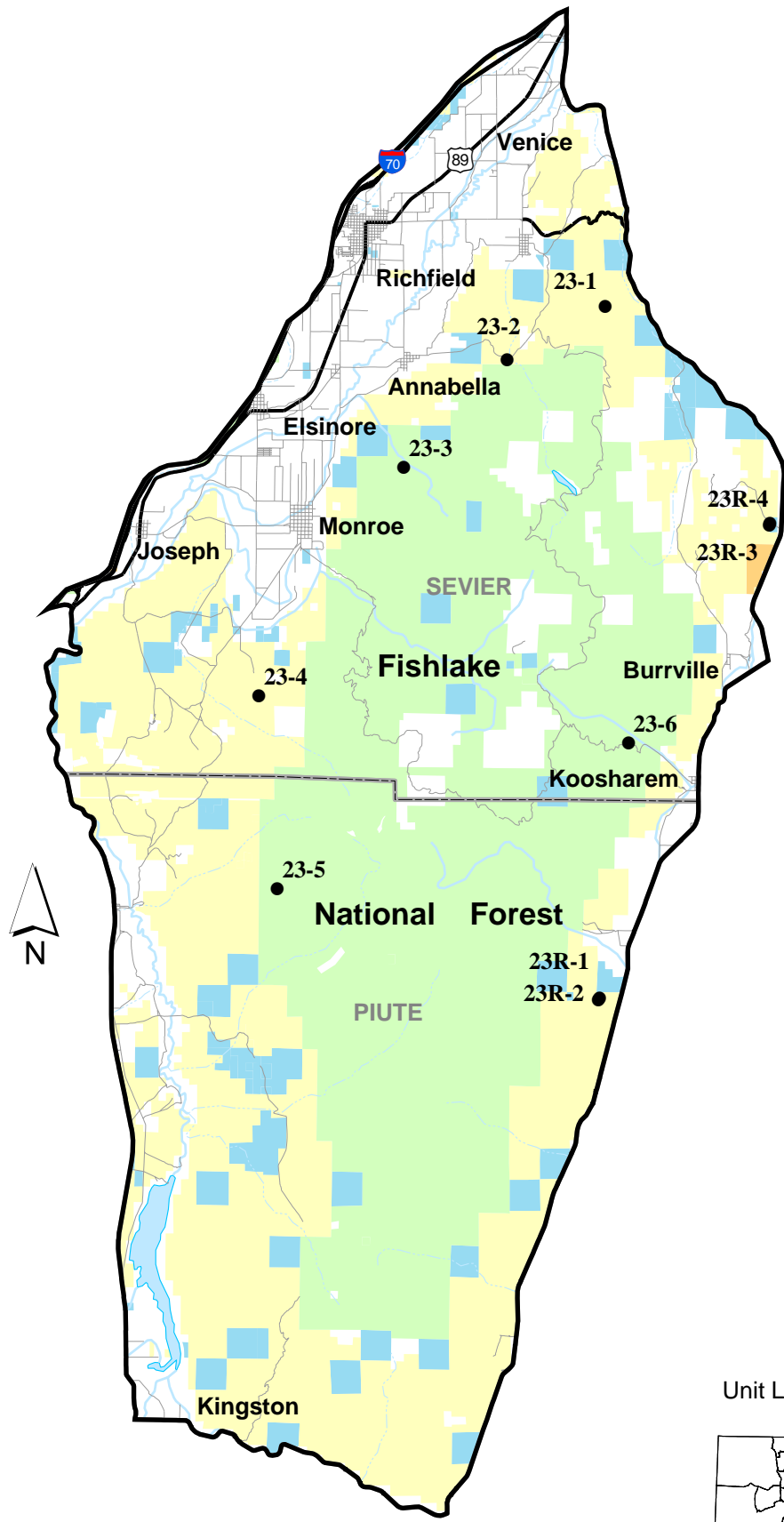
(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
 (est) = established, (n/a) = no trend, (susp) = suspended, (NR) = not read

	Category	1985	1991	1998	2003
22-9 Rocks Reseeding	soil	est	1	3	2
	browse	est	3	4	2
	herbaceous understory	est	1	3	3
22-10 Doubleup Hollow	soil	est	2	3	3
	browse	est	1	3	3
	herbaceous understory	est	2	3	1
22-11 "B" Hill	soil	est	1	4	3
	browse	est	2	3	2
	herbaceous understory	est	4	1	3
22-12 Big Cedar Cove	soil	est	2	2	3
	browse	est	2	3	2
	herbaceous understory	est	5	3	3
22-13 Minersville Reservoir	soil	est	1	1	1
	browse	est	3	1	1
	herbaceous understory	est	4	2	4
22-14 Antelope Mountain	soil	est	3	2	5
	browse	est	1	1	n/a
	herbaceous understory	est	5	3	3
	Category			1998	2003
22-15 South Creek	soil			est	2
	browse			est	2
	herbaceous understory			est	2
	Category			1999	2003
22R-4 Above Fremont Wash	soil			est	3
	browse			est	3
	herbaceous understory			est	3

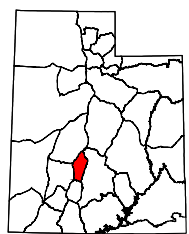
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Management Unit 23

- Transect location
- Forest Service
- BLM
- State of Utah
- Native American
- Private
- Water body
- County boundary
- Stream or river
- Ditch or canal
- Intermittent stream
- Major road
- Other road



Unit Location



WILDLIFE MANAGEMENT UNIT 23 - MONROE

Boundary Description

Piute and Sevier counties - The boundary begins at Interstate 70 and highway U.S. 89 at Sevier; then south on US-89 to highway SR-62; then east and north on SR-62 to highway SR-24; then 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 at 11,223 feet and Monroe Peak at 11,227 feet are the elevational high points. 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 unit's elk and deer herds. 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 unit's 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 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-juniper made up 62% of the winter range with 13% of this made up 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, percent preferred browse made up 14%, 18%, and 39% of these vegetative types respectively. The pinyon-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. Estimate of total acreage for normal winter range is 146,000 acres. Mann (1985) determined how much additional acreage would be needed. It was estimated to be approximately 2,026 acres that needed to be acquired from private landowners to help maintain the herd at its present numbers.

The summer range is in fairly good condition despite a history of overgrazing by livestock. More restrictive grazing plans have resulted in an upward trend in vegetative composition and vigor in recent years. The gentle topography, abundance of water with an interspersed forage and cover provide quality fawning, calving, and summering areas for both deer and elk. Fawn production and survival is normally good. The ratio of fawns per 100 does was 82 between 1975-84 (Jense et al. 1985). It had fallen to 76 fawns/100 does with the prolonged drought from 1986 to 1990 (Jense et al. 1991). The ratio declined further in 1997-98 to

only 58 fawns per 100 does but rebounded some by 1998-99 to 67. 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 units 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.

Big Game Harvest History and Management Objectives

The Monroe Mountain unit has been a productive deer unit providing excellent hunting opportunities in the past. Between 1951 and 1971, an average of 1,456 bucks were taken for a yearly hunter success rate averaging over 75% (Jense et al. 1985). A combination of over harvesting does during the either sex hunts of 1971 and 1972, a drought during 1974-75 and the devastating winters of 1972-73 and 1978-79, resulted in low populations in the late 1970's and early 1980's, but the herd rebounded somewhat since. The lower deer numbers reduced pressure on the browse, and combined with good water years from 1982 through 1985, resulted in improved range conditions. Because of the great variations in deer harvest through time, a regression of deer harvest from 1950 to 1990 gives a more realistic indication of overall trend through the last forty years. The regression of the harvest trend actually shows a 5% decline. The current (1998) unit management goals are to maintain a target population of 7,500 wintering deer with a post season herd composition of 15 bucks to 100 does with 30% of the bucks being 3 point or better (DeBloois 2001).

The Monroe Mountain elk herd unit boundaries are the same as the deer herd unit boundaries. The first elk hunt was held in 1982. Ten bull permits have been issued each year since, with 21 mature bulls and 3 spikes harvested during the 1982, 1983 and 1984 hunts (Jense et al. 1985). Since 1985, the number of bull permits have remained about the same until 1990 with a more than 30% increase in permits and over 50 antlerless permits. Total permits dropped to 11 limited entry bull permits in 1997 and 21 in 1998 (Hodson 2000). The current management goals are to achieve a target modeled population of 1,800 elk with a minimum post season bull to cow ratio of 20:100 with at least 10 of these bulls being 2½ years of age or older. The bull harvest objective is to manage for an average age of harvested bull from 7 to 9 years old (DeBloois 2001).

Trend Study Site Description

Bear Ridge, Saul Meadow, Thompson Basin, Poverty Flat, Smith Canyon and Koosharem Canyon were chosen as study sites by an interagency committee of Forest Service, BLM, and DWR personnel. These permanent range trend transects were established and read in 1985, and reread in 1991, 1998 and 2003. In addition, 2 new studies were established near Greenwich in 1997 to monitor a sagebrush disking treatment and 2 studies were established in 1999 to monitor a sagebrush harrow treatment near Koosharem Reservoir. These 4 studies were reread in 2003.

Trend Study 23-1-03

Study site name: Bear Ridge.

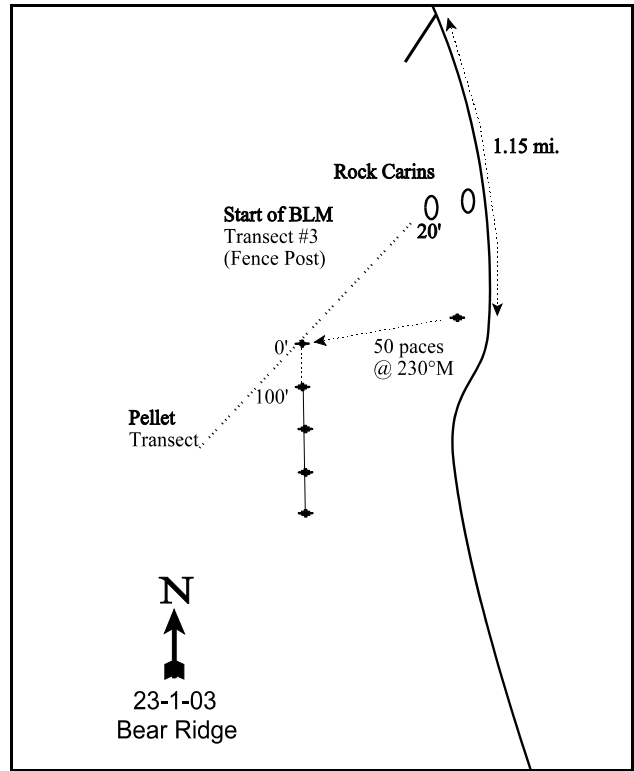
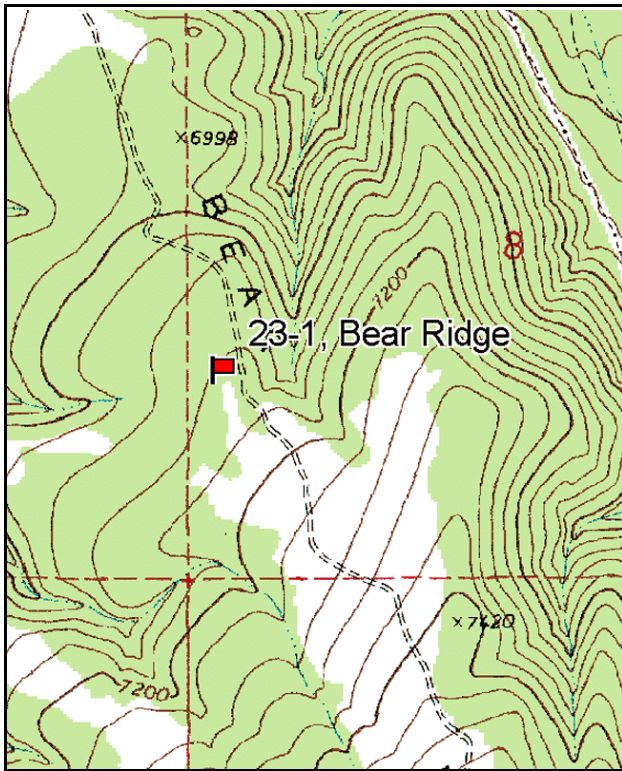
Vegetation type: Juniper-Pinyon.

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 1ft, belt 2 on 7ft.

LOCATION DESCRIPTION

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 27, UTM 12S 4287488 N, 418334 E

DISCUSSION

Bear Ridge - Trend Study No. 23-1

This trend study is located near the top of Bear Ridge. It has a gentle slope (5-10%) and a southwest aspect. The ridge is covered by a mature pinyon-juniper stand with a fairly abundant understory of shrubs and herbaceous vegetation. The 7,000 foot elevation is still within the limits of normal winter range. The range trend study samples the same area as the DWR Bell Rock pellet group transect. Counts from this pellet transect showed that deer use was relatively stable through 1985 with an average of 9 deer days use/acre (22 ddu/ha) (Jense et al. 1985). The average at that time was low when compared to data from the other pellet group transects in the unit. Deer use from 1985 to 1991 averaged almost 15 deer days use/ acre (36 ddu/ha) (Jense et al. 1991). There was no sign of elk use at that time. A pellet group transect read along the trend study site baseline in 1998 and 2003 estimated 52 and 54 deer days use/acre respectively (128 ddu/ha and 134 ddu/ha). A small amount of elk use was noted during both readings. Livestock grazing pressure appears to be light on this BLM land and no sign of cattle grazing was noted in 1998 or 2003.

The soil is covered by a layer of erosion pavement and rocks with small patches of bare soil exposed. Vegetation cover is abundant but consists mostly of shrub and tree canopy cover. Erosion is not a problem due to the gentle terrain. The erosion condition class was determined to be stable in 2003. Soil texture is a loam and neutral in reactivity (pH 7.3). Effective rooting depth is estimated at just over 11 inches with a moderately high soil temperature of 62° F (for this elevation) at almost 13 inches in depth in 2003. The amount of phosphorus in the soil is slightly low at 9 ppm, while percent organic matter is relatively high at 3.4%.

Pinyon and juniper trees are abundant and are beginning to effect the understory of shrubs and herbaceous species. Point-centered quarter data from 2003 estimated 197 juniper trees/acre with an average diameter of 7 inches and 119 pinyon trees/acre with an average diameter of 5 inches. Approximately 40% of the pinyon trees sampled were in the 4 to 8 foot height range while 45% of the juniper were over 12 feet in height. Line intercept canopy cover for pinyon and juniper trees was estimated at 32% in 2003. This high of a density and cover will decrease understory production.

Mountain big sagebrush, black sagebrush, and antelope bitterbrush are all important browse species on this site. Black sagebrush is the most abundant preferred browse species with a relatively stable density of 1,300 plants/acre in 1998 and 1,140 in 2003. Use was heavy in 1985 and 1991, but light to moderate in 1998 and 2003. The number of decadent plants was also high in 1985 and 1991, estimated at 53% and 77% of the population respectively. Percent decadence declined to 34% of the plants sampled in 1998, then increased to 53% in 2003. The population appears to be in a state of decline due to the lack of seedlings and young plants, combined with a high number of decadent plants. Drought and competition from pinyon and juniper trees is likely major driving force in this trend.

Mountain big sagebrush also appears to be in state of decline. Due to the shallow and rocky nature of the soil, this site is likely marginal for mountain big sagebrush. It has had a relatively stable density of around 1,200 plants/acre since 1985, but decadence has always been high averaging 62% between 1985 and 1998. However, reproduction appears to have been adequate to maintain the population up until 1998. Mountain big sagebrush density was estimated at only 840 plants/acre in 2003. Nearly 70% of the population was classified as decadent with 59% of those plants rated as dying (>50% crown death). No seedlings were encountered in 1998 or 2003, although young plants accounted for 9% and 14% of the population respectively. Poor vigor and decadence numbers are nearly identical to 1998. Annual leader growth for mountain big sagebrush was poor averaging only 1 inch in 2003. Utilization has remained light to moderate since 1991.

Bitterbrush occurs in smaller numbers, yet produced more cover than sagebrush in 2003. The average mature plant is around 2 feet in height with a crown diameter of 4 to 5 feet. Bitterbrush has received consistently moderate to heavy use since 1985, yet the plants have maintained good vigor. Annual leader growth was excellent in 2003, averaging 4 inches. Nearly one-third of the population was decadent in 1991, declining to only 8% in 1998. Decadence again increased in 2003 to 24%. Although recruitment was poor in 1998 and 2003, the population appears stable.

Herbaceous vegetation is not particularly abundant producing a cover value of 12% in 1998 and only 7% in 2003. Perennial grasses dominate the herbaceous composition. Large, vigorous bluebunch wheatgrass plants are most common. They have a high yield and good forage value on spring and early summer ranges. Sandberg bluegrass, bottlebrush squirreltail, and Indian ricegrass are also fairly common. Forbs are almost nonexistent on this site.

1985 APPARENT TREND ASSESSMENT

The soil appears stable although vegetative conditions appear to be in a state of decline. The pinyon-juniper overstory is closing in and due to heavy use coupled with competition with the trees, there is little reproduction of the key browse species. Chaining and seeding would help restore the area, but treatment is not yet critical as forage production and erosion control are still within acceptable limits.

1991 TREND ASSESSMENT

With the increase in bare ground from 10% to 15%, and percent cover for rock and pavement decreasing to 30%, the trend would be considered slightly down as vegetative basal cover is barely 6%. The key browse species, black sagebrush, mountain big sagebrush, and bitterbrush all show different stages of a downward trend. Black sagebrush didn't change much in density, but percent decadence went from 53% to 77%. Mountain big sagebrush lost 24% of its population with the proportion of the population classified as decadent also increasing. Bitterbrush density decreased by 13% and percent decadence increased to 29%. The herbaceous species show a slight upward trend for grasses and forbs. There are still very few forbs present on the site, although quadrat frequency and nested frequency values have increased for the most part.

TREND ASSESSMENT

soil - slightly downward (2)

browse - downward (1)

herbaceous understory - slightly upward (4)

1998 TREND ASSESSMENT

The trend for soil is slightly downward again. Percent bare soil has increased to 21%. The ratio of protective cover to bare soil is also marginal. This site is basically becoming more dominated by juniper and pinyon and its effect on the understory species has been intensified by drought. The trend for browse is stable. Black sagebrush which contributes to 11% of the browse cover, displays improved vigor and lower decadence. Mountain big sagebrush (makes up 13% of the browse cover) has most of its measured parameters showing a stable trend, but overall health of the stand is poor. Currently, 68% of the population is dead with percent decadence remaining high at 67%. Bitterbrush, which provides 16% of the browse cover, shows some improvement. Utilization is lighter, vigor good and the number of decadent plants has declined from 29% in 1991 to 8% currently. The herbaceous understory trend is stable. Sum of nested frequency for perennial grasses and forbs remained similar to 1991. Nested frequency of the most abundant species, bluebunch wheatgrass declined significantly although other perennial grasses increased significantly. However, the herbaceous species still barely provide 12% total cover. Forbs are rare and contribute less than one percent cover and provide little cover or forage.

TREND ASSESSMENT

soil - slightly downward (2)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil has improved since 1998. Percent cover of bare ground has declined to 13%, while litter and vegetation cover have increased slightly. There is excellent protective ground cover to help prevent erosion. The erosion condition class was determined as stable in 2003. Trend for the key browse species is down slightly. Density has declined slightly for black and mountain big sagebrush while poor vigor and the number of decadent plants has increased. Recruitment remains poor. Bitterbrush is more stable but percent decadence has increased from 8% to 24%. Use was mostly heavy in 2003. The large difference in bitterbrush density between 1998 and 2003 appears to be due to a problem in differentiating between individual mature plants in 1998. Cover and strip frequency remained similar between 1998 and 2003, suggesting that the true population density is closer to the 420 plants/acre estimated in 2003. Trend for the herbaceous understory is stable but poor. Total herbaceous cover was estimated at only 7% in 2003. The most abundant grasses remained stable in nested frequency even though sum of nested frequency of perennial grasses declined slightly. Forbs are still rare.

TREND ASSESSMENT

soil - up slightly (4)

browse - down slightly (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 23 , Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	_b 227	_b 227	_a 183	_a 160	7.78	5.59
G	Bromus tectorum (a)	-	-	_b 42	_a 15	.43	.03
G	Oryzopsis hymenoides	4	12	12	5	.17	.04
G	Poa fendleriana	_a 6	_{bc} 36	_c 49	_{ab} 24	.98	.46
G	Poa secunda	_a 3	_a 18	_b 94	_b 80	2.00	.94
G	Sitanion hystrix	_c 25	_{bc} 20	_{ab} 6	_a 2	.01	.01
Total for Annual Grasses		0	0	42	15	0.43	0.03
Total for Perennial Grasses		265	313	344	271	10.95	7.05
Total for Grasses		265	313	386	286	11.39	7.08
F	Agoseris glauca	_a -	_a 10	_{ab} 1	_a -	.00	-
F	Arabis spp.	_a -	_b 18	_a 1	_a 1	.00	.00
F	Astragalus convallarius	2	4	6	6	.15	.10
F	Calochortus nuttallii	4	8	-	-	-	-
F	Chaenactis douglasii	-	-	1	-	.03	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Comandra pallida	-	-	3	-	.03	-
F	Collinsia parviflora (a)	-	-	3	-	.00	-
F	Crepis acuminata	-	6	7	-	.06	-
F	Eriogonum racemosum	-	-	4	-	.03	-
F	Eriogonum umbellatum	_a -	_a 1	_b 9	_{ab} 5	.16	.07
F	Lomatium spp.	-	-	1	-	.00	-
F	Phlox austromontana	-	6	4	6	.16	.15
F	Physaria chambersii	1	4	-	-	-	-
F	Phlox longifolia	_a 8	_b 27	_a 16	_a 6	.20	.02
F	Unknown forb-perennial	3	1	-	-	-	-
Total for Annual Forbs		0	0	3	0	0.00	0
Total for Perennial Forbs		18	85	53	24	0.83	0.35
Total for Forbs		18	85	56	24	0.84	0.35

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	'98	'03
B	Artemisia nova	35	26	2.24	2.41
B	Artemisia tridentata vaseyana	40	26	2.54	.76
B	Chrysothamnus depressus	1	0	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	.15	-
B	Gutierrezia sarothrae	2	0	-	-
B	Juniperus osteosperma	4	5	5.51	9.29
B	Opuntia spp.	1	2	.15	-
B	Pinus edulis	4	6	5.99	8.81
B	Purshia tridentata	18	15	3.20	4.31
Total for Browse		106	80	19.79	25.60

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 1

Species	Percent Cover	
	'98	'03
Artemisia nova	-	1.85
Artemisia tridentata vaseyana	-	.55
Juniperus osteosperma	7.19	23.31
Pinus edulis	2.59	8.94
Purshia tridentata	-	3.86

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 1

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

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 1

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	213	197
Pinus edulis	115	119

Average diameter (in)	
'98	'03
8.8	7.0
4.8	5.3

BASIC COVER --

Management unit 23 , Study no: 1

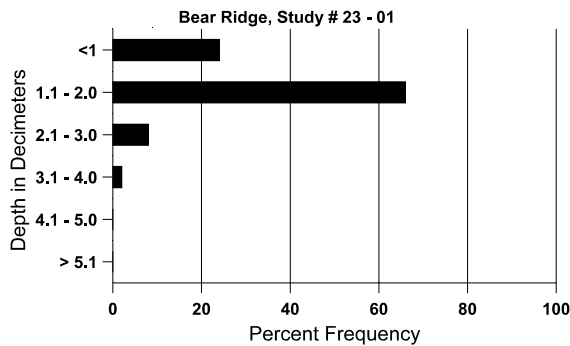
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	2.00	5.75	30.04	32.50
Rock	6.00	5.25	11.18	13.20
Pavement	30.50	24.25	26.32	19.74
Litter	46.50	46.50	42.49	37.44
Cryptogams	5.00	3.00	.93	3.45
Bare Ground	10.00	15.25	21.42	13.10

SOIL ANALYSIS DATA --

Management unit 23, Study no: 1, Study Name: Bear Ridge

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

Stoniness Index



PELLET GROUP DATA --

Management unit 23, Study no: 1

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

BROWSE CHARACTERISTICS --

Management unit 23, Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
85	2266	133	200	866	1200	-	50	47	53	24	13/21
91	2265	66	66	466	1733	-	32	24	77	21	9/16
98	1300	-	80	780	440	860	49	0	34	9	16/23
03	1140	-	20	520	600	880	9	0	53	18	15/25
Artemisia tridentata vaseyana											
85	1400	266	200	400	800	-	67	24	57	14	13/15
91	1065	333	333	66	666	-	19	6	63	38	12/13
98	1100	-	100	260	740	2300	56	2	67	40	15/23
03	840	-	120	140	580	1740	29	0	69	40	14/21

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus depressus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus											
85	400	-	200	200	-	-	0	0	-	0	12/11
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	10/12
03	0	-	-	-	-	-	0	0	-	0	-/-
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	9/9
03	0	-	-	-	-	-	0	0	-	0	6/5
Juniperus osteosperma											
85	266	66	66	200	-	-	0	0	-	0	69/64
91	333	66	133	200	-	-	20	40	-	20	152/98
98	80	40	40	40	-	-	0	0	-	0	-/-
03	100	-	60	40	-	-	0	0	-	0	-/-
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	60	20	40	20	-	-	0	0	-	0	8/12
03	40	-	-	40	-	-	0	0	-	0	6/14
Pinus edulis											
85	133	-	-	133	-	-	0	0	-	0	69/64
91	133	-	-	133	-	-	0	0	-	0	133/104
98	80	20	-	80	-	-	0	0	-	0	-/-
03	120	20	40	80	-	-	0	0	-	0	-/-
Purshia tridentata											
85	533	133	200	333	-	-	63	0	0	0	24/42
91	466	-	133	200	133	-	43	43	29	0	19/35
98	760	40	40	660	60	100	37	0	8	5	22/41
03	420	-	20	300	100	20	43	48	24	0	27/59

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Tetradymia canescens</i>											
85	66	-	-	66	-	-	100	0	-	0	7/4
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 23-2-03

Study site name: Saul Meadow .

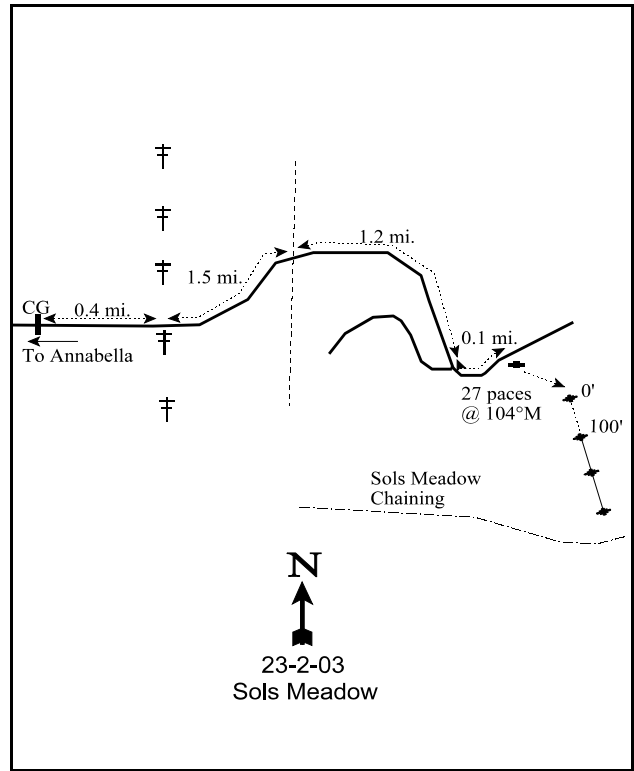
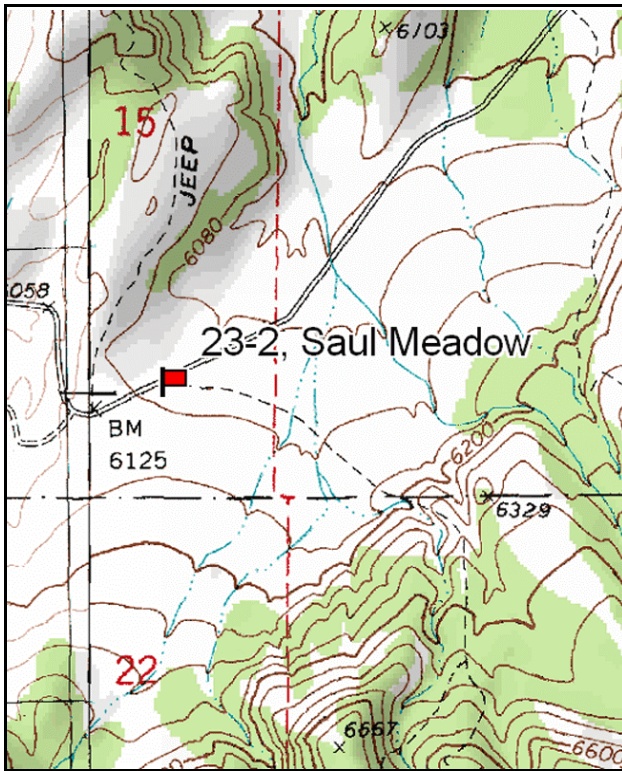
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 167 degrees magnetic.

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

LOCATION DESCRIPTION

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 27, UTM 12S 4284668 N, 413213 E

DISCUSSION

Saul Meadow - Trend Study No. 23-2

The Saul Meadow trend site is located on BLM land that was chained and aerially seeded with crested wheatgrass in 1965. Some juniper trees have become reestablished, but Wyoming big sagebrush is presently the dominant species. Point-centered quarter data estimated juniper density at only 19 trees/acre in 1998, with an average diameter at just over 5 inches. All juniper trees on the site were hand cut sometime prior to the 2003 reading and no live trees were encountered. Currently, the seeding has permits for 22 AUM's for cattle in May, June, and October. Sheep do not use this portion of the allotment. Deer use has generally been moderate in the area as determined by the DWR Maple Creek pellet group transect. A pellet group transect read parallel to the trend study baseline in 1998 and 2003 estimated moderately heavy to moderate deer use at respectively 97 deer days use/acre (239 ddu/ha) and 59 deer days use/acre (146 ddu/ha). Elk use was estimated at 19 days use/acre (47 edu/ha) in 1998 and 10 days use/acre (25 edu/ha) in 2003. Cattle use was low during both readings.

The site is located on a dry, gentle northeast facing slope (3-5%) on the northwest side of the Monroe Mountains. The soil developed on an old alluvial fan from sandstone, shale, quartzite, and limestone parent materials. The light-brown soil is a sandy loam which is neutral in reactivity (pH 6.6). Effective rooting depth was estimated at almost 17 inches with a relatively cool average soil temperature of 55° F at 18 inches in depth in 1998. Soil temperature was much higher in 2003, averaging 79° F at just over 12 inches in depth. This trend study was read in July of 1998 and July of 2003. The difference in soil temperature is related to soil moisture, indicating a much drier soil profile in 2003 compared to 1998. Precipitation data from 2003 indicate drier than normal conditions in 2001 and 2002. Spring precipitation (April - June) was only 44% of normal in 2003, resulting in a much drier soil profile compared to 1998. Organic matter content is comparatively low at only 1.2%, indicating a low site potential. Phosphorus is also low at 8.6 ppm, which could be a limiting factor to plant development. Litter and vegetative cover are good around and under the sagebrush plants and junipers, although the interspaces are mostly bare soil or have a cover of annuals and pavement. Erosion has not been a serious problem because of the negligible slope, but should be monitored closely. The erosion condition class was determined to be stable in 2003.

The key browse species is Wyoming big sagebrush. The sagebrush population appeared healthy and expanding in 1985 and 1991. Seedlings and young plants were abundant. Most of the larger plants were moderately hedged, but some individuals had been heavily browsed. The more heavily browsed plants were hybrids between Wyoming big sagebrush and mountain big sagebrush. The larger sample used in 1998 estimated 2,840 plants/acre. Use was moderate and vigor normal on most plants. The number of decadent plants was moderately high at 44%. Density remained similar in 2003, at just over 3,000 plants/acre. Use was mostly light. The number of decadent plants decreased and the number of young plants increased to 31% of the population.

Cover and diversity of herbaceous species is low. The most common perennial species is crested wheatgrass. It grows tall and vigorous, but only under the protection of the sagebrush. Cheatgrass grows mostly in the shrub interspaces providing 61% of the herbaceous cover in 1998 and 43% in 2003. Forbs are rare and consist mostly of small, low-value annuals.

1985 APPARENT TREND ASSESSMENT

Soil conditions appear stable. Soil movement is kept to a minimum by the gentle terrain. In terms of the key species, their form, vigor, and age class distribution appear stable. However, the community is slowly changing as many junipers, not controlled with the chaining, have been released from adult competition and are quickly growing to maturity.

1991 TREND ASSESSMENT

Most measured parameters for soil did not change except for percent pavement and bare ground. Bare ground increased from 21% to 31%, while percent pavement decreased from 25% to 16%. This increase in bare ground indicates a slight downward trend for soil which should be watched closely. This could be just an effect of the drought, which effects litter and vegetative cover. The Wyoming big sagebrush has shown an increase of 16% in it's population, but it's percent decadency has gone up from 12% to 52%. Another critical parameter is that the percentage of the population that is expressing poor vigor has gone from 5% up to 24% in 1991. These downward changes could directly be attributed to the extended drought, but percent decadency and vigor should improve with more normal precipitation patterns. There are not very many species of grasses or forbs on the site. However, trend for herbaceous understory is up slightly since the last inventory.

TREND ASSESSMENT

soil - slightly downward (2)

browse - slightly downward (2)

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

1998 TREND ASSESSMENT

Trend for soil is slightly up with percent bare soil decreasing from 31% to 22%. The only key browse species is Wyoming big sagebrush, which is continuing to show downward trends for most of the measured parameters. Trend for browse is down slightly. Trend for the herbaceous understory is stable, with sum of nested frequency remaining relatively unchanged.

TREND ASSESSMENT

soil - slightly up (4)

browse - down slightly (2)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is considered down slightly. Percent cover of bare ground has increased from 22% to 35%, and conversely, litter and vegetation cover have declined. However, there is not much erosion occurring due to the gentle terrain. Trend for the key browse species, Wyoming big sagebrush, is up slightly. Density and average vigor are similar to 1998 estimates, although the number of decadent plants has declined from 44% to 28%. Use is mostly light with young plants being more abundant, accounting for 31% of the population. Trend for the herbaceous understory is stable but poor. The only common perennial grass, crested wheatgrass, has remained stable for nested frequency. One positive aspect of the herbaceous trend is the decline in nested frequency and cover of cheatgrass. Forbs are rare and consist of a few annual species.

TREND ASSESSMENT

soil - down slightly (2)

browse - up slightly (4)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 23 , Study no: 2

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	97	114	132	135	7.03	6.89
G	Bromus tectorum (a)	-	-	_b 252	_a 228	11.73	5.92
G	Sitanion hystrix	_a 4	_b 26	_{ab} 10	_{ab} 11	.45	.31
G	Vulpia octoflora (a)	-	-	-	7	-	.01
Total for Annual Grasses		0	0	252	235	11.73	5.94
Total for Perennial Grasses		101	140	142	146	7.49	7.20
Total for Grasses		101	140	394	381	19.22	13.14
F	Alyssum alyssoides (a)	-	-	2	4	.00	.01
F	Eriogonum cernuum (a)	6	5	-	-	-	-
F	Euphorbia spp.	-	-	2	-	.00	-
F	Gayophytum ramosissimum(a)	-	-	3	3	.00	.00
F	Ranunculus testiculatus (a)	-	-	_a -	_b 13	-	.06
F	Sisymbrium altissimum (a)	_a -	_b 19	_a -	_b 19	-	.65
F	Stephanomeria pauciflora	3	-	-	-	-	-
Total for Annual Forbs		6	24	5	39	0.00	0.72
Total for Perennial Forbs		3	0	2	0	0.00	0
Total for Forbs		9	24	7	39	0.01	0.72

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

BROWSE TRENDS --
Management unit 23 , Study no: 2

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	78	75	12.83	14.86
B	Atriplex canescens	0	1	-	-
B	Gutierrezia sarothrae	2	0	-	-
B	Juniperus osteosperma	3	0	2.00	-
B	Opuntia spp.	4	2	-	-
Total for Browse		87	78	14.83	14.86

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 2

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	12.03
Juniperus osteosperma	1.39	-
Opuntia spp.	-	.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 2

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.4

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 2

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	19	N/A

Average diameter (in)	
'98	'03
5.4	N/A

BASIC COVER --

Management unit 23 , Study no: 2

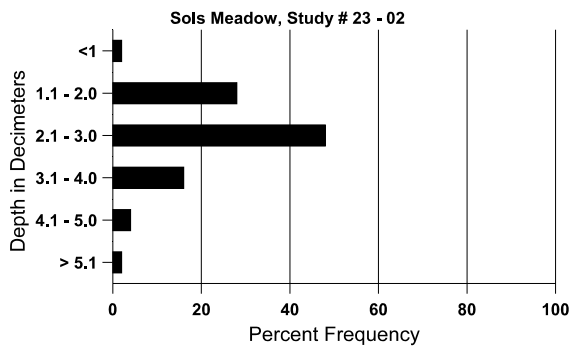
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	5.00	3.75	31.53	27.32
Rock	5.00	2.00	4.00	4.58
Pavement	25.00	16.00	7.97	8.46
Litter	44.25	46.00	45.56	36.73
Cryptogams	0	1.50	1.85	1.64
Bare Ground	20.75	30.75	21.92	34.51

SOIL ANALYSIS DATA --

Management unit 23, Study no: 2, Study Name: Saul Meadow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
16.9	79.0 (12.1)	6.6	62.0	19.4	18.6	1.2	8.6	115.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 23 , Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	57	68	-	-
Elk	11	3	18 (44)	10 (25)
Deer	52	36	94 (232)	59 (145)
Cattle	1	2	4 (10)	1 (4)

BROWSE CHARACTERISTICS --

Management unit 23 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	5398	600	2266	2466	666	-	36	22	12	5	18/23
91	6399	200	1133	1933	3333	-	25	1	52	24	26/30
98	2840	40	240	1340	1260	1520	45	4	44	14	24/31
03	3060	40	940	1260	860	1500	12	1	28	13	24/32
Atriplex canescens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	6/8
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	-	60	-	-	0	0	-	0	-/-
03	0	-	-	-	-	20	0	0	-	0	-/-
<i>Opuntia spp.</i>											
85	1599	-	333	1000	266	-	0	0	17	8	4/9
91	1332	66	400	866	66	-	15	0	5	0	5/6
98	80	-	-	60	20	20	0	0	25	25	4/6
03	40	-	-	40	-	-	0	0	0	0	6/16

Trend Study 23-3-03

Study site name: Thompson Basin.

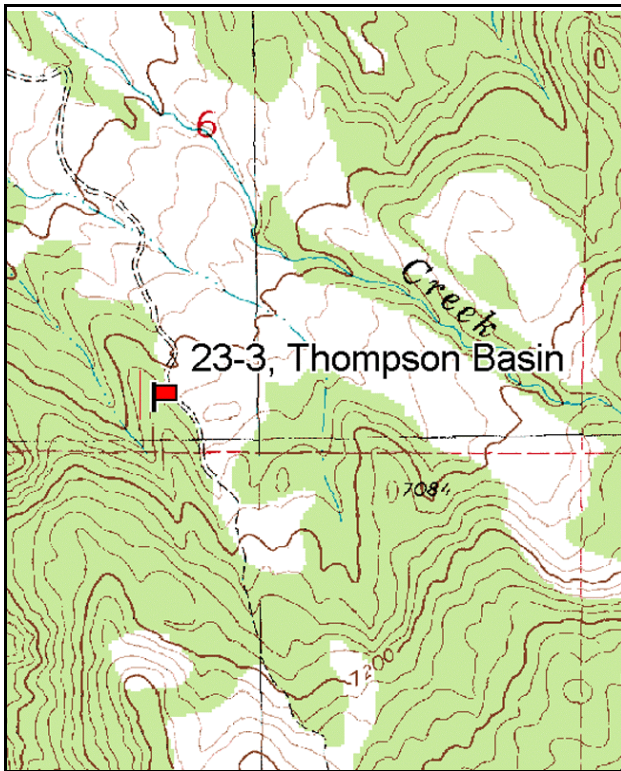
Vegetation type: Juniper-Pinyon.

Compass bearing: frequency baseline 180 degrees magnetic. (Lines 2 & 3 155°M)

Frequency belt placement: line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft). No rebar.

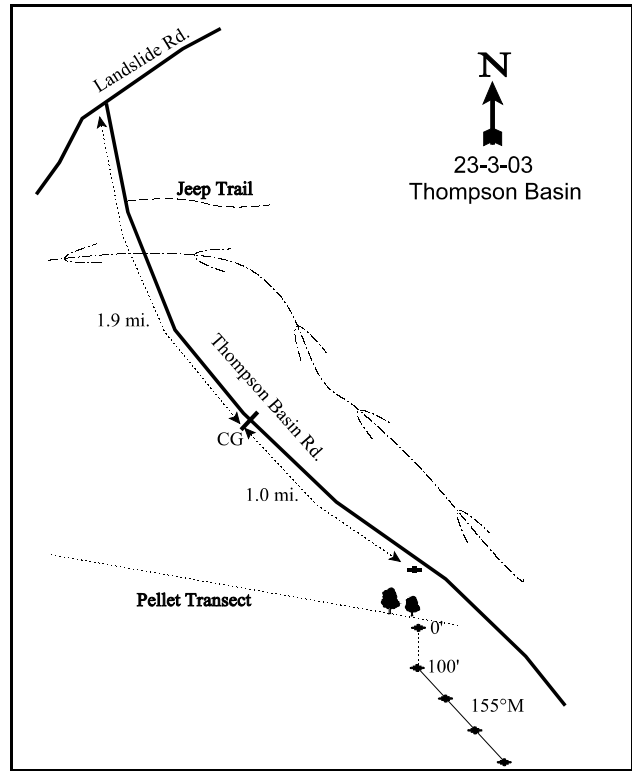
LOCATION DESCRIPTION

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

Township 25S, Range 2W, Section 6



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4279063 N, 407808 E

DISCUSSION

Thompson Basin - Trend Study No. 23-3

This trend study is located on a moderately steep (25%) juniper covered slope above Thompson Basin. The study is at an elevation of 6,800 feet with a northeast aspect. An area below the transect was chained about 20 years ago by the Forest Service. A fire has also gone through the area approximately 25 years ago. Thompson Basin has been noted historically as a concentration area for deer during the winter. Deer pellet groups are frequently encountered. A DWR pellet group transect, which intersects the trend study, indicated a 5 year average of 32 deer days use/acre (80 ddu/ha) between 1980 and 1985 (Jense et al. 1985). The 6 year average from 1986 to 1991 was only 9 deer days use/acre (21 ddu/ha) (Jense et al. 1991). A pellet group transect read in association with the vegetative transect in 1998 estimated 21 deer days use/acre (52 ddu/ha) and 12 elk days use/acre (30 edu/ha). Data from 2003 estimated 26 deer and 9 elk days use/acre (65 ddu/ha and 23 edu/ha). The site provides good thermal cover but little forage for wintering big game. In the past, the slopes were heavily grazed by both sheep and deer. However, the Forest Service has now closed the area to livestock grazing to protect watershed values.

Ground cover is dominated by large rocks and pavement. Soil texture is a sandy clay loam that is neutral in reactivity (pH 6.6). Effective rooting depth is estimated at 13 inches. Soil temperature is relatively high for a site at this elevation and aspect, averaging 75° F at 10 to 14 inches in depth in 1998 and 2003. The steep slope has a moderate to severe erosion potential. The cover provided by the bunch grasses and the low amount of bare soil helps keep erosion to a minimum. However, there are a few large active gullies on the hillside and in the valley.

The dominant overstory is a mixture of mature juniper and pinyon. The older junipers show evidence of high-lining, but the younger trees do not show this characteristic yet. All are vigorous. There was a high proportion of seedlings and young in the population when it was first read in 1985. Point-center quarter data from 1998 estimated 99 juniper trees/acre and 72 pinyon trees/acre. Average diameter of juniper was almost 10 inches, while pinyon averaged only about 4 inches indicating the invasion of pinyon into the juniper. Overhead canopy cover for juniper and pinyon was estimated at 23% in 1998 and 34% in 2003. This amount of canopy cover will decrease productivity of the understory. Tree density remained similar in 2003, at 97 juniper trees/acre and 63 pinyon trees/acre. Average diameter of juniper was estimated at 8 inches while pinyon averaged 5 inches.

Mountain big sagebrush is the principal key browse species. It had a relatively low density of only 1,000 plants/acre in 1998 and 2003. In 1985, the sagebrush appeared vigorous and seemed to be recovering from heavy browsing pressure of the past, especially the hard winter's of 1982-84. The mature plants showed light to moderate use of the current year's growth. The majority of the plants were classified as mature and decadent. No seedlings were encountered in 1985 or 1991. Percent decadence peaked at 55% in 1991, declining to 30% by 1998. This is still moderately high for a healthy sagebrush population. By 2003, the number of decadent plants increased upward again to 42% and the number of shrubs displaying poor vigor also increased from 10% to 24%. It appears that the trend for sagebrush is slowly declining due to competition with the juniper and pinyon overstory in conjunction with drought.

Grasses are fairly abundant in the interspaces. Mutton and Sandberg bluegrass's are the most abundant, followed by bluebunch wheatgrass and bottlebrush squirreltail. The grasses provide important ground cover, some winter forage, and are valuable in spring as early green forage. Forbs are sparse, with the more common species being desert and longleaf phlox.

1985 APPARENT TREND ASSESSMENT

There is some soil movement and erosion from the hillside, but the grass and sagebrush cover aides in infiltration and stabilizes the slope. The slow increase in the density of pinyons and junipers threatens the understory plants and increases erosion potential. The character of the soil and steepness of the slope make chaining very difficult. However, firewood cutting could be encouraged to maintain open canopy in this area.

1991 TREND ASSESSMENT

The soil trend appears to be slightly down, with percent bare ground increasing from 11% up to almost 20%. Most sites have shown this same pattern with the extended drought (1986-1990). The numerous large rocks setting on the soil surface indicate that there has been considerable soil loss in the past. This should be monitored closely because of the steepness of the slope. Mountain big sagebrush has declined slightly in density in conjunction with an increase in percent decadency from 33% to 55%. The percentage of plants that are heavily hedged and classified with poor vigor have also increased. Low rabbitbrush has not increased in numbers since the last inventory. The trend for browse is down slightly. The herbaceous understory has improved, with almost all nested frequency values for both grasses and forbs increasing.

TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - up (5)

1998 TREND ASSESSMENT

The trend for soil is stable with percent bare soil decreasing to about 8%. Rock and pavement cover has remained high at almost 57%. Mountain big sagebrush density has declined slightly along with a large number of dead plants being sampled. Percent decadence has decreased, but it is still relatively high at 30%. Trend for the key browse is down slightly because seedling and young recruitment is still fairly low. Trend for the herbaceous understory is down due to a decline in the sum of nested frequency values for both the grasses and forbs. Nested frequency of the dominant perennial grasses, bluebunch wheatgrass, mutton and Sandberg bluegrass, all declined significantly.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - down (1)

2003 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in percent bare ground and a decline in vegetation and litter cover. Erosion is not a problem yet. The erosion condition class was determined to be stable in 2003. Trend for mountain big sagebrush is down slightly. Density has remained stable but the number of decadent plants increased to 42% of the population. In addition, 57% of the decadent plants sampled were classified as dying (>50% of crown dead). Young recruitment has improved slightly, yet it is not adequate to maintain the stand if current precipitation trends continue. Competition with pinyon and juniper trees is also a major factor. Canopy cover (line-intercept) of these trees was estimated at 34% in 2003. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses declined slightly, while frequency of perennial forbs increased slightly. Total herbaceous production is poor averaging only 13% cover in 1998 and 8% in 2003.

TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 23 , Study no: 3

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	_a 41	_c 203	_b 124	_b 151	4.71	2.65
G	Bromus tectorum (a)	-	-	36	44	.19	.18
G	Oryzopsis hymenoides	-	-	-	2	-	.03
G	Poa fendleriana	_b 41	_c 128	_d 162	_a 7	6.05	.04
G	Poa secunda	_a 17	_c 138	_b 85	_c 148	1.00	2.59
G	Sitanion hystrix	_a 4	_b 43	_a 1	_a 1	.00	.00
Total for Annual Grasses		0	0	36	44	0.18	0.18
Total for Perennial Grasses		103	512	372	309	11.77	5.31
Total for Grasses		103	512	408	353	11.96	5.50
F	Antennaria rosea	1	3	-	-	-	-
F	Arabis spp.	_a -	_b 17	_{ab} 8	_{ab} 11	.02	.07
F	Castilleja chromosa	-	8	-	-	-	-
F	Collinsia parviflora (a)	-	-	_a -	_b 51	-	.21
F	Crepis acuminata	-	5	-	-	-	-
F	Descurainia pinnata (a)	-	-	_a -	_b 92	-	.75
F	Draba spp. (a)	-	-	-	5	-	.02
F	Erigeron eatonii	-	3	3	-	.00	-
F	Erigeron pumilus	3	6	-	-	-	-
F	Eriogonum racemosum	3	1	3	-	.03	-
F	Gilia spp. (a)	-	-	-	1	-	.00
F	Holosteum umbellatum (a)	-	-	_a -	_b 14	-	.03
F	Machaeranthera canescens	5	-	-	-	-	-
F	Phlox austromontana	_a 12	_b 52	_b 56	_b 63	1.24	1.70
F	Phlox longifolia	_a -	_c 59	_a 3	_{ab} 15	.01	.07
F	Streptanthus cordatus	-	-	1	1	.00	.00
Total for Annual Forbs		0	0	0	163	0	1.02
Total for Perennial Forbs		24	154	74	90	1.31	1.84
Total for Forbs		24	154	74	253	1.31	2.87

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	'98	'03
B	Artemisia tridentata vaseyana	40	35	4.21	4.77
B	Chrysothamnus viscidiflorus stenophyllus	0	0	-	.00
B	Gutierrezia sarothrae	0	1	-	-
B	Juniperus osteosperma	10	10	8.44	12.06
B	Opuntia spp.	12	14	.06	.04
B	Pinus edulis	4	5	4.00	6.38
Total for Browse		66	65	16.72	23.27

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 3

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	4.26
Juniperus osteosperma	16.79	25.36
Opuntia spp.	-	.03
Pinus edulis	6.00	8.44

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23 , Study no: 3

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.5

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 3

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	99	97
Pinus edulis	72	63

Average diameter (in)	
'98	'03
9.9	8.4
4.2	5.3

BASIC COVER --

Management unit 23 , Study no: 3

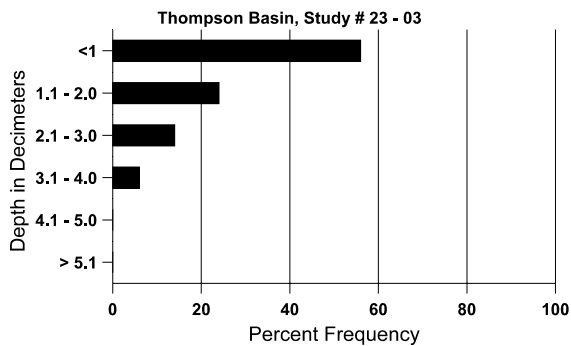
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	2.75	6.00	33.60	29.34
Rock	29.00	24.25	21.23	28.35
Pavement	18.00	14.25	17.47	14.74
Litter	38.00	35.50	42.68	30.02
Cryptogams	1.50	.75	.14	.28
Bare Ground	10.75	19.25	8.38	17.11

SOIL ANALYSIS DATA --

Management unit 23, Study no: 3, Study Name: Thompson Basin

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.7	74.7 (9.6)	6.6	54.0	19.4	26.6	2.0	10.5	166.4	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 23 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Sheep	2	-	-	-
Rabbit	23	21	-	-
Elk	4	1	11 (27)	9 (23)
Deer	12	8	21 (52)	26 (64)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
85	1599	-	133	933	533	-	46	8	33	0	11/21
91	1466	-	133	533	800	-	50	18	55	32	14/22
98	1000	60	60	640	300	720	14	0	30	10	20/29
03	1000	-	100	480	420	280	12	6	42	24	20/28
<i>Cercocarpus montanus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	22/33
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	266	-	-	133	133	-	25	0	50	0	11/14
91	266	-	-	200	66	-	25	0	25	25	11/14
98	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	8/10
<i>Ephedra viridis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	12/22
03	0	-	-	-	-	-	0	0	-	0	11/9
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	40	-	-	-	40	-	0	0	100	100	-/-
<i>Juniperus osteosperma</i>											
85	66	133	-	66	-	-	0	0	-	0	69/93
91	199	-	133	66	-	-	0	0	-	0	118/79
98	200	-	100	100	-	40	0	0	-	0	-/-
03	200	-	60	140	-	20	0	0	-	10	-/-
<i>Opuntia spp.</i>											
85	133	-	-	133	-	-	0	0	0	0	3/2
91	200	-	-	200	-	-	0	0	0	0	4/5
98	320	20	60	240	20	40	0	0	6	0	5/10
03	360	-	60	300	-	-	0	0	0	0	5/11

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Pinus edulis</i>											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
98	80	20	20	60	-	40	0	0	-	0	-/-
03	100	-	40	60	-	40	0	0	-	0	-/-

Trend Study 23-4-03

Study site name: Poverty Flat.

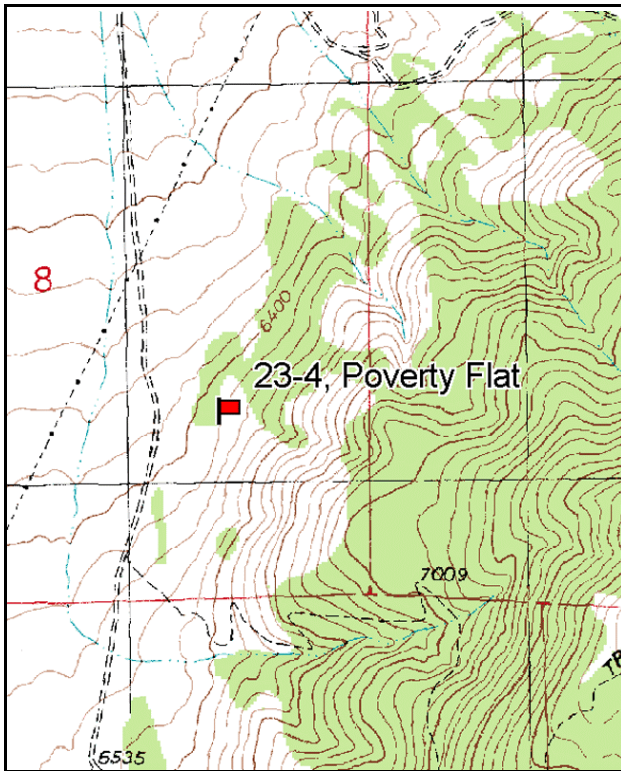
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 162 degrees magnetic. (Line 3 & 4 175°M)

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

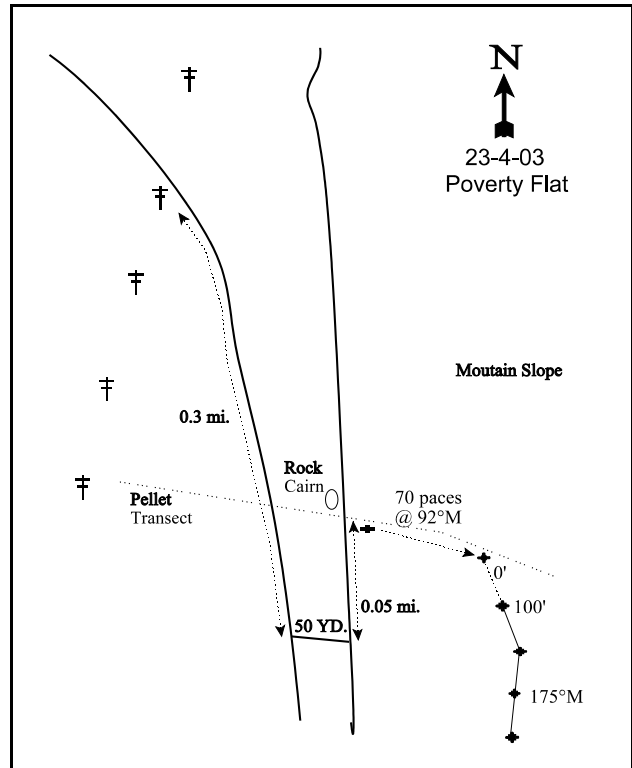
LOCATION DESCRIPTION

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

Township 26S, Range 3W, Section 8



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4267143 N, 400228 E

DISCUSSION

Poverty Flat - Trend Study No. 23-4

This study is located on the west side of the Monroe Mountains on the foothills above Poverty Flat, south of the town of Monroe. The hillside study has a slope of about 20%-25%, an elevation of 6,420 feet, and a west aspect. The slope was originally covered by juniper and Wyoming big sagebrush. When the site was visited in 1998, it was determined that a wildfire had burned through the area in 1997, eliminating all the key browse species. The land is administered by the BLM and is part of a sheep allotment. Sheep use is more concentrated on the flat, and they graze the hillside where the transect is located only when trailing to and from summer pasture on the forest. Deer use on the site has been moderate to heavy in the past prior to the burn, as evidenced by the numerous pellet groups, hedging and antler drops. Several carcasses were found near the site in both 1985 and 1991, indicating winter losses. Wildlife use has been lighter since the burn and the elimination of most of the Wyoming big sagebrush. A pellet group transect read in conjunction with the vegetative transect in 1998 estimated 19 deer days use/acre (47 ddu/ha) and 2 elk days use/acre (5 edu/ha). Data from 2003 estimated 57 deer and 5 elk days use/acre (141 ddu/ha and 12 edu/ha). No livestock sign was noted in 1998 or 2003.

The effective rooting depth is moderately shallow at about 11 inches. Rocks are concentrated in the upper portion of the soil profile and on the surface. A year after the fire in 1998, ground cover was predominately large rocks and pavement, leaving very little bare soil. Soil temperature was relatively high averaging 81° F at just over 12 inches in depth. This high temperature will be very limiting to the establishment of perennial species after the wildfire and would allow continued dominance of the site by annuals. By 2003, much of the soil surface was covered with cheatgrass and rock leaving little bare ground exposed. Soil texture is a loam which is neutral in reactivity (pH 6.7).

This site in the past supported a stand of Utah juniper with a thick stand of Wyoming big sagebrush in the understory. The sagebrush had been browsed heavily in the past, and although it appeared healthy, its growth and seed production was below optimum. After the wildfire, there are few sagebrush plants within the sampled area. Density was estimated at only 40 plants/acre in 1998. Due to the lack of preferred browse forage this area would no longer be considered a winter range for deer. Density of sagebrush was estimated at 400 plants/acre in 2003. Approximately 65% of the population consists of mature plants, while 30% were classified as decadent. Recruitment is poor and limited by the dense cover of annual cheatgrass and high soil temperatures. Prostrate kochia was seeded after the burn, and although it is vigorous and producing good growth, it is not abundant. Most juniper trees were killed by the fire yet some scattered trees survived.

Perennial herbaceous vegetation was sparse in past readings, and with the wildfire and poor establishment of seeded species, cheatgrass and other weeds dominate the site. Cheatgrass was present in 1998, but not particularly abundant. However, it provided 86% of the total grass cover with a cover value of 9%. The only other grasses included some squirreltail and a few Sandberg bluegrass and Indian ricegrass plants. In 2003, cheatgrass still dominates the understory and has increased in nested frequency and has a cover value of 25%. Some seeded grasses, crested and intermediate wheatgrass, were sampled in 2003, although they occur in low numbers. Utilization of the perennial grass species was moderate in the past, but it was not apparent whether the use was from wildlife or livestock. Forbs are still rarely found on this site except for a few weeds.

1985 APPARENT TREND ASSESSMENT

The soil type is one of severe erosion potential, but is stabilized here by the extensive rock and pavement cover (53%). There is also no evidence of sedimentation. The vegetative community appears to have struck a balance between the sagebrush and junipers and other increasers. However, if the site is grazed excessively by trailing sheep in spring and fall, the desirable perennial grasses and sagebrush will decline.

1991 TREND ASSESSMENT

The soil trend is downward because bare soil has increased in cover from only 2% to 11%. Most of this increase has come from a loss of litter cover. This condition should be watched closely, for with more drought, this condition could worsen. Wyoming big sagebrush has increased its density by 30% with only a slight increase in percent decadence. It should also be noted that the number of heavily hedged sagebrush (>60% use) has increased from 9% to 41%, while shrubs exhibiting poor vigor increased from 0% to 33%. Average plant height and crown have also decreased substantially. Even with the increase in its density, the other measured parameters indicate the health of the community is declining with this prolonged drought. This condition could turn around with an end to the drought. The herbaceous understory is still almost nonexistent except for a few bottlebrush squirreltail.

TREND ASSESSMENT

soil - slightly downward (2)

browse - slightly downward (2)

herbaceous understory - downward and poor (1)

1998 TREND ASSESSMENT

Trend for soil is down. Although percent bare soil has changed little, the fire has changed many other important parameters on the site. The most noticeable is that protective herbaceous and litter cover have been severely altered. At the present time, 80% of the herbaceous cover comes from only two weedy species which became more dominant after the fire. Protective litter cover is now down to only 12%, while rock and pavement cover is up to 67%. The trend for browse is obviously down as 99% of the Wyoming big sagebrush was lost to the fire of 1997. The trend for the herbaceous understory is also down, because without the major two weedy species, total herbaceous cover would be just over 2%, one of the lowest values we have measured.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - down (1)

2003 TREND ASSESSMENT

Trend for soil has improved slightly due to an increase in vegetation and litter cover. There is little bare ground exposed and the erosion condition class was determined to be stable in 2003. Trend for browse is improving. Wyoming big sagebrush is still lacking with only 400 plants/acre estimated. Recruitment is poor and obviously limited by the dense understory of annual cheatgrass. It will take time for the sagebrush to become reestablished. Trend for the herbaceous understory is mixed. Sum of nested frequency for perennial grasses has increased but frequency and cover of cheatgrass has also increased. It now accounts for 86% of the grass cover with a high cover value of 25%. Cheatgrass is tall and vigorous and more than abundant enough to carry another wildfire. Some seeded perennial grasses have become established but they occur in limited numbers. Forbs are rare and consist of annual and biennial weeds. With this in mind, trend for the herbaceous understory is considered down slightly. Due to the rocky nature of the site, further rehabilitation is not very feasible. This site needs to be protected from wildfire and hope that the few sagebrush and native perennial grasses on the site can reestablish themselves.

TREND ASSESSMENT

soil - up slightly (4)

browse - up slightly (4)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 23 , Study no: 4

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	a-	a-	a-	b58	-	2.25
G	Agropyron intermedium	-	-	-	4	-	.16
G	Bromus tectorum (a)	-	-	a160	b316	9.03	25.35
G	Oryzopsis hymenoides	4	-	1	4	.03	.22
G	Poa secunda	7	7	5	13	.18	.35
G	Sitanion hystrix	b77	ab48	ab60	a37	1.24	1.02
Total for Annual Grasses		0	0	160	316	9.03	25.35
Total for Perennial Grasses		88	55	66	116	1.44	4.00
Total for Grasses		88	55	226	432	10.48	29.35
F	Alyssum alyssoides (a)	-	-	-	1	-	.00
F	Argemone munita	-	-	2	-	.15	-
F	Astragalus spp.	1	-	-	-	-	-
F	Calochortus nuttallii	-	-	1	-	.00	-
F	Castilleja spp.	-	-	1	-	.00	-
F	Descurainia pinnata (a)	-	-	4	9	.04	.07
F	Erigeron pumilus	1	3	-	-	-	-
F	Euphorbia spp.	-	-	5	-	.04	-
F	Lappula occidentalis (a)	-	-	4	-	.01	-
F	Lactuca serriola	-	-	-	7	-	.04
F	Leucelene ericoides	a-	a-	b15	a-	.33	-
F	Lupinus argenteus	-	-	3	-	.15	-
F	Nicotiana attenuata (a)	-	-	3	-	1.06	-
F	Sisymbrium altissimum (a)	a-	a1	a-	b35	-	2.07
F	Unknown forb-perennial	-	-	-	-	.38	-
Total for Annual Forbs		0	1	11	45	1.11	2.15
Total for Perennial Forbs		2	3	27	7	1.07	0.03
Total for Forbs		2	4	38	52	2.18	2.19

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	'98	'03
		B	Artemisia tridentata wyomingensis	2	13
B	Atriplex canescens	0	1	-	-
B	Gutierrezia sarothrae	10	12	.16	.22
B	Juniperus osteosperma	0	1	.63	.38
B	Kochia prostrata	0	2	-	.03
B	Sambucus cerulea	0	1	-	-
Total for Browse		12	30	0.79	2.95

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 4

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	1.48
Atriplex canescens	.53
Gutierrezia sarothrae	.85
Juniperus osteosperma	3.40
Kochia prostrata	.40

POINT-QUARTER TREE DATA --

Management unit 23 , Study no: 4

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	26	N/A
Pinus edulis	20	N/A

Average diameter (in)	
'98	'03
9	N/A
1.6	N/A

BASIC COVER --

Management unit 23 , Study no: 4

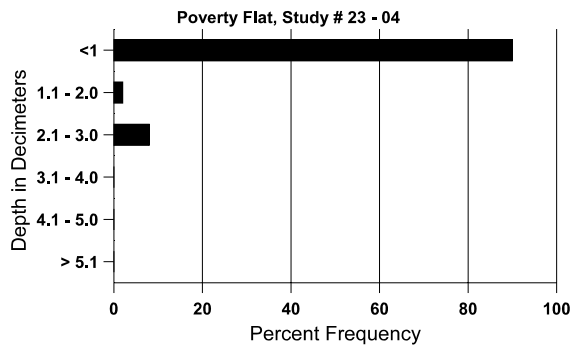
Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	3.25	2.75	14.86	33.31
Rock	28.75	25.25	48.72	33.97
Pavement	24.00	28.00	18.13	1.89
Litter	41.50	33.25	11.90	35.83
Cryptogams	.25	0	.06	.15
Bare Ground	2.25	10.75	9.93	7.62

SOIL ANALYSIS DATA --

Management unit 23, Study no: 4, Study Name: Poverty Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.1	81.0 (12.6)	6.7	44.0	35.4	20.6	4.8	26.2	163.2	0.8

Stoniness Index



PELLET GROUP DATA --

Management unit 23 , Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	-	8	-	-
Elk	1	1	2 (5)	5 (12)
Deer	3	21	19 (47)	57 (141)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	5399	533	1133	3200	1066	-	58	9	20	0	20/23
91	7733	733	1133	4000	2600	-	38	41	34	33	15/17
98	40	-	20	-	20	660	0	0	50	0	-/-
03	400	-	20	260	120	360	10	0	30	25	19/23
<i>Atriplex canescens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	32/48
<i>Echinocereus spp.</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	0	0	-	0	5/6
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	4/7
<i>Gutierrezia sarothrae</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	500	20	180	320	-	40	0	0	0	0	10/13
03	620	-	-	500	120	320	29	16	19	16	12/15
<i>Juniperus osteosperma</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	60	0	0	0	0	-/-
03	40	-	-	-	40	60	0	0	100	0	-/-
<i>Kochia prostrata</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	50	0	-	0	18/29
<i>Opuntia spp.</i>											
85	200	-	-	200	-	-	0	0	-	0	6/10
91	333	-	133	200	-	-	0	0	-	0	6/13
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	6/14

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Sambucus cerulea											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	48/43

Trend Study 23-5-03

Study site name: Smith Canyon.

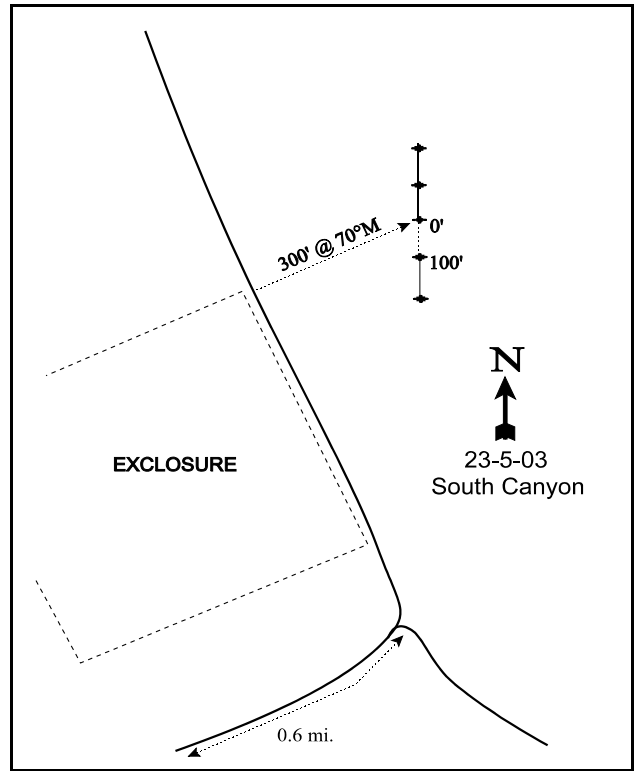
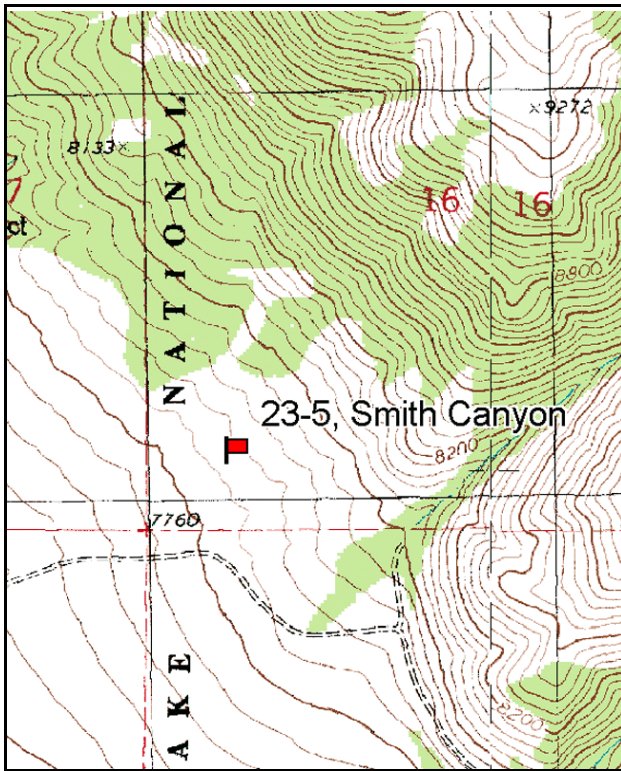
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

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 enclosure. Turn north (left) and go along the east side of a cattle enclosure. From the northeast corner of the enclosure, 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 rebar with a browse tag #7043 attached.



Map Name: Marysvale

Diagrammatic Sketch

Township 27S, Range 2.5W, Section 16

GPS: NAD 27, UTM 12S 4257082 N, 401193 E

DISCUSSION

Smith Canyon - Trend Study No. 23-5

The Smith Canyon trend study is located on the southwestern side of Marysvale Peak, at an elevation of about 7,800 feet. The foothills here level out to form open, gentle sagebrush covered slopes (about 3-5% slope). Much of the area has been chained and seeded. Now there are scattered junipers, clumps of Gambel oak, and curlleaf mountain mahogany. An adjacent cattle enclosure displays similar vegetation, yet the plants there appear slightly more vigorous. Grazing pressure from livestock appears light on this Forest Service land. Browsing pressure from wintering wildlife has been heavy at times. The importance of this area is demonstrated by the DWR Smith Canyon pellet group transect which has shown more use than any other pellet group transect on the unit. Data showed a 10-year average (1980-81 to 1990-91) of 55 deer days use/acre (135 ddu/ha) (Jense et al. 1985, 1991). Although use is concentrated in winter, tracks and sightings indicate deer use is common year-round. Elk have been noted in the area and if the herd continues to increase, this may become an important elk wintering area as well. A pellet group transect read along the trend study baseline in 1998 estimated 112 deer days use/acre (277 ddu/ha). Deer use continued to be high in 2003 at an estimated 139 days use/acre (343 ddu/ha). Most of the pellet groups appeared to be from winter use but about 40% were from late winter or early spring. Elk use was estimated at just 7 days use/acre (17 edu/ha). Cattle use was estimated at 14 days use/acre (35 cdu/ha) in 1998 and 3 in 2003 (7 cdu/ha).

The soil appears to be well-developed and protected on this site. Litter cover is moderately high from the diverse and healthy plant community. Soil texture is a sandy loam which is moderately acidic in reactivity (pH 5.9). Effective rooting depth is estimated at nearly 12 inches. There is a relatively dense cover of vegetation over much of the transect, leaving little bare soil. Pavement occupies much of the space between vegetation. Erosion could be severe on this soil type, but the ground cover and gentle slope tend to minimize the problem.

Mountain big sagebrush is the dominant shrub species as it makes up more than three-fourths of the browse cover. The subspecies *Artemisia tridentata vaseyana* is considered a very palatable sagebrush, yet it is not as utilized as the bitterbrush on this site. The sagebrush population shows a relatively large decrease in numbers from 1991 to 1998. However, only about 25% of this decrease can be explained by the number of dead plants in the population. Therefore, most of the decrease would be due to the larger sampling design giving greater accuracy in estimating shrub populations that are discontinuous and/or clumped in their distributions. Density was estimated at 3,860 plants/acre in 1998. Use was moderate, vigor good, and the number of decadent plants was low at 18%. Population density remained similar in 2003 at 3,400 plants/acre. Drought conditions combined with competition from other sagebrush and cheatgrass caused an increase in the number of decadent plants (18% to 41%). Average vigor remains good but no seedlings were encountered in 1998 or 2003 and young plants accounted for only 1% of the population in 2003.

Antelope bitterbrush has maintained a relatively stable density since site establishment in 1985. It displays similar trends as sagebrush with a minor decline in density between 1998 and 2003 combined with a major increase in decadent plants (8% to 58%). Bitterbrush has sustained heavy use since 1991, peaking during the drought years of 1991 and 2003. Annual leader growth averaged 3.2 inches in 2003, but the plants did not appear to be flowering or producing seed. Juniper, Gambel oak, and mountain mahogany are abundant nearby and appear to be spreading slowly. These trees provide the only good escape and thermal cover in the area.

The herbaceous understory is abundant but dominated by annual cheatgrass. Bluebunch wheatgrass, mutton bluegrass, and bottlebrush squirreltail were growing well and were fairly abundant, especially under shrub crowns in 1985 and 1991. Annuals were not included in data collection in 1985 and 1991, but site narratives indicate that cheatgrass was present, but made up only a small percentage of the vegetation. By 1998, cheatgrass contributed 68% of the grass cover with a cover value of 11%. In 2003, cheatgrass increased in

frequency and cover, accounting for 92% of the grass cover with a cover value of 17%. Utilization of grasses has been generally light.

There is good diversity of valuable perennial forbs on the site, but they are not very common. Total forb cover was estimated at only 3% in 1998 and 5% in 2003. The most abundant is silky lupine, which grows tall and vigorous. Other useful forbs include arrowleaf balsamroot, redroot eriogonum, and tapertip hawksbeard. Density is rather low and most of these plants are small and low-growing, yet they show utilization by wildlife.

1985 APPARENT TREND ASSESSMENT

As this is such a heavily used and important winter range, it is vital to monitor the community to help prevent severe downward trends. Continued heavy use could be detrimental to the bitterbrush population. Light spring cattle grazing or elk use can help to release young browse plants from perennial grass competition, especially here where the grasses grow thick under the cover of the sagebrush. As the junipers and oaks increase, they will provide excellent cover, but a continuous stand would not be desirable. Generally, vegetative trend appears stable to slightly downward because of the heavy pressure on the bitterbrush. The soil appears stable and in good condition.

1991 TREND ASSESSMENT

Percent bare ground has increased from 4 to 11% and vegetative basal cover has decreased from 8% to 4%. The common denominator appears to be the drought. Precipitation data from Marysville indicate drier than average conditions from 1988 to 1991. This downward trend should be watched closely, but should improve with improved precipitation patterns. The two key browse species, mountain big sagebrush and bitterbrush, are both increasing in density, 16% and 20% respectively. Percent decadence has gone down for sagebrush, but has gone up sharply for bitterbrush. The increased decadence for bitterbrush could be a combination of heavy use and drought. Even with the increase in decadence, the browse trend is still considered to be improving. With increased moisture, the degree of decadence for bitterbrush would be expected to go down. The herbaceous understory is also on an upward trend, with most of the grasses and forbs increasing in frequency.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly up (4)

herbaceous understory - up slightly (4)

1998 TREND ASSESSMENT

The trend for soil is slightly down because of significant decreases in grass and forb nested frequency values which are the lowest they have ever been. The browse trend is stable. Mountain big sagebrush shows similar use (moderate) compared to 1991. Average vigor has improved and the number of decadent plants has declined. Bitterbrush is still heavily browsed although the number of decadent plants has declined from 55% to only 8%. The trend for the herbaceous understory is slightly down because nested frequency values for both perennial grasses and forbs has decreased since 1991.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - slightly down (2)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics have remained similar to 1998 estimates and there is still abundant protective ground cover to prevent erosion. Trend for the key browse species, mountain big sagebrush and bitterbrush, is down. Sagebrush has declined slightly in density. It displays mostly light to moderate use and good vigor, but the number of decadent plants has increased to 41% of the population. In addition, 17% of the decadent plants sampled were classified as dying. Young recruitment is poor and not adequate to maintain the population at current levels. Bitterbrush shows extremely heavy use. The number of decadent plants has increased from 8% of the population to 58%. Vigor is poor on 35% of the plants sampled and 60% of the decadent bitterbrush encountered were classified as dying (>50% crown death). Young recruitment is nonexistent this year indicating a possible future bitterbrush die-off. These browse trends are caused by a combination of use, drought, and competition with cheatgrass in the understory. Trend for the herbaceous understory is also down. Sum of nested frequency for perennial grasses and forbs has declined, while nested frequency for cheatgrass increased significantly. Average cover for cheatgrass is 17% in 2003. Cheatgrass is vigorous and tall providing ample fine fuels for a wildfire.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 23 , Study no: 5

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	_b 179	_b 176	_b 195	_a 75	4.20	.58
G	Bromus tectorum (a)	-	-	_a 305	_b 342	10.56	17.33
G	Hilaria jamesii	-	-	3	-	.15	-
G	Poa fendleriana	_a 58	_b 78	_a 28	_a 32	.25	.33
G	Poa secunda	-	-	6	7	.01	.21
G	Sitanion hystrix	_{ab} 47	_b 64	_a 28	_a 36	.22	.35
G	Stipa comata	-	4	5	1	.18	.00
Total for Annual Grasses		0	0	305	342	10.56	17.33
Total for Perennial Grasses		284	322	265	151	5.02	1.48
Total for Grasses		284	322	570	493	15.59	18.82
F	Agoseris glauca	-	6	-	7	.00	.01
F	Alyssum alyssoides (a)	-	-	_a 3	_b 11	.00	.07
F	Arabis spp.	-	4	3	-	.00	-
F	Astragalus convallarius	17	6	9	10	.19	.16
F	Astragalus spp.	-	12	3	2	.01	.03
F	Balsamorhiza sagittata	-	5	2	-	.01	-
F	Calochortus nuttallii	_a	_b 9	_a 1	_a	.00	-

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	<i>Chaenactis douglasii</i>	-	-	5	-	.01	-
F	<i>Comandra pallida</i>	5	5	1	4	.03	.03
F	<i>Collinsia parviflora</i> (a)	-	-	_a 2	_b 82	.00	.69
F	<i>Crepis acuminata</i>	_{ab} 4	_b 14	_a -	_a -	-	-
F	<i>Cryptantha nana</i>	3	-	-	-	-	-
F	<i>Eriogonum racemosum</i>	_a 20	_b 59	_a 21	_a 9	.29	.12
F	<i>Eriogonum umbellatum</i>	_a -	_a -	_{ab} 3	_b 11	.00	.08
F	<i>Lotus utahensis</i>	_a -	_a 1	_b 16	_a 1	.30	.00
F	<i>Lupinus argenteus</i>	_b 74	_b 46	_a 18	_a 6	1.55	.76
F	<i>Microsteris gracilis</i> (a)	-	-	_a 11	_b 170	.02	2.63
F	<i>Phlox longifolia</i>	_{bc} 42	_c 50	_{ab} 21	_a 3	.11	.00
F	<i>Sphaeralcea coccinea</i>	-	3	-	-	-	-
F	<i>Streptanthus cordatus</i>	4	2	1	2	.00	.00
F	<i>Wyethia amplexicaulis</i>	_b 11	_a -	_a -	_a -	-	-
Total for Annual Forbs		0	0	16	263	0.02	3.40
Total for Perennial Forbs		180	222	104	55	2.53	1.22
Total for Forbs		180	222	120	318	2.56	4.62

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	'98	'03
B	<i>Artemisia tridentata vaseyana</i>	88	88	24.61	24.54
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	0	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	0	-	-
B	<i>Eriogonum microthecum</i>	2	0	-	-
B	<i>Pinus edulis</i>	1	1	-	-
B	<i>Purshia tridentata</i>	44	36	6.61	3.71
B	<i>Sclerocactus</i>	2	0	-	-
B	<i>Symphoricarpos oreophilus</i>	1	2	-	-
B	<i>Tetradymia canescens</i>	0	1	-	-
Total for Browse		141	128	31.22	28.26

CANOPY COVER, LINE INTERCEPT --
Management unit 23 , Study no: 5

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	28.85
Purshia tridentata	5.46
Symphoricarpos oreophilus	.10

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 23 , Study no: 5

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.7
Purshia tridentata	3.2

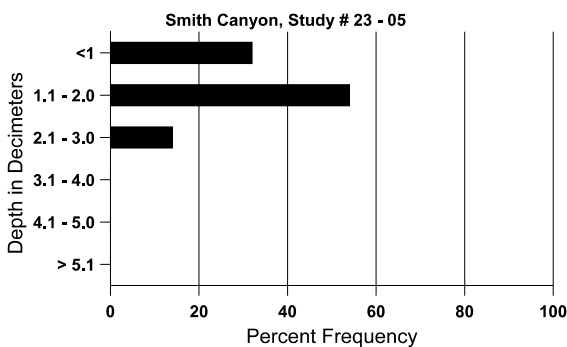
BASIC COVER --
Management unit 23 , Study no: 5

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	8.00	4.25	40.73	49.27
Rock	1.00	1.25	2.75	2.19
Pavement	18.50	8.75	12.96	16.32
Litter	68.25	73.25	54.14	45.69
Cryptogams	.75	1.25	.12	.03
Bare Ground	3.50	11.25	13.71	10.39

SOIL ANALYSIS DATA --
Management unit 23, Study no: 5, Study Name: Smith Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.9	66.7 (11.9)	5.9	54.0	29.4	16.6	3.5	21.9	281.6	0.4

Stoniness Index



PELLET GROUP DATA --
 Management unit 23 , Study no: 5

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Elk	-	-	1 (2)	7 (17)
Rabbit	26	3	-	-
Deer	34	27	112 (277)	139 (344)
Cattle	3	-	14 (35)	3 (7)

BROWSE CHARACTERISTICS --
 Management unit 23 , Study no: 5

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	24/17
03	0	-	-	-	-	-	0	0	-	0	9/9
Artemisia tridentata vaseyana											
85	6066	66	666	3800	1600	-	54	11	26	15	24/27
91	7199	-	133	5466	1600	-	50	3	22	12	22/30
98	3860	-	140	3040	680	840	46	7	18	5	32/44
03	3400	-	20	1980	1400	660	26	5	41	7	31/39
Chrysothamnus nauseosus albicaulis											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	-	0	0	100	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Chrysothamnus viscidiflorus viscidiflorus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	50	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Eriogonum microthecum											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	199	-	133	66	-	-	0	33	-	0	1/2
98	60	-	40	20	-	-	0	33	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	5/11
03	0	-	-	-	-	-	0	0	-	0	-/-
Pinus edulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-
Purshia tridentata											
85	1066	66	200	866	-	-	69	31	0	0	20/27
91	1332	-	66	533	733	-	15	80	55	0	13/20
98	1220	-	180	940	100	120	26	67	8	0	20/37
03	1040	-	-	440	600	20	15	79	58	35	19/39
Sclerocactus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	80	-	-	20	60	-	0	75	75	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Symphoricarpos oreophilus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	66	-	66	-	-	-	0	100	0	0	-/-
98	20	-	-	20	-	-	0	0	0	0	13/28
03	60	-	-	40	20	-	0	0	33	33	8/14
Tetradymia canescens											
85	133	-	133	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	11/13

Trend Study 23-6-03

Study site name: Koosharem Canyon.

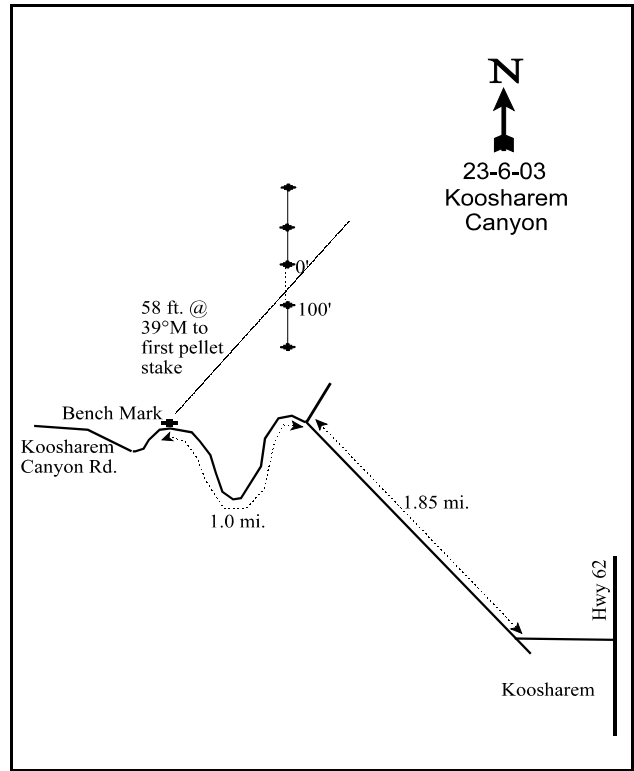
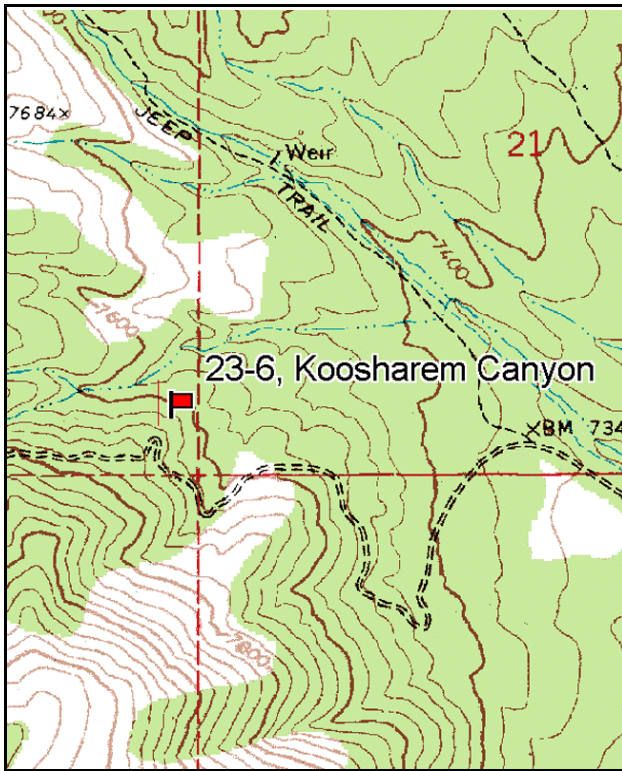
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

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 runs due south, crossing the pellet group transect.



Map Name: Koosharem

Diagrammatic Sketch

Township 26S, Range 1W, Section 20

GPS: NAD 27, UTM 12S 4264704 N, 419554 E

DISCUSSION

Koosharem Canyon - Trend Study No. 23-6

The Koosharem Canyon study samples a moderately high elevation winter range on the east side of the Monroe Mountain management unit. The site is located on a northeast, moderately steep slope (28%) at an elevation of 7,600 feet. The range type is mountain brush with 10 browse species present. Wildlife use appears to be year-round. Data from the nearby DWR pellet group transect showed moderate deer use since 1981 (Jense et al. 1985 & 1991). A pellet group transect read in conjunction with the vegetation transect in 1998 estimated 63 deer days use/acre (156 ddu/ha). Elk use was estimated at 31 days use/acre (77 edu/ha) and cattle at 5 days use/acre (12 cdu/ha) in 1998. Pellet group data from 2003 estimated even higher deer use at 113 days use/acre (279 ddu/ha). About 70% of the deer pellet groups appeared to be from spring and early summer use. Only a few elk pellet groups and 1 cattle pat was encountered in 2003. Cattle graze this Forest Service range during the summer. Past grazing pressure appears to have been very heavy.

Ground cover is highly variable on the site. The vegetation and litter cover provides the majority of the ground cover. Soil movement is detectable on trails and shrub interspaces where rocks and pavement and bare soil are predominant. The soil is prone to erosion, as seen on some steeper areas nearby. Erosion at the site is occurring but localized. The erosion condition class was determined to be stable to slight in 2003. The soil is rocky but also contains a fair amount of organic matter. Soil texture is a clay loam which is slightly acidic (pH 6.5). Effective rooting depth is good, estimated at just over 16 inches.

The hillside is dominated mainly by mountain big sagebrush and true mountain mahogany (*Cercocarpus montanus*). These two species alone provided 82% of the browse cover in 1998 and 77% in 2003. Further up the hill and to the south, large mature Utah juniper and curlleaf mountain mahogany (*Cercocarpus ledifolius*) are more prominent. Mountain big sagebrush is fairly dense at an estimated 3,420 plants/acre in 1998 and 4,400 plants/acre in 2003. Utilization has been moderate since 1985, when the site was established. A few plants displayed heavy browsing. Vigor has been generally good through the years with the exception of 1991, when 31% of the sagebrush sampled displayed poor vigor. The number of decadent plants was also exceptionally high that year at 65%. Vigor was good in 1998 and percent decadence declined to a more normal 26%. By 2003, the number of decadent plants increased slightly to 33%. Vigor remained good on most plants and seed production was excellent. Annual leader growth was low averaging only 1.3 inches. No seedlings were encountered in 2003, and young recruitment was poor.

True mountain mahogany, a long-lived species, provides abundant and preferred browse forage. Density has been moderately low with 1,066 plants/acre estimated in 1985, increasing slightly to 1,520 plants/acre by 2003. These plants have consistently received moderate to heavy use during each reading, peaking in 1991 and 2003 (60% and 72% heavily browsed). Vigor has remained good for most plants with a few decadent plants being encountered in 1998 and 2003. Annual leader growth was estimated at nearly 3 inches in 2003.

Utah serviceberry occurs in small numbers (140 plants/acre in 2003) but provides some additional preferred forage. It also received extremely heavy use in 1991 and 2003. About one-third of the population was classified as being decadent and displaying poor vigor in 2003. Other shrubs which provide some additional forage include curlleaf mountain mahogany, dwarf rabbitbrush, slenderbush eriogonum, bitterbrush, Gambel oak, and snowberry. Dwarf rabbitbrush and bitterbrush were both heavily browsed in 2003. Pinyon and juniper trees are scattered throughout the site. Point-center quarter data from 2003 estimated 51 pinyon and 39 juniper trees/acre with average diameters of 3.1 and 5.6 inches respectively.

Herbaceous vegetation is not abundant, producing a cover value of 13% in 1998 and 7% in 2003. The most common species are mutton bluegrass and a sedge (*Carex spp.*). Bluebunch wheatgrass and bottlebrush squirreltail make up the balance of the most abundant grasses. These grass and grass-like species provide

some spring and summer forage, but the community is lacking a desirable high-yielding herbaceous species. Bluebunch wheatgrass could fill this need, but it occurs in very low numbers. Perennial grass sum of nested frequency has decreased substantially since 1991.

There are a variety of forbs on the site, but density is very low and most are small and low-growing. Thus they are only a minor forage source. Some of the more common species include longleaf phlox, scarlet globemallow, clover, dusty penstemon, and sulphur eriogonum. Utilization of these forbs appears to be light.

1985 APPARENT TREND ASSESSMENT

Soil conditions on the site appear to be declining as erosion continues on localized areas of the slope. An increase in basal vegetative cover from new growth of the grasses and forbs will help hold the soil in place. The grasses are vigorous and appear to be recovering from past heavy grazing pressure. The key species, mountain big sagebrush and true mountain mahogany, may also be increasing. They both have a high percentage of young plants in their respective populations. They are moderately browsed, in good vigor, and have good leader growth. However, encroachment of Gambel oak could become a problem in the future.

1991 TREND ASSESSMENT

The soil trend is considered slightly down because vegetative basal cover is down and percent bare ground is up to 29%. Serviceberry, big sagebrush, and true mountain mahogany are all decreasing in density and have increased decadence rates. This would indicate a downward trend that should be watched closely. The majority of the grasses and forbs have shown increases in nested and quadrat frequency values, indicating an overall upward trend for the herbaceous understory.

TREND ASSESSMENT

soil - slightly down (2)

browse - down (1)

herbaceous understory - up slightly (4)

1998 TREND ASSESSMENT

The soil trend is considered stable with a slight decrease in percent bare soil and a corresponding decrease in herbaceous cover. Trend for the key browse is up slightly. Sagebrush shows improved vigor and a decline in the number of decadent plants (65% to 26%). Young recruitment remains good. True mountain mahogany appears stable with less heavy use. Trend for herbaceous species is down due to declines in nested frequency values for both grasses and forbs. Total herbaceous production is poor with cover estimated at only 13%.

TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - down (1)

2003 TREND ASSESSMENT

Trend for soil remains stable with similar ground cover characteristics compared to 1998 estimates. Protective ground cover is variable with some localized erosion occurring on the site. Overall, the erosion condition class was determined to be stable to slight. Trend for browse is stable. Mountain big sagebrush provided 51% of the browse cover in 2003. Use remained light to moderate with heavy use on 10% of the plants sampled. Vigor was good on most plants and percent decadence remained relatively stable (26% to 33%). Young recruitment is currently marginal with 3% of the population consisting of young plants.

Mountain mahogany accounts for 26% of the browse cover. This preferred shrub shows a stable trend with increased heavy use, good vigor and low decadence. Trend for the herbaceous understory is slightly down. This downward trend has continued since 1991. Current herbaceous production is poor with only 7% cover of grasses and forbs being estimated in 2003. Sum of nested frequency of grasses and forbs has also declined since the last reading. Shrub cover is increasing while the herbaceous cover is declining.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 23 , Study no: 6

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron smithii	a-	b24	a5	a5	.03	.01
G	Agropyron spicatum	a10	b49	ab32	a21	.83	.76
G	Bouteloua gracilis	-	-	2	-	.00	-
G	Bromus tectorum (a)	-	-	-	1	-	.00
G	Carex spp.	d221	c179	b109	a54	2.02	1.37
G	Oryzopsis hymenoides	a-	ab8	b18	ab14	.70	.22
G	Poa fendleriana	b176	b183	a138	a138	8.00	3.93
G	Sitanion hystrix	a58	b110	a56	a32	.98	.33
G	Stipa lettermani	-	-	-	8	-	.24
Total for Annual Grasses		0	0	0	1	0	0.00
Total for Perennial Grasses		465	553	360	272	12.58	6.87
Total for Grasses		465	553	360	273	12.58	6.88
F	Agoseris glauca	-	6	-	-	-	-
F	Antennaria rosea	1	3	-	6	-	.03
F	Androsace septentrionalis (a)	-	-	b14	a-	.06	-
F	Arabis spp.	-	-	3	-	.00	-
F	Astragalus lentiginosus	6	7	5	-	.03	-
F	Castilleja chromosa	a-	b16	a-	a-	-	-
F	Calochortus nuttallii	a-	b17	a-	a-	-	-
F	Crepis acuminata	ab3	b13	a-	a-	-	-
F	Cryptantha humilis	4	5	1	-	.03	-
F	Descurainia pinnata (a)	-	-	2	3	.00	.01
F	Erigeron eatonii	5	3	-	-	-	-
F	Eriogonum racemosum	-	-	4	-	.03	-
F	Eriogonum umbellatum	a5	b16	a3	a-	.03	-

T y p e	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Lappula occidentalis (a)	-	-	a-	b10	-	.02
F	Lomatium spp.	a-	b12	a-	a-	-	-
F	Machaeranthera canescens	5	-	-	-	-	-
F	Penstemon comarrhenus	6	2	8	5	.04	.06
F	Phlox longifolia	b40	c69	a7	a4	.01	.01
F	Potentilla gracilis	-	-	1	-	.03	-
F	Sphaeralcea coccinea	b28	ab17	a5	a-	.04	-
F	Taraxacum officinale	1	-	-	-	-	-
F	Tragopogon dubius	-	-	1	-	.00	-
F	Trifolium spp.	b21	c37	a2	a3	.00	.00
F	Unknown forb-perennial	5	-	-	-	-	-
F	Wyethia amplexicaulis	5	-	-	-	-	-
F	Zigadenus paniculatus	2	-	-	-	-	-
Total for Annual Forbs		0	0	16	13	0.07	0.03
Total for Perennial Forbs		137	223	40	18	0.27	0.11
Total for Forbs		137	223	56	31	0.34	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	'98	'03
B	Amelanchier utahensis	10	6	.36	.15
B	Artemisia tridentata vaseyana	91	92	17.00	15.68
B	Cercocarpus ledifolius	1	0	-	-
B	Cercocarpus montanus	44	50	6.75	8.14
B	Chrysothamnus depressus	5	6	.33	.03
B	Chrysothamnus viscidiflorus viscidiflorus	6	3	.03	.18
B	Eriogonum microthecum	15	17	.42	.34
B	Juniperus osteosperma	3	5	.00	.76
B	Mahonia repens	1	0	-	-
B	Opuntia spp.	21	24	.23	.57
B	Pediocactus simpsonii	2	1	.01	.00
B	Pinus edulis	3	3	.18	.33
B	Purshia tridentata	8	8	.16	.30
B	Quercus gambelii	11	11	1.54	2.71
B	Symphoricarpos oreophilus	31	32	1.77	1.74
Total for Browse		252	258	28.80	30.96

CANOPY COVER, LINE INTERCEPT --

Management unit 23 , Study no: 6

Species	Percent Cover
	'03
Amelanchier utahensis	.13
Artemisia tridentata vaseyana	12.36
Cercocarpus montanus	8.06
Chrysothamnus viscidiflorus viscidiflorus	.25
Eriogonum microthecum	.31
Juniperus osteosperma	1.68
Opuntia spp.	.26
Pinus edulis	1.31
Purshia tridentata	1.06
Quercus gambelii	2.79
Symphoricarpos oreophilus	1.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 23 , Study no: 6

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.3
Cercocarpus montanus	2.9
Purshia tridentata	2.4

POINT-QUARTER TREE DATA --
Management unit 23 , Study no: 6

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	42	39
Pinus edulis	30	51

Average diameter (in)	
'98	'03
2.5	5.6
2.8	3.1

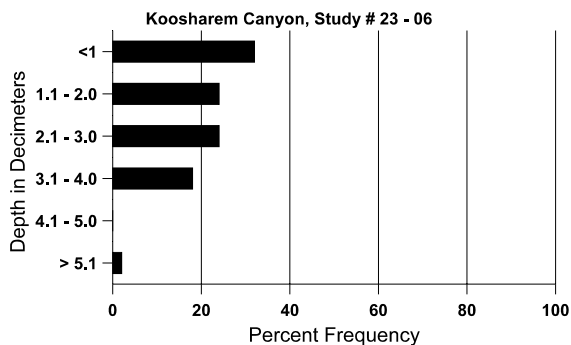
BASIC COVER --
Management unit 23 , Study no: 6

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	9.25	5.25	37.37	37.10
Rock	11.25	10.25	9.54	12.19
Pavement	13.00	7.75	14.62	7.19
Litter	49.00	47.25	47.14	43.18
Cryptogams	0	.25	.00	.15
Bare Ground	17.50	29.25	23.75	19.78

SOIL ANALYSIS DATA --
Management unit 23, Study no: 6, Study Name: Koosharem Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
16.2	58.7 (16.5)	6.5	40.0	25.4	34.6	4.2	26.8	243.2	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 23 , Study no: 6

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	50	34	-	-
Elk	10	-	31 (77)	2 (5)
Deer	45	42	63 (156)	113 (279)
Cattle	1	-	5 (12)	1 (2)

BROWSE CHARACTERISTICS --
 Management unit 23 , Study no: 6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
85	599	266	533	66	-	-	33	0	0	0	13/9
91	332	-	266	-	66	-	0	60	20	0	-/-
98	240	-	80	160	-	-	25	0	0	0	25/21
03	140	-	-	100	40	-	14	71	29	29	22/16
Artemisia tridentata vaseyana											
85	7599	1066	3066	2933	1600	-	37	2	21	6	39/33
91	5732	-	533	1466	3733	-	56	6	65	31	31/26
98	3420	60	320	2200	900	480	33	6	26	2	29/31
03	4400	-	140	2820	1440	1300	32	10	33	7	24/27
Cercocarpus ledifolius											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	100	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Cercocarpus montanus											
85	1066	66	666	400	-	-	44	0	0	0	34/19
91	666	-	333	333	-	-	30	60	0	0	49/21
98	1360	-	180	1060	120	40	49	24	9	1	33/37
03	1520	-	60	1340	120	-	18	72	8	8	33/35
Chrysothamnus depressus											
85	1599	-	666	933	-	-	0	0	0	0	5/5
91	1399	-	66	133	1200	-	0	100	86	0	2/3
98	160	-	-	160	-	-	63	0	0	0	3/10
03	260	-	-	260	-	-	38	54	0	0	6/9

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus											
85	266	133	133	133	-	-	0	0	0	0	10/7
91	0	-	-	-	-	-	0	0	0	0	-/-
98	140	-	-	120	20	-	0	0	14	14	15/14
03	60	-	-	20	40	-	0	0	67	33	14/10
Eriogonum microthecum											
85	66	66	-	66	-	-	0	0	0	0	7/4
91	0	-	-	-	-	-	0	0	0	0	-/-
98	780	-	160	620	-	-	3	0	0	0	10/12
03	860	-	20	780	60	20	0	2	7	5	7/7
Juniperus osteosperma											
85	465	200	266	133	66	-	14	0	14	0	69/157
91	333	66	133	200	-	-	20	0	0	0	71/43
98	60	20	20	40	-	-	0	0	0	0	-/-
03	100	-	40	60	-	-	0	0	0	0	-/-
Mahonia repens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	-	60	-	-	0	0	-	0	4/7
03	0	-	-	-	-	-	0	0	-	0	-/-
Opuntia spp.											
85	933	-	133	800	-	-	0	0	0	0	7/10
91	666	-	-	-	666	-	40	0	100	80	-/-
98	620	20	100	520	-	-	0	0	0	13	6/14
03	940	-	20	920	-	-	0	0	0	0	4/9
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	2/3
Pinus edulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	66	-	-	-	-	0	0	-	0	-/-
98	60	-	20	40	-	-	0	0	-	0	-/-
03	60	-	40	20	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Purshia tridentata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	180	-	40	140	-	-	33	22	-	0	24/35
03	200	-	-	200	-	-	30	70	-	0	17/36
Quercus gambelii											
85	733	333	600	133	-	-	0	0	0	0	42/21
91	666	-	400	266	-	-	50	10	0	0	59/18
98	960	80	540	360	60	120	52	8	6	0	35/28
03	940	-	420	500	20	80	30	28	2	0	43/29
Symphoricarpos oreophilus											
85	1133	200	600	533	-	-	0	0	0	0	14/10
91	2466	-	2133	200	133	-	27	3	5	0	11/11
98	1540	20	580	940	20	-	17	0	1	0	12/19
03	2240	-	160	2040	40	-	0	2	2	2	10/14

Trend Study 23R-1-03

Study site name: Greenwich Disking.

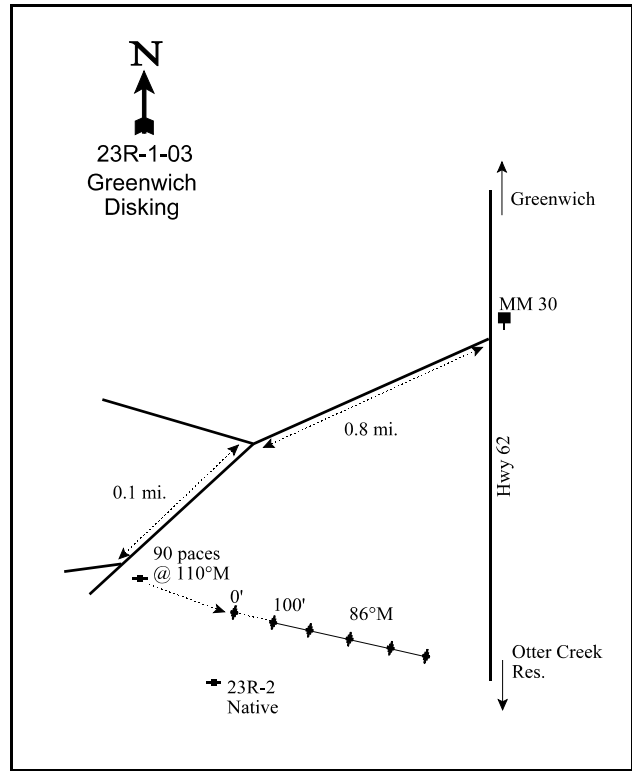
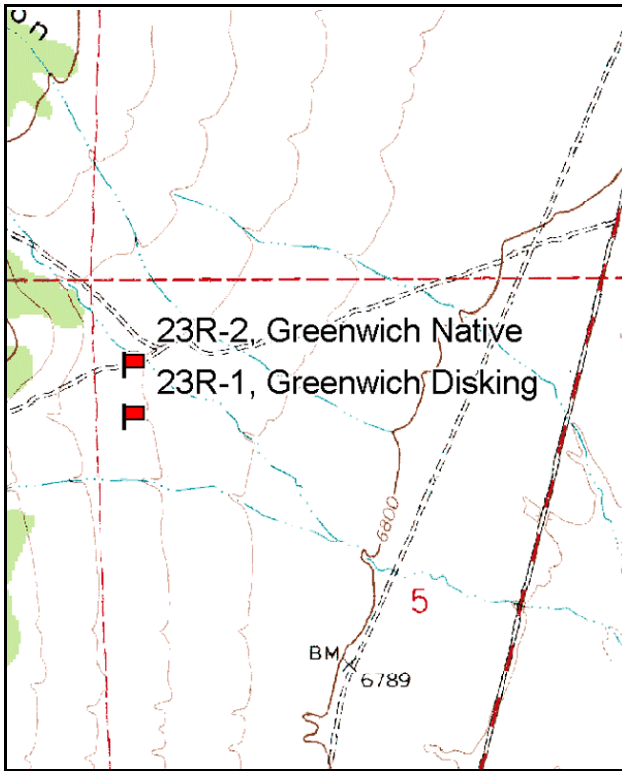
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 86 degrees magnetic.

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

LOCATION DESCRIPTION

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 27, UTM 12S 4251601 N, 417966 E

DISCUSSION

Greenwich Disking - Trend Study No. 23R-1

This trend study samples a sagebrush disking and seeding treatment on big game winter range just south of the town of Greenwich and west of Highway 62. Elevation at the site is about 6,850 feet. The terrain is nearly level with a 3% to 5% slope and an eastern aspect. The area was treated during the fall of 1996 to enhance herbaceous vegetation. Long narrow areas were disked (200 ft to 300 ft in width) and seeded leaving large areas of undisturbed sagebrush. The native sagebrush, sampled with trend study 23R-2, is overly mature with little understory vegetation. A pellet group transect read during the first reading of this site in 1997 indicated little big game use, estimated at only 3 deer days use/acre (7 ddu/ha). Only one elk pellet group was encountered but rabbit pellets were abundant. Pellet group transect data from 2003 found no deer pellet groups and only one elk pellet group. Rabbit pellets were even more abundant than in 1997, with a quadrat frequency of 91% in 2003.

Soil is moderately deep with an estimated effective rooting depth of nearly 15 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.4). Organic matter is low at <1%. There are moderate amounts of rock and pavement on the surface and in the profile. Soil temperature was estimated at 61°F in 1997 and 63°F in 2003 at an average depth of 14 inches. Protective ground cover is poor leaving abundant bare ground subject to erosion. There is little erosion occurring due to the lack of significant slope. The erosion condition class was determined as slight in 2003.

The site was dominated by thick stand of Wyoming big sagebrush with a poor understory prior to treatment. After the disking, little sagebrush remained in the treatment strips. Density was estimated at 740 plants/acre in 1997. These shrubs were not utilized and in good vigor. Seeded fourwing saltbush established well with a density of 720 young plants/acre estimated. During the 2003 reading, no sagebrush was encountered within the shrub density strips but a few surviving sagebrush were measured for height/crown and leader growth measurements. These shrubs were vigorous and producing abundant seed. Annual leader growth averaged 2.6 inches. No fourwing saltbush was found during the 2003 survey.

Seeded grasses and forbs established well during the first growing season in 1997. Crested and intermediate wheatgrass had quadrat frequencies of 79% and 36% respectively. Cover was estimated at 3.5% for crested wheat and 1% for intermediate wheatgrass. Annual cheatgrass was encountered in only 1 quadrat. Seeded alfalfa and small burnet also established well. Alfalfa had a quadrat frequency value of 79% and produced 6% cover. Annual kochia was abundant in 1997, but the only other weedy forb found was some willowweed. During the 2003 reading, no seeded grasses were found and the only forb encountered was cutleaf nightshade (*Solanum triflorum*).

1997 APPARENT TREND ASSESSMENT

The treatment has effectively eliminated much of the sagebrush cover and established a good stand of seeded grasses and forbs. Soil conditions are poor with abundant bare ground exposed but this should improve as the herbaceous plants increase. There is little erosion occurring due to the gentle terrain. Seeded fourwing saltbush has established well and should increase as well as the surviving sagebrush.

2003 TREND ASSESSMENT

Trend for soil is down. Percent cover of bare ground is unchanged but there is less protective vegetation cover than was estimated in 1997. There are no perennial grasses and only cutleaf nightshade is left on the site. The soil erosion condition class was determined to be slight but erosion is limited by the gentle terrain. Trend for browse is down. There was no sagebrush or fourwing saltbush sampled within the shrub density

strips in 2003. Trend for the herbaceous understory is down. No seeded grasses or forbs were found in 2003. The only herbaceous plant sampled was cutleaf nightshade, a weedy annual forb. It appears, that due to the lack of wildlife and livestock use, rabbit use combined with drought conditions have caused these trends. Data from the Koosharem weather station indicates that spring precipitation (April-June) has been well below average since 2000, averaging only 59% of normal (2000-2003). Total annual precipitation was 80% of normal in 2001 and 82% of normal in 2002. Pellet group data indicates abundant rabbit use of these treated areas with quadrat frequency of rabbit pellets increasing from 11% in 1997 to 91% in 2003. Quadrat frequency of rabbit pellets was also high in 2003 on the adjacent native site increasing from only 1% in 1997 to 64% in 2003. Treatments like this, especially if small in scope, often concentrate use by wildlife.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 23R, Study no: 1

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	Agropyron cristatum	_b 209	_a -	3.49	-
G	Agropyron intermedium	_b 83	_a -	1.22	-
G	Bromus tectorum (a)	2	-	.00	-
Total for Annual Grasses		2	0	0.00	0
Total for Perennial Grasses		292	0	4.71	0
Total for Grasses		294	0	4.71	0
F	Astragalus spp.	2	-	.03	-
F	Epilobium brachycarpum (a)	7	-	.07	-
F	Kochia scoparia (a)	_b 156	_a -	5.71	-
F	Medicago sativa	_b 226	_a -	6.09	-
F	Sanguisorba minor	_b 33	_a -	.22	-
F	Solanum triflorum (a)	-	5	-	4.94
Total for Annual Forbs		163	5	5.78	4.94
Total for Perennial Forbs		261	0	6.36	0
Total for Forbs		424	5	12.14	4.94

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	'97	'03
B	Artemisia tridentata wyomingensis	24	0	.58	-
B	Atriplex canescens	21	0	.02	-
B	Atriplex confertifolia	0	0	.11	-
B	Opuntia spp.	1	0	.15	-
Total for Browse		46	0	0.86	0

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 1

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	2.6

BASIC COVER --

Management unit 23R, Study no: 1

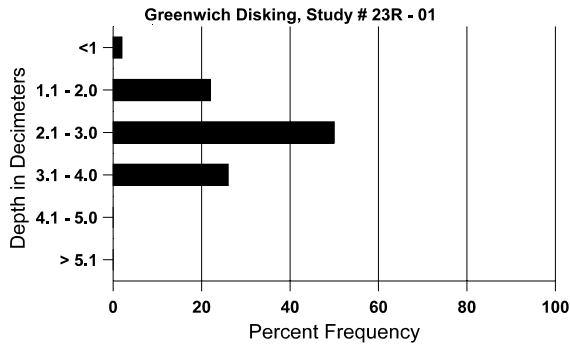
Cover Type	Average Cover %	
	'97	'03
Vegetation	15.51	5.21
Rock	4.41	9.32
Pavement	4.51	3.75
Litter	20.42	36.52
Cryptogams	.18	.11
Bare Ground	51.62	49.48

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 1, Study Name: Greenwich Disking

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
14.8	62.7 (13.0)	6.4	57.6	25.1	17.3	1.0	22.7	288.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 23R, Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'03	
Rabbit	11	91	-
Elk	-	4	1 (2)
Deer	6	-	-
Cattle	-	1	-

BROWSE CHARACTERISTICS --

Management unit 23R, Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
97	740	20	480	220	40	2500	0	0	5	0	14/23
03	0	-	-	-	-	-	0	0	0	0	21/31
Atriplex canescens											
97	720	20	720	-	-	-	0	0	-	0	11/9
03	0	-	-	-	-	-	0	0	-	0	-/-
Opuntia spp.											
97	20	-	-	20	-	-	0	0	-	0	6/11
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 23R-2-03

Study site name: Greenwich Native.

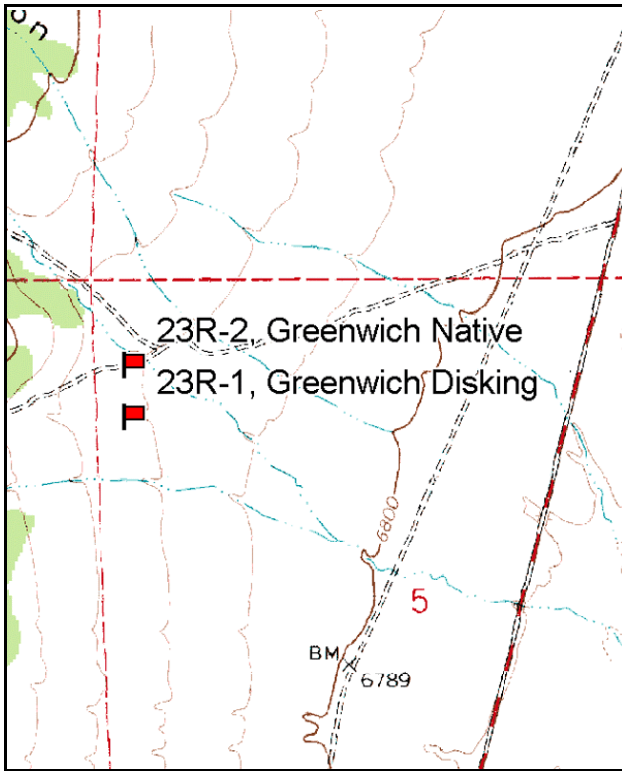
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 79 degrees magnetic.

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

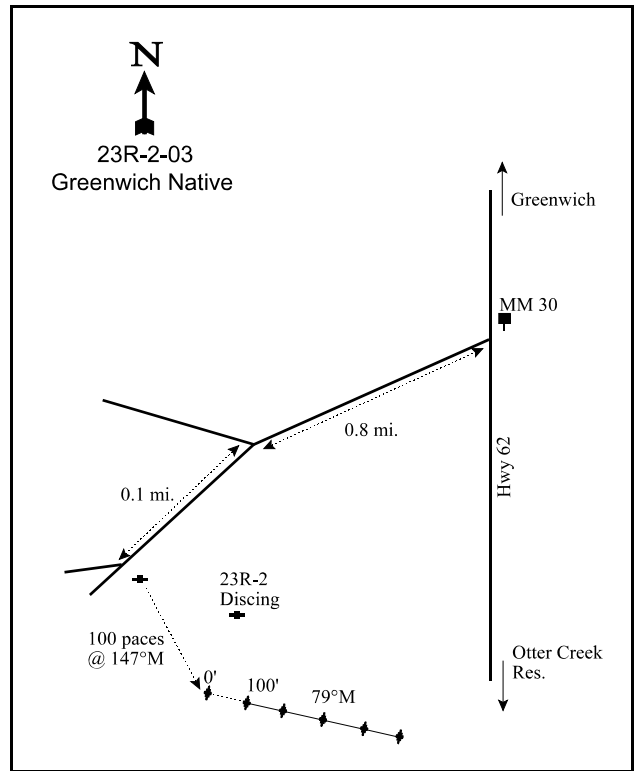
LOCATION DESCRIPTION

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

Township 28S, Range 1W, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4251554 N, 417893 E

DISCUSSION

Greenwich Native - Trend Study No. 23R-2

This trend study samples an undisturbed sagebrush site adjacent to the disking and seeding treatment sampled by the previous trend study (23R-1). The area is considered big game winter range just south of the town of Greenwich and west of Highway 62. Elevation at the site is about 6,850 feet. The terrain is nearly level with a 3% to 5% slope and an eastern aspect. The area appears to be only lightly used by deer and elk. Pellet group transect data from 1997 estimated only 6 deer days use/acre (15 ddu/ha). Only one elk pellet group was encountered. During the 2003 reading, no deer pellet groups were encountered and elk use was estimated at only 1 day use/acre (3 edu/ha). Rabbit pellets were fairly common in 1997 and abundant in 2003 with a quadrat frequency of 64%.

Soils are moderately deep with an estimated effective rooting depth of 11 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.3). Organic matter is low at 1%. Rock and pavement are abundant on the soil surface and moderate amounts of rock are found in the soil profile. Soil temperature is moderately high averaging 63°F at an depth of 11 inches. Sagebrush plants are pedestalled with cryptogamic plants concentrated under the shrub canopies. There is little erosion occurring due to the lack of significant slope. The erosion condition class was determined as slight in 2003.

The site is dominated by an over mature stand of Wyoming big sagebrush. It accounts for virtually all of the browse cover with line intercept canopy cover estimated at nearly 17%. Density was estimated at 4,200 plants/acre in 1997. Utilization was mostly light, vigor good, and only 17% of the population was classified as decadent. Seedling and young recruitment was good. During the 2003 reading, density estimates were stable at 4,220 plants/acre. Use was mostly light but the number of decadent plants increased to 82% of the population. In addition, half of those shrubs were classified as dying (>50% crown death). Average height/crown measurements also declined by 5 inches in height and 13 inches in crown diameter. No seedlings were sampled in 2003 but 4% of the population consists of young plants. Many of the sagebrush had good seed production in 2003 and annual leader growth averaged 2 inches. The only other shrubs on the site consist of a few broom snakeweed and prickly pear cactus.

The herbaceous understory is very poor, consisting of small numbers of blue grama and bottlebrush squirreltail. Forbs are rare with only one forb being sampled in one quadrat in 1997 and 2003. Total herbaceous cover was estimated at less than 1% in 1997 and only 0.12% in 2003.

1997 APPARENT TREND ASSESSMENT

Soil conditions are marginal. Rock and pavement cover are high while litter cover is low. Herbaceous vegetation cover is very low. Exposed bare ground is confined to the shrub interspaces with most litter and cryptogamic cover found under sagebrush canopies. There is little erosion occurring due to the gentle terrain. The sagebrush stand is abundant, lightly browsed, and vigorous. Most of the population is mature but age class distribution would indicate a stable population. The herbaceous understory is very poor. Perennial grasses are represented by low numbers of blue grama and bottlebrush squirreltail. Forbs are rare.

2003 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 1997. Trend for browse is down. The Wyoming big sagebrush population has remained stable in density but it has shifted from a mostly mature population to a mostly decadent one. The number of decadent sagebrush has increased from 17% in 1997 to 82% in 2003. In addition, half of the decadent plants sampled were classified as dying which represents 1,680 plants/acre. Many of the sagebrush had good seed production in 2003 and annual leader

growth averaged 2 inches. Utilization remains light so drought conditions are the likely culprit for the downward trends in sagebrush. Data from the Koosharem weather station indicate that spring precipitation (April-June) has been well below average since 2000, averaging only 59% of normal (2000-2003). Total annual precipitation was 80% of normal in 2001 and 82% of normal in 2002. The sagebrush stand is fairly dense for a Wyoming big sagebrush type. Drought will likely cause a thinning of the stand but there are plenty of plants that will survive. Trend for the herbaceous understory is down and in very poor condition. Perennial grasses are uncommon and produce little forage. Forbs are even more rare with only one forb being found in one quadrat in 1997 and 2003. Since 1997, the only fairly common perennial grass, bottlebrush squirreltail, has declined significantly in nested frequency.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 23R, Study no: 2

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	Bouteloua gracilis	17	9	.27	.07
G	Sitanion hystrix	_b 42	_a 11	.49	.05
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		59	20	0.76	0.12
Total for Grasses		59	20	0.76	0.12
F	Astragalus spp.	2	-	.03	-
F	Solanum triflorum (a)	-	1	-	.00
Total for Annual Forbs		0	1	0	0.00
Total for Perennial Forbs		2	0	0.03	0
Total for Forbs		2	1	0.03	0.00

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	'97	'03
B	Artemisia tridentata wyomingensis	88	86	22.94	21.12
B	Opuntia spp.	1	0	.06	-
Total for Browse		89	86	23.00	21.12

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 2

Species	Percent Cover	
	'97	'03
Artemisia tridentata wyomingensis	-	16.56

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 2

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	2.0

BASIC COVER --

Management unit 23R, Study no: 2

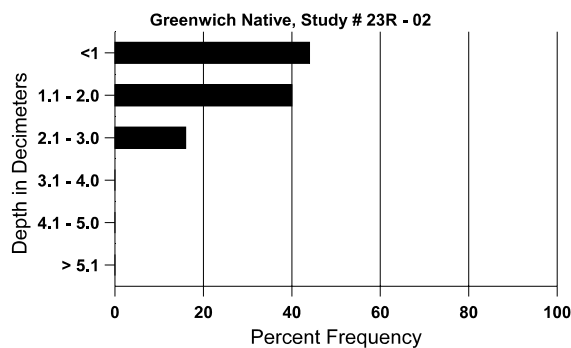
Cover Type	Average Cover %	
	'97	'03
Vegetation	24.26	21.27
Rock	22.26	19.95
Pavement	37.05	18.17
Litter	23.88	22.29
Cryptogams	12.39	7.34
Bare Ground	25.52	21.89

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 2, Study Name: Greenwich Native

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.8	63.3 (11.4)	6.3	55.3	26.2	18.6	1.2	17.7	147.2	0.4

Stoniness Index



PELLET GROUP DATA --
 Management unit 23R, Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Rabbit	1	64	-	-
Elk	-	-	1 (2)	1 (3)
Deer	3	-	78 (193)	-

BROWSE CHARACTERISTICS --
 Management unit 23R, Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
97	4200	160	240	3240	720	1040	42	.47	17	7	27/41
03	4220	-	160	600	3460	1520	11	1	82	40	22/28
<i>Gutierrezia sarothrae</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	8/6
<i>Opuntia spp.</i>											
97	40	-	-	40	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	5/13

Trend Study 23R-3-03

Study site name: Plateau Harrow.

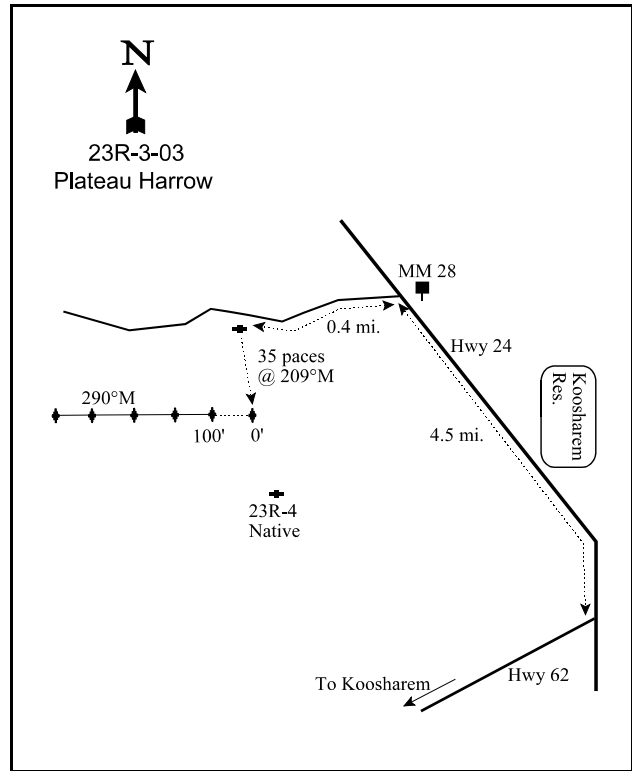
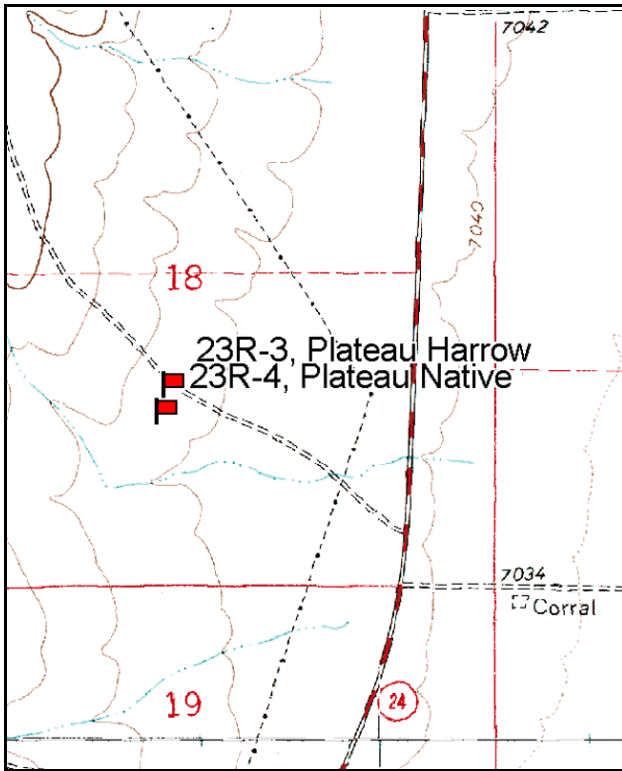
Vegetation type: Perennial Grass.

Compass bearing: frequency baseline 290 degrees magnetic.

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

LOCATION DESCRIPTION

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 27, UTM 12S 4276136 N, 426936 E

DISCUSSION

Plateau Harrow - Trend Study No. 23R-3

This trend study was established in 1999 to monitor a 2-way harrow treatment of Wyoming big sagebrush on private land. This site is paired with an untreated site nearby and sampled with trend study 23R-4. These sites are located about 5 miles north of Koosharem Reservoir and about ½ of a mile west of Highway 62. Elevation is 7,100 feet with an eastern aspect. The area is high elevation winter and spring/summer range for deer and elk. It also grazed by sheep by the land owner but the area has been rested since the treatment was completed. Local biologists stated that deer have been regularly hit by cars during past winters and that deer and elk had been seen on the site during the winter of 1998. Pellet group data taken in 1997 and 2003 indicated light use by both deer and elk (<5 days use/acre).

Soil at the site is deep for a Wyoming big sagebrush site. Effective rooting depth was estimated at nearly 14 inches. It has a sandy loam texture which is neutral in reactivity. There was little noted horizon development in the soil profile and organic matter is low at 1.5% during the initial reading in 1999. Phosphorus was marginal at 10.8 ppm. Protective ground cover is abundant and there are few signs of erosion.

Prior to the harrow treatment, this site was dominated by a thick stand of Wyoming big sagebrush. The 2-way harrow treatment was intended to get around an 80% kill of sagebrush. Density of the sagebrush on the untreated sagebrush site was estimated at 2,000 plants/acre in 2003, while density was estimated at 700 plants/acre on the treatment area. This represents a 65% kill. Remaining sagebrush in the treatment area displayed light use in 1999. Vigor was good on most plants and there were few decadent plants (7%). In 2003, density declined to 700 plants/acre. Use remained light, vigor good, and percent decadence low at 17%. Seed production was excellent in 2003 and annual leader growth averaged nearly 2 inches.

The herbaceous understory is abundant and diverse. The grass composition is dominated by needle-and-thread grass which accounted for 42% of the total grass cover in 1999 and annual cheatgrass which provided 51%. Other perennial grasses included bluebunch wheatgrass, Indian ricegrass, bottlebrush squirreltail and Letterman needlegrass. Data from 2003 indicate a significant increase in the nested frequency of needle-and-thread while cheatgrass declined significantly. Needle-and-thread now provides 83% of the grass cover with a cover value of 19% ('03). Cheatgrass declined to 1% cover which now represents 6% of the grass cover ('03).

The forb composition is also abundant and diverse. Seeded forbs, Lewis flax, yellow sweet clover, alfalfa, and small burnet, all established in small numbers in 1999. The most abundant perennial forbs include stoneseed, Utah deervetch, and lupine which provided 83% of the total forb cover in 1999 and 97% in 2003. During the 2003 reading, no seeded forbs were encountered.

1999 APPARENT TREND ASSESSMENT

Soil conditions are good with abundant protective ground cover to prevent erosion. The treatment reduced the sagebrush from just under 2,000 plants/acre in the adjacent untreated native site to 840 plants/acre in the harrowed area. This represents a 56% kill. Average cover declined from 17% on the native site to 4% in the harrowed area. The remaining sagebrush are lightly browsed and in good vigor. They should slowly increase in density. The herbaceous understory is abundant and diverse with grasses providing about 60% of the total herbaceous cover. Needle-and-thread is the most abundant perennial grass and it accounts for 42% of the total grass cover. Unfortunately, annual cheatgrass is also abundant and it provides just over half (51%) of the total grass cover. Hopefully, perennials will increase in abundance and out-compete cheatgrass. Forbs are also abundant and diverse with seeded forbs, Lewis flax, yellow sweet clover, alfalfa, and small burnet, establishing in small numbers. The most abundant perennial forbs include stoneseed, Utah deervetch, and lupine which provide 83% of the total forb cover.

2003 TREND ASSESSMENT

Trend for soil is up since 1999. Vegetation cover has remained constant but litter cover has increased from 29% to 41%, while cover of bare ground has declined from 22% to 10%. There is abundant protective ground cover coming mostly from perennial grasses. The browse trend is stable. Density has declined slightly but use remains light, vigor good and percent decadence low at 17%. Some seedlings and young were counted indicating successful recruitment since the treatment. The only other shrubs on the site include a few prickly phlox and prickly pear cactus. Trend for the herbaceous understory is mixed. Trend is up for grasses with a significant increase in the nested frequency of needle-and-thread grass combined with a significant decline in annual cheatgrass. Needle-and-thread rose in average cover from 7% in 1999 to 19% in 2003. It now provides 83% of the total grass cover and 62% of the total herbaceous cover. Cheatgrass declined from a cover value of 9% in 1999 to only 1% in 2003. Other perennial grasses, bluebunch wheatgrass, Indian ricegrass, bottlebrush squirreltail, and Letterman needlegrass occur in small numbers. Trend for perennial forbs is down with an overall decline in sum of nested frequency. In addition, all seeded forbs encountered in 1999 were not found in 2003. Stoneseed and lupine dominate the forb composition by providing 97% of the total forb cover. The herbaceous trend is considered up slightly due to the improvement in perennial grasses and the decline of cheatgrass.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - up slightly (4)

HERBACEOUS TRENDS --

Management unit 23R, Study no: 3

T y p e	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
G	Agropyron spicatum	_b 35	_a 11	.87	.48
G	Bromus tectorum (a)	_b 389	_a 126	8.64	1.36
G	Oryzopsis hymenoides	_a 6	_b 13	.24	1.14
G	Sitanion hystrix	_a 8	_b 26	.04	.47
G	Stipa comata	_a 165	_b 276	7.05	19.36
G	Stipa lettermani	_a -	_b 22	-	.44
Total for Annual Grasses		389	126	8.64	1.36
Total for Perennial Grasses		214	348	8.21	21.90
Total for Grasses		603	474	16.85	23.26
F	Alyssum alyssoides (a)	_b 237	_a -	1.51	-
F	Astragalus convallarius	6	3	.04	.09
F	Cryptantha spp.	5	-	.18	.00
F	Eriogonum racemosum	14	12	.17	.11
F	Eriogonum umbellatum	3	-	.00	-
F	Ipomopsis aggregata	1	-	.00	-

Type	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
F	<i>Linum lewisii</i>	3	-	.00	-
F	<i>Lithospermum ruderale</i>	43	41	3.42	4.54
F	<i>Lotus utahensis</i>	_b 61	_a 5	1.25	.24
F	<i>Lupinus argenteus</i>	_b 23	_a 15	4.44	3.11
F	<i>Melilotus officinalis</i>	1	-	.00	-
F	<i>Medicago sativa</i>	_b 7	_a -	.02	-
F	<i>Onobrychis viciaefolia</i>	11	-	.04	-
F	<i>Phlox longifolia</i>	-	3	-	.00
F	<i>Sanguisorba minor</i>	9	-	.09	-
F	<i>Sphaeralcea grossulariaefolia</i>	1	-	.00	-
F	<i>Streptanthus cordatus</i>	-	2	-	.00
F	<i>Tragopogon dubius</i>	3	-	.00	-
Total for Annual Forbs		237	0	1.51	0
Total for Perennial Forbs		191	81	9.72	8.12
Total for Forbs		428	81	11.23	8.12

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	'99	'03
B	<i>Artemisia tridentata wyomingensis</i>	28	27	3.71	4.59
B	<i>Leptodactylon pungens</i>	0	1	-	-
B	<i>Opuntia spp.</i>	3	4	-	.03
Total for Browse		31	32	3.71	4.63

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 3

Species	Percent Cover
	'03
<i>Artemisia tridentata wyomingensis</i>	4.96
<i>Opuntia spp.</i>	.06

PELLET GROUP DATA --
 Management unit 23R, Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'03	'99	'03
Deer	-	-	2 (5)	4 (10)
Rabbit	12	84	-	-
Elk	1	1	3 (7)	3 (7)

BROWSE CHARACTERISTICS --
 Management unit 23R, Study no: 3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	9/12
Artemisia tridentata wyomingensis											
99	840	-	40	740	60	460	7	0	7	5	21/33
03	700	20	60	520	120	20	6	0	17	9	21/29
Leptodactylon pungens											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	5/9
Opuntia spp.											
99	80	-	40	20	20	-	0	0	25	25	4/13
03	100	-	-	100	-	-	0	0	0	0	5/12
Symphoricarpos oreophilus											
99	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	17/24

Trend Study 23R-4-03

Study site name: Plateau Native.

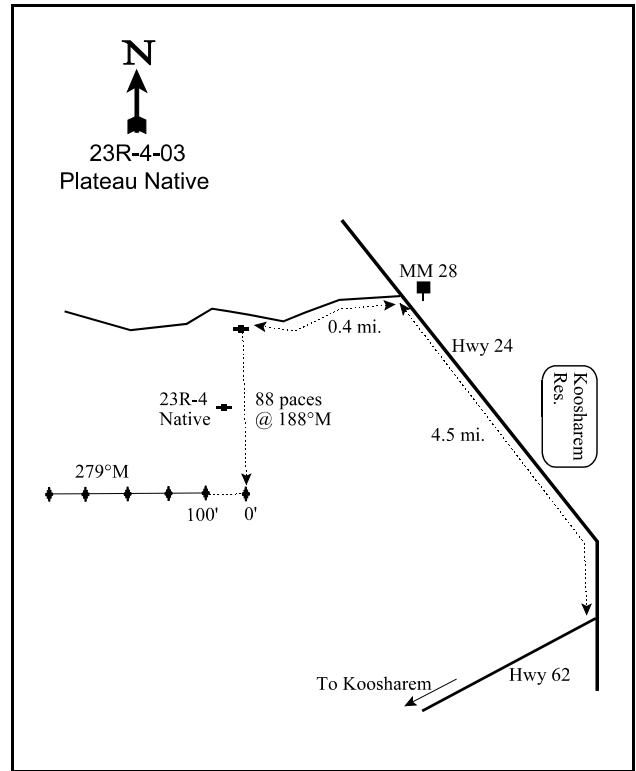
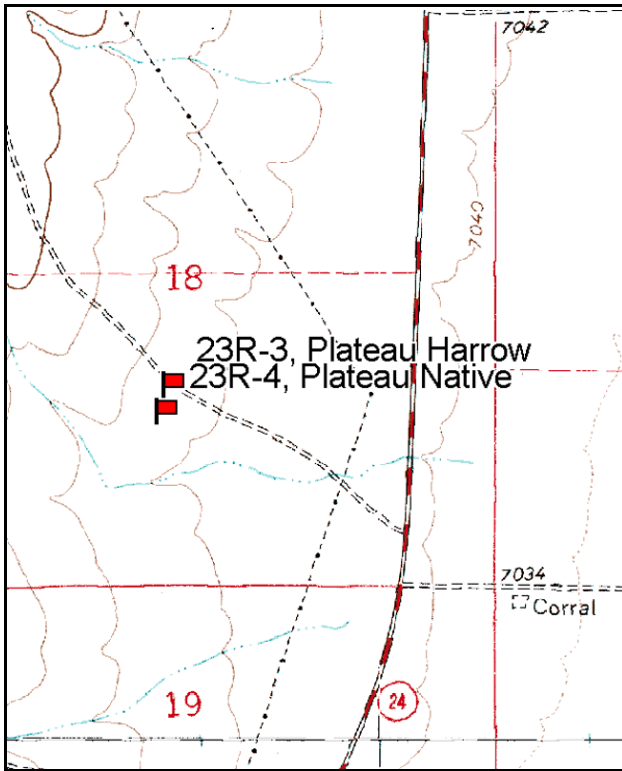
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 279 degrees magnetic.

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

LOCATION DESCRIPTION

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 27, UTM 12S 4276062 N, 426919 E

DISCUSSION

Plateau Native - Trend Study No. 23R-4

This trend study samples an untreated Wyoming big sagebrush site which is paired with previous harrowed trend study, 23R-3. These sites are located about 5 miles north of Koosharem Reservoir and about ½ of a mile west of Highway 62. Elevation is 7,100 feet with an eastern aspect. The area is high elevation winter and spring/summer range for deer and elk. Pellet group data from 1997 found very few deer and elk pellet groups and no pellet groups were encountered in 2003. This area has been grazed by sheep in the past by the land owner but it does not appear that grazing has resumed as of the 2003 reading.

Soil at the site is deep for a Wyoming big sagebrush site. Effective rooting depth is estimated at nearly 14 inches. It has a sandy loam texture which is neutral in reactivity. There was little noted horizon development in the soil profile and organic matter is low at 1.5%. Phosphorus was marginal at 10.8 ppm. Vegetation and litter cover are abundant but concentrated under shrubs leaving shrub interspaces mostly bare. Pavement is concentrated on the soil surface, especially in the shrub interspaces, with a high cover value of 31% in 2003. There is little erosion occurring however. The erosion condition class was determined as stable in 2003.

The site supports a rather dense stand of Wyoming big sagebrush which had an estimated line intercept cover value of 24% in 2003. Population density was estimated at 1,920 plants/acre in 1999. Use was estimated to be moderate to heavy in 1999, but due to the lack of wildlife pellet groups, use was likely overestimated because of the poor annual leader growth that year. Density increased slightly to 2,000 plants/acre by 2003. Use was mostly light, vigor good, with 27% of the stand classified as decadent. Seed production was good in 2003 and annual leader growth was marginal averaging 1.4 inches. The only other shrubs on the site consist of a few prickly phlox and prickly pear cactus.

The herbaceous understory is diverse and fairly abundant but most plants are concentrated under the protection of sagebrush canopies. Total grass cover was estimated at 11% in 1999 and 10% in 2003. Composition is similar to the harrowed site, but needle-and-thread grass is not quite as dominant here without the disturbance. It provided 53% of the total grass cover in 1999 and 65% in 2003. Bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, bottlebrush squirreltail, and Letterman needlegrass are also found on the site. Cheatgrass was common in 1999, producing 26% of the grass cover, but it declined significantly in 2003. Several forbs were encountered but only a few are common. The most abundant perennial forbs include stoneseed, Utah deervetch, redroot eriogonum, and lupine. Total forb cover was estimated at 7% in 1999 and 6% in 2003.

1999 APPARENT TREND ASSESSMENT

Soil conditions are marginal. There is good vegetation and litter cover on the site but it is concentrated under sagebrush canopies leaving shrub interspaces mostly bare. Cover of bare ground was estimated at 20%. There is little erosion occurring however, primarily due to the gentle terrain. The sagebrush population appears stable. Use is mostly moderate, vigor good, and decadence low. The herbaceous understory is diverse but not particularly abundant. Most plants are found growing within sagebrush canopies.

2003 TREND ASSESSMENT

Trend for soil is up slightly. Vegetation and litter cover increased slightly, and cover of bare ground declined from 20% in 1999 to 10% in 2003. One reason for the change is the increase in pavement cover (30% to 40%). There is still a lot of bare ground within the shrub interspaces but most is protected by pavement. Trend for the Wyoming big sagebrush is stable. Density has remained similar. Utilization is mostly light, vigor good, and percent decadence remains about what would be expected for a Wyoming big sagebrush site at 27%. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses has

increased slightly, while frequency of perennial forbs has declined slightly. Nested frequency of the most abundant perennial grass, needle-and-thread, has remained stable. However, nested frequency of annual cheatgrass has declined significantly. Nested frequency of Utah deervetch declined significantly, while all other forbs remained stable or increased significantly.

TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 23R, Study no: 4

Type	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
G	Agropyron spicatum	_b 63	_a 22	1.26	.50
G	Bromus tectorum (a)	_b 248	_a 81	2.67	.64
G	Oryzopsis hymenoides	_b 32	_a 17	.87	.46
G	Poa secunda	_a 2	_b 8	.03	.16
G	Sitanion hystrix	_a 2	_b 54	.03	1.18
G	Stipa comata	165	153	5.58	6.16
G	Stipa lettermani	_a -	_b 27	-	.41
Total for Annual Grasses		248	81	2.67	0.64
Total for Perennial Grasses		264	281	7.77	8.88
Total for Grasses		512	362	10.45	9.53
F	Agoseris glauca	2	-	.00	-
F	Alyssum alyssoides (a)	_b 368	_a 5	1.87	.01
F	Arabis spp.	9	-	.04	-
F	Astragalus convallarius	_a 7	_b 31	.02	.38
F	Cryptantha spp.	_a -	_b 13	-	.14
F	Eriogonum racemosum	44	35	.42	.29
F	Linum lewisii	4	-	.01	-
F	Lithospermum ruderales	69	56	2.77	3.51
F	Lotus utahensis	_b 54	_a 16	.70	.09
F	Lupinus argenteus	22	19	1.20	1.33
F	Penstemon comarrhenus	5	-	.00	-
F	Phlox longifolia	-	8	-	.01
F	Streptanthus cordatus	2	-	.00	-
F	Tragopogon dubius	-	-	.00	-
F	Trifolium spp.	-	3	-	.00

Type	Species	Nested Frequency		Average Cover %	
		'99	'03	'99	'03
	Total for Annual Forbs	368	5	1.87	0.01
	Total for Perennial Forbs	218	181	5.19	5.77
	Total for Forbs	586	186	7.06	5.79

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	'99	'03
B	<i>Artemisia tridentata wyomingensis</i>	62	63	16.89	22.17
B	<i>Leptodactylon pungens</i>	4	3	.18	.15
B	<i>Opuntia</i> spp.	1	4	-	-
	Total for Browse	67	70	17.07	22.32

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 4

Species	Percent Cover
	'03
<i>Artemisia tridentata wyomingensis</i>	23.51

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 4

Species	Average leader growth (in)
	'03
<i>Artemisia tridentata wyomingensis</i>	1.4

BASIC COVER --

Management unit 23R, Study no: 4

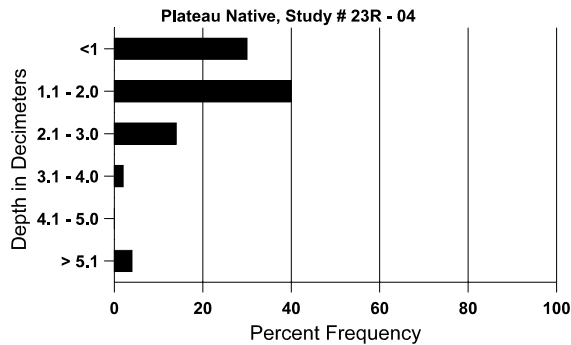
Cover Type	Average Cover %	
	'99	'03
Vegetation	31.04	33.57
Rock	.59	.85
Pavement	30.20	39.80
Litter	22.84	30.55
Cryptogams	4.03	.93
Bare Ground	20.36	10.06

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 4, Study Name: Plateau Native

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.5	62.3 (11.2)	7.1	63.6	19.8	16.6	1.6	10.9	198.4	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 23R, Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)	
	'99	'03	'99	'03
Rabbit	35	86	-	-
Elk	5	-	1 (2)	-
Deer	2	-	1 (3)	-

BROWSE CHARACTERISTICS --
 Management unit 23R, Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
99	1920	-	100	1420	400	240	40	29	21	15	35/50
03	2000	-	-	1460	540	80	30	1	27	9	36/47
<i>Leptodactylon pungens</i>											
99	140	-	-	140	-	-	0	0	-	0	6/11
03	140	-	-	140	-	-	0	43	-	0	4/6
<i>Opuntia spp.</i>											
99	20	-	-	20	-	-	0	0	-	0	3/16
03	120	-	-	120	-	-	0	0	-	0	6/12

SUMMARY

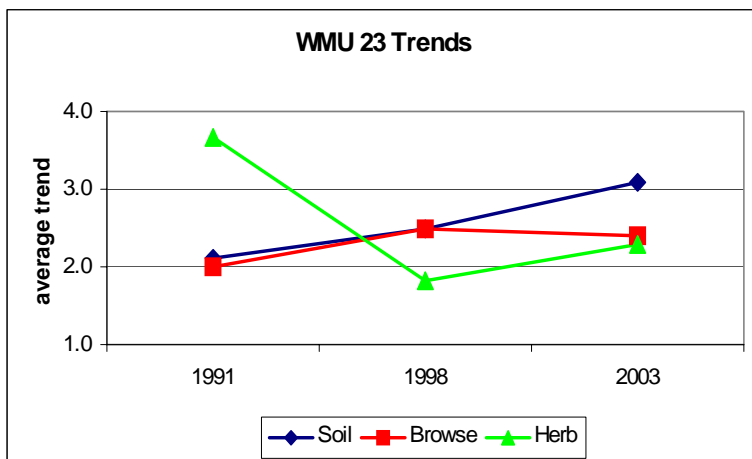
WILDLIFE MANAGEMENT UNIT 23 - MONROE

Six trend studies were established on the Monroe unit in 1985. All of these studies sample big game winter ranges. These studies were reread in 1991, 1998, and 2003. Two additional paired trend studies (treatment & control) were established; one in 1997 near Greenwich sampling a sagebrush disking treatment, and the other north of Koosharem Reservoir which samples a harrow treatment. Average soil trends on unit 23 are stable at 3.1. Saul Meadow (23-2) and Bear Ridge (23-3) had slightly downward soil trends while Greenwich disking had a downward soil trend. All other sites soil trends were stable or improving. Browse trends averaged slightly down unit wide at 2.4. Slightly downward browse trends were found at Bear Ridge (23-1) and Thompson Basin (23-3). Both sites have significant pinyon and juniper cover averaging 32% at Bear Ridge and 34% at Thompson basin. The increased competition combined with drought caused increased decadence in the key browse species. Downward trends were found at Smith Canyon (23-5) and at the paired trend study, Greenwich disking (23R-1) and Greenwich native (23R-2). Smith Canyon's key browse species, mountain big sagebrush declined slightly in density, increased in decadence, and had a decline in young recruitment. All surviving shrubs on the Greenwich disking treatment found in 1998 were not found in 2003. On the Greenwich native site, Wyoming big sagebrush remained stable in density but the number of decadent plants increased from 17% to 82%, and half of the decadent shrubs were classified as dying. Herbaceous trends averaged slightly down unit wide at 2.3. Downward trends were found at Smith Canyon, Greenwich disking, and Greenwich native sites. Slightly downward trends were encountered at Poverty Flat (23-4) and Koosharem Canyon (23-6). Of the 10 trend studies sampled in 2003, eight studies displayed a decline in the sum of nested frequency of perennial grasses while 6 of the 10 showed a decline in the sum of nested frequency of perennial forbs. The average number of forb species sampled declined by half between 1998 and 2003.

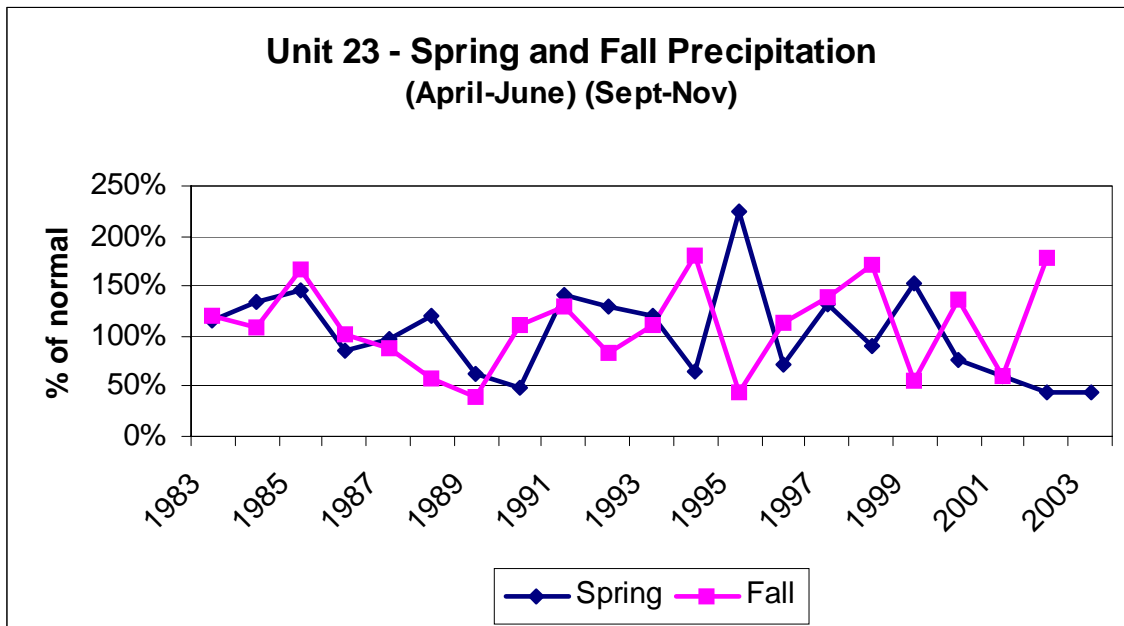
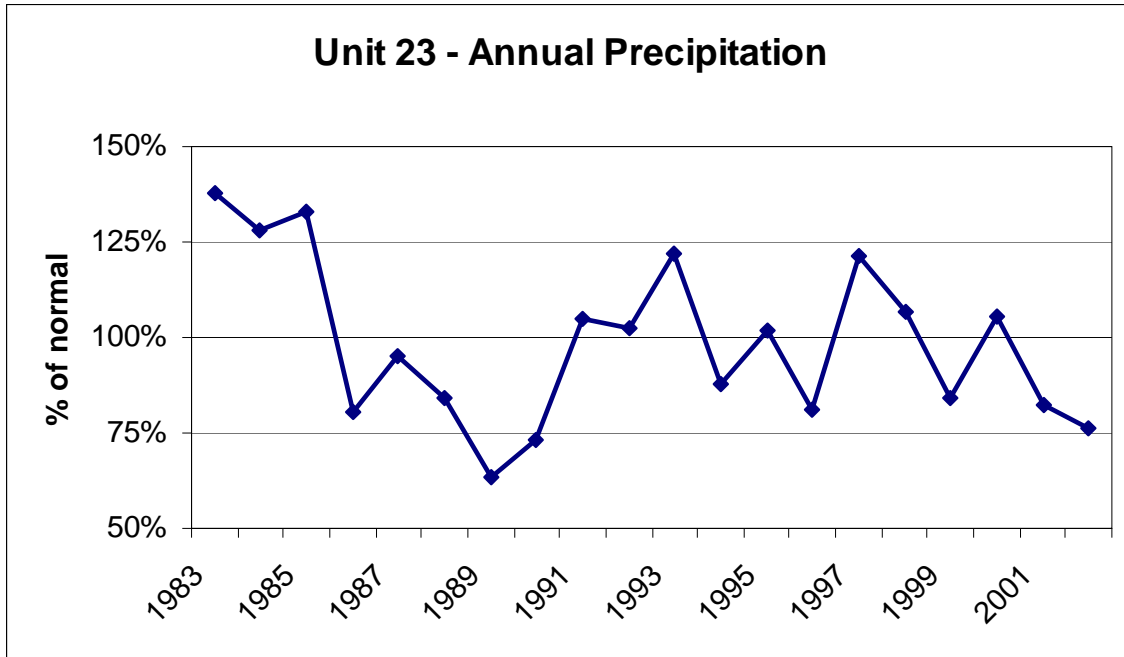
These trends have been driven primarily by weather patterns. Precipitation data from weather stations surrounding the unit (Richfield, Marysvale, and Koosharem) show a dry period prior to the 2003 reading. Annual precipitation was below normal in 2001 and 2002. Spring periods were also very dry from 2000 to 2003, averaging only 44% of normal in 2002 and 43% in 2003 (Utah climate summaries 2004). These dry conditions are the primary factor for the downward browse and herbaceous trends seen on the unit.

Average Trends - WMU 23 Monroe

	1991	1998	2003
Soil	2.0	2.5	3.1
Browse	2.0	2.5	2.4
Herb	3.7	1.8	2.3
	6 sites	6 sites	10 si



Below are precipitation graphs for the Monroe unit. Data represents percent of normal precipitation averaged for 3 weather stations which include Richfield, Marysville, and Koosharem (Utah climate summaries 2004).



Trend Summary

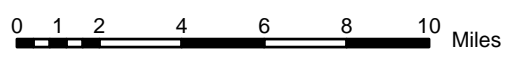
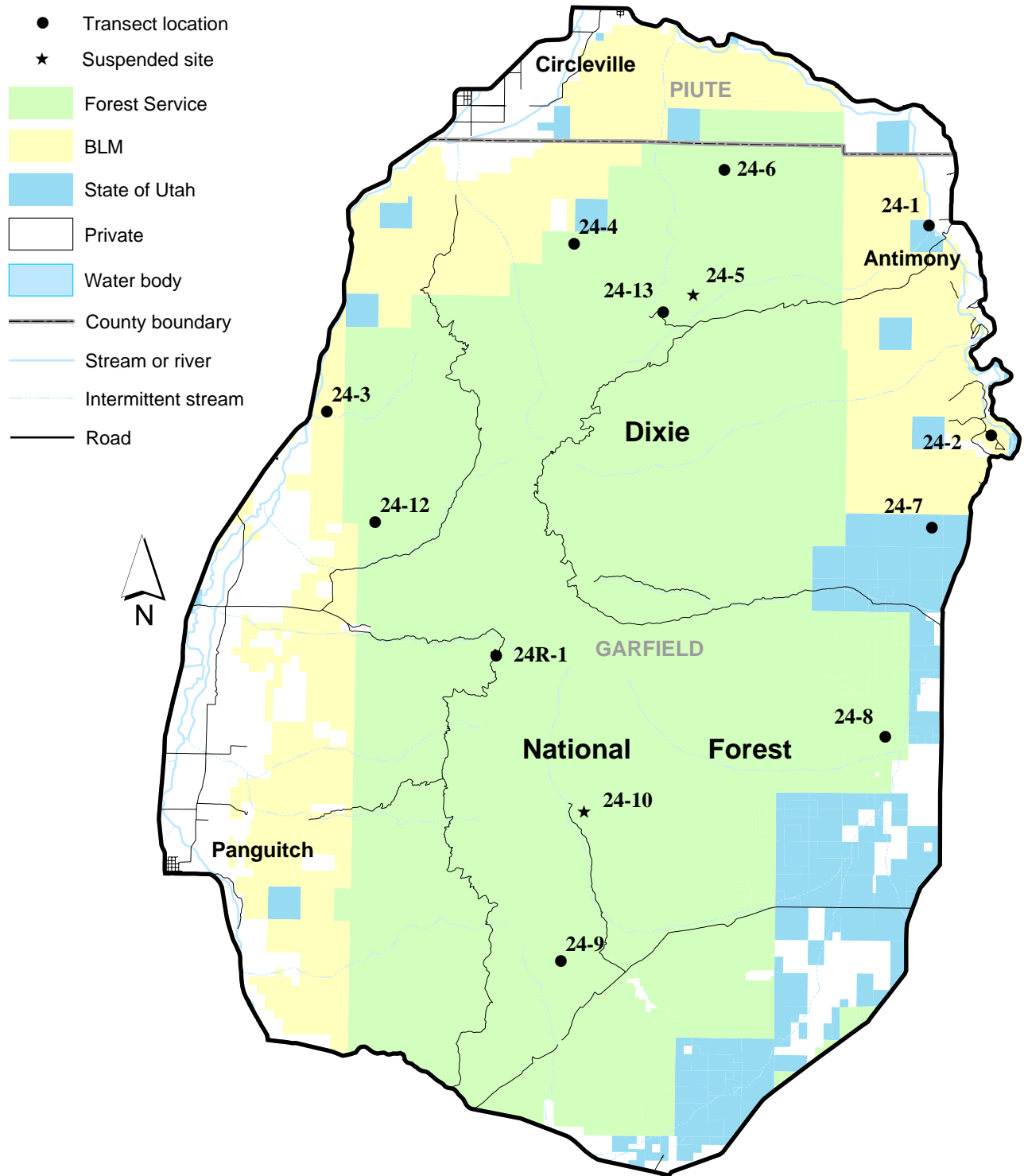
	Category	1985	1991	1998	2003
23-1 Bear Ridge	soil	est	2	2	4
	browse	est	1	3	2
	herbaceous understory	est	4	3	3
23-2 Saul Meadow	soil	est	2	4	2
	browse	est	2	2	4
	herbaceous understory	est	4	3	3
23-3 Thompson Basin	soil	est	2	3	2
	browse	est	2	2	2
	herbaceous understory	est	5	1	3
23-4 Poverty Flat	soil	est	2	1	4
	browse	est	2	1	4
	herbaceous understory	est	1	1	2
23-5 Smith Canyon	soil	est	2	2	3
	browse	est	4	3	1
	herbaceous understory	est	4	2	1
23-6 Koosharem Canyon	soil	est	2	3	3
	browse	est	1	4	3
	herbaceous understory	est	4	1	2
	Category			1997	2003
23R-1 Greenwich Disking	soil			est	1
	browse			est	1
	herbaceous understory			est	1
23R-2 Greenwich Native	soil			est	3
	browse			est	1
	herbaceous understory			est	1

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

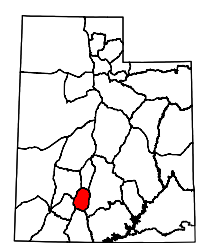
	Category	1999	2003
23R-3 Plateau Harrow	soil	est	5
	browse	est	3
	herbaceous understory	est	4
23R-4 Plateau Native	soil	est	4
	browse	est	3
	herbaceous understory	est	3

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

Management Unit 24



Unit Location



WILDLIFE MANAGEMENT UNIT 24 - MT. DUTTON

Boundary Description

Garfield and Piute Counties - Boundary begins at the junction of Highways US-89 and SR-62; then south on US-89 to Highway SR-12; then east on SR-12 to the Widtsoe-Antimony road; then north on this road to Highway SR-22; then north on SR-22 to SR-62; then west on SR-62 to US-89 and beginning point.

Herd Unit Description

The Dutton Unit is located at the southern end of one of several high plateaus in southern Utah that are the result of a long succession of volcanic activity which centered in the Tushar Mountains and extended south and east to create the Kolob, Sevier and Aquarius Plateaus. Table Mountain is an example of a lava capped plateau on the north end of the unit. Non-marine sedimentary rocks form the parent material for the soils at lower elevations on the southern and eastern portions of the unit. Mt. Dutton rises to an elevation of 11,036 feet near the center of the unit. The reader is directed to review the herd unit description given by Huff and Bowns (1965) for information on the major drainages, municipalities and the limits of normal and severe deer winter range. Huff and Bowns (1965) identified the vegetation composition of normal and severe deer winter range. The acreages for each type are presented below.

ACREAGE OF VEGETATION TYPES FOR NORMAL AND SEVERE WINTER RANGE

Vegetation Type	Acres	%
Pinyon-Juniper	97,500	66
Sagebrush	32,000	22
Mixed Types	10,900	8
Sagebrush-Rabbitbrush	900	1
Seedings	1,900	1
Agricultural Lands	2,600	2
TOTAL	145,900	100

The 1998 deer and elk management plans estimate 131,752 acres of deer and 114,892 acres of elk summer range on the unit. The majority of the summer range for deer and elk is on land administered by the U. S. Forest Service, 94% and 99% respectively. Deer and elk winter range is estimated at 159,508 acres and 71,951 acres, with most being on Forest Service lands, 51% and 70% respectively. BLM administered lands make up most of the remainder of deer and elk winter range.

Key Areas

Key winter range areas for deer were identified by the local interagency committee during the spring of 1987 and include the following areas: North Pole Canyon, Deer Creek Bench, North Bull Rush, Mud Springs, Cow Creek, and the Marshall Basin chaining. The elevation of these key areas range from 6,500 to 7,300 feet. Range types included in the monitoring effort are pinyon-juniper (chained and seeded), Wyoming big sagebrush, and black sagebrush.

Key areas for elk during the winter and summer periods were also identified by the local interagency committee and include: Suicide Pasture, Table Mountain, Cow Creek, Mud Spring Ridge, Barnhurst Ridge,

and Prospect Pasture. These sites range in elevation from 7,200 feet for winter range in Cow Creek to 9,600 feet for summer range in Suicide. The range types included in the monitoring effort are mixed alpine, black sagebrush, and mixed mountain brush.

Activities which have greatly influenced the vegetation composition on these key areas are livestock grazing, range seedings, prescribed burning, and logging. Since livestock grazing has impacted every key area, a discussion of the allotment management plans for each area gives important background information for these sites. **The following discussion comes from the 1997 Range Trend Report and grazing information was current in 1997. Actual dates and numbers of grazing animals may have changed since.**

Livestock Grazing Summary

East Pines - C & H Allotment

Prior to 1954, sheep and cattle used the area now included in this allotment. Approximately 5,770 acres were dixe harrowed or plowed and seeded from 1949 to the early 1950's. From 1954-68, the unit was grazed on a deferred rotation system. Since 1968, it has been grazed by cattle only on a three pasture, rest-rotation system involving the Showalter, West Hunt, and East Hunt pastures. The Mud Spring trend study is located in the Showalter pasture. The Allotment Management Plan, prepared in 1965 and updated in 1977 found 23% of the pasture to be in good condition, 70% in fair condition, and 7% in poor condition. About 50% of the pasture which is suitable for livestock grazing was seeded in the early 1950's. The permittee uses this Forest Service allotment 6/1 to 10/10 and then grazes state land adjacent to U.S. Forest Land in Johns Valley in the fall from 10/10-12/1.

Hunt Creek

Cottonwood S & G Allotment

The allotment has been grazed by livestock since the 1860's. Livestock numbers have fluctuated from 50 to 140 cows and from 800-1,750 sheep. In addition, cattle drift in from adjacent areas to increase the level of use in the area. In 1953, the allotment was allocated to sheep only. From 1953-59 the allotment was composed of the West Hunt Creek S & G Allotment and the Prospect Creek - Spring Creek S & G Allotment. Active preference for the two units was 1,148 sheep from 6/15-9/30 each year (803 AUMs). In 1960, these two units were combined to form the Hunt Creek S & G Allotment. Stocking levels were reduced to 595 AUMs for the same period of use. In 1965, the same number of AUMs were authorized for a shorter grazing period (7/1-9/30). In 1981, the allotment was combined with the Cottonwood S & G Allotment. Numbers were changed to 1,200 from 6/16-10/10 (932 AUMs). Prior to this time, 400-450 AUMs had been allocated for sheep use in the Cottonwood Allotment since 1962. The Barnhurst Ridge trend study is located in the West Hunt Pasture which is grazed by 930 cattle as part of a 5 pasture deferred rotation grazing system.

Widtsoe C & H Allotment

The population in Johns Valley reached a peak population of 1,200 in 1915 as homesteaders attempted to dry farm. Lack of sufficient moisture forced the settlers to move. By 1935, most of the homesteads were purchased by the government through the Resettlement Act and returned to federal ownership. In 1960, an executive order gave sole jurisdiction of 14,825 acres to the BLM and 11,783 acres to the U.S. Forest Service. The Widtsoe Allotment was described as a separate unit and included inside the U.S. Forest Service boundary at that time. The unit was divided into three pastures in 1968 following the treatment of approximately 8,200 acres of sagebrush rangeland. A 1977 updated AMP shows that 88% of the treated area is in good condition, and 12% is only in fair condition. The native range (1,139 acres) is considered to be in fair condition, and 500

acres dominated by rabbitbrush are listed as being in poor condition.

The Prospect trend study is located in the lower Prospect Pasture which is grazed by 337 cattle from June 1st to October 10th, as part of a three pasture deferred rotation system. The number of elk using this allotment has increased over the years during late winter and early spring months.

Jones Corral C & H Allotment

The Mud Springs, Jones Corral, and Suicide trend studies are located in the Mud Springs Division of the Jones Corral C & H Allotment. The Mud Springs site was chained and seeded in 1975 (2,418 acres). The Jones Corral Enclosure was also seeded.

The Mud Springs C & H allotment was established in 1969. Prior to 1955, seven permittees grazed 110 cattle season long. The cows drifted to higher elevations and caused overstocking problems in the vicinity of Jones Corral. Prior to the creation of the U.S. Forest Service, the Jones Corral area was grazed by a large number of sheep. It has since been converted to cattle and is the middle unit of a 3-pasture deferred rotation system involving two pastures in the Mud Springs chaining. Currently, the Mud Springs part of the unit is grazed by 208 cattle sometime between June 1st to October 10th depending on the rotation. Cattle do not get on to the Suicide area until mid-July.

Deer Creek Sheep Allotment

Three units make up this allotment: Horse Valley, Table Mountain and Deer Creek. The Marshall Basin trend study is located in the Horse Valley Unit, although the chained area has been set aside for wildlife. The Table Mountain study is located in the Table Mountain Unit.

The Horse Valley Unit was grazed with cattle and horses prior to 1922. After 1922, it was switched over to sheep use, and numbers varied from 1,076 prior to 1924 to 900 in 1931 following a 10% reduction. Table Mountain has always been sheep range. Cattle have drifted from the Jones Corral Unit onto Table Mountain, and sheep have drifted into the cattle allotment. For the past few years, sheep have been kept off the Table Mountain area.

Pine Creek Allotment - BLM

This allotment historically has provided spring and fall range for cattle. For the grazing history of this area and the percent composition of the various condition classes for suitable grazing land, the reader is referred to the BLM Resource Management Plan for the area. Active preference is 691 AUM's on the federal portion and 62 AUM's on the state with spring and fall cattle use.

The North Pole Canyon and Cow Creek trend studies are located on state land adjacent to this allotment.

Herd Unit Management Objectives

The current management objectives for deer are to achieve a target population size of 2,700 wintering deer with a post season buck to doe ratio of 15:100 and 30% of these bucks being three point or better. The elk management objective is to achieve a target winter population of 1,500 elk with a minimum post season bull to cow ratio of 14:100 and at least 7 of these bulls being 2 ½ years of age or older. The bull elk harvest objective is to provide opportunity for a 60% bull harvest success ratio and 40% of the harvest being 2 ½ year or older bulls. The bull harvest will be managed to average 5-6 year old animals.

Herd Unit Status

The buck deer harvest averaged 201 between 1990 and 1995. This is a major decline from the previous four years (1986 to 1989) which averaged 565 bucks harvested per year. The fawn/doe ratio was marginal with 49 fawns/100 does estimated during the 1994-95 and 1995-96 seasons. Since 1991-92, the ratio has averaged only 54 fawns/100 does. Poor fawn production was also found in 1989-90 and 1990-91 at 34 and 42 fawns/100 does respectively. Prior to those years fawn production was much higher averaging 72 fawns/100 does between 1986-87 and 1988-89.

The Mount Dutton unit is a limited entry elk unit. Harvests averaged 41 bulls between 1991 and 1995. Antlerless permits have been issued during each season with the exception of 1992. A high of 500 antlerless permits were issued in 2003. Elk calf production has improved since the severe winter of 1991-92 when only 20 calves/100 cows were estimated. In 1994-95, that ratio increased to 52 calves/100 cows.

Study Site Description

A total of 11 trend study sites were established on the unit in 1987. Most of these sites were reread in 1991, 1997, and 2003. Two additional studies were established on the unit following 1987. One study was established in 1998 to sample a prescribed burn on a conifer/aspen vegetation type on the right fork of Sanford Canyon. The other study was established near the Jones Correl enclosure in 2003 to monitor an area heavily used by elk and livestock. Study sites monitor important winter, spring/winter, and summer range for elk and deer. A site description for each site follows along with data tables and a discussion of trends taking place.

Trend Study 24-1-03

Study site name: N. Pole Canyon.

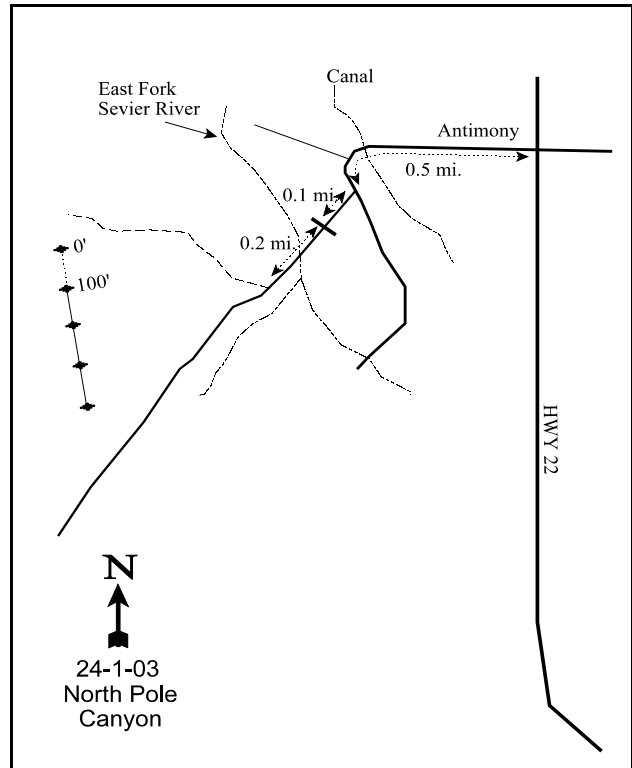
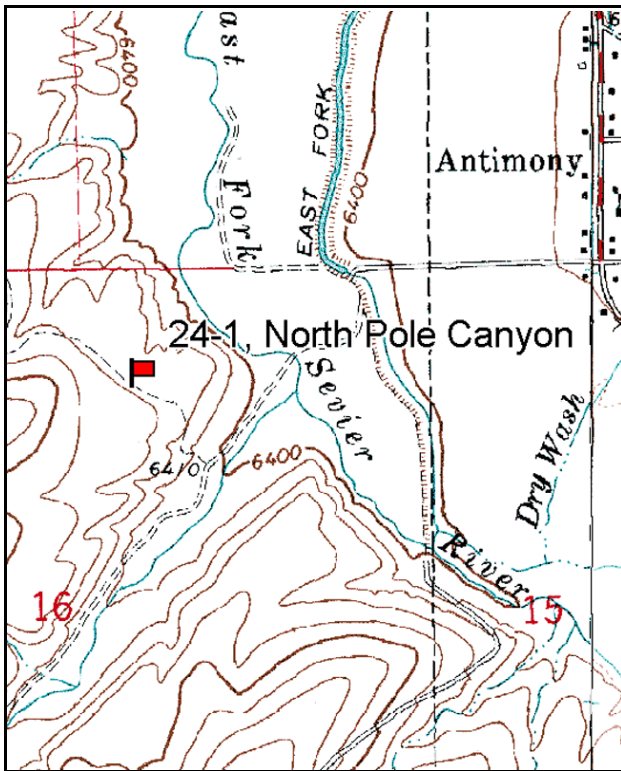
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From the town of Antimony, drive west on the Mt. Dutton road for approximately 0.5 mile to a canal and bridge. Just past the canal bridge, turn right, go through a gate and bear left down towards the Sevier River. Go 0.1 mile to another gate. Go through the gate and continue 0.2 miles across a field to the river. The old road is washed out, so cross the river on foot and hike up the hill to the southwest along an old jeep trail. The transect is on top of the hill and starts 20 feet south of the old road. The study is marked by short, green fence posts. There is a browse tag on the 0' stake.



Map Name: Deep Creek

Diagrammatic Sketch

Township 31S, Range 2W, Section 16

GPS: NAD 27, UTM 12S 4218738 N, 411278 E

DISCUSSION

North Pole Canyon - Trend Study 24-1

The North Pole Canyon study is located on a bench above the East Fork of the Sevier River and about one-half mile from the town of Antimony. The site is at an elevation of about 6,520 feet with a gentle 4% slope and a slight northeast aspect. It is a key area for wintering mule deer. Deer concentrate on the bench and utilize forage from adjacent agricultural lands in the valley during the spring and fall. Cattle use this area in the spring, and it appears as though the area has been overstocked in the past. This site does not receive much pressure from people since the jeep trail across the East Fork of the Sevier River has been washed out. The only activities on this bench are those associated with livestock grazing. Pellet group data from 2003 estimated 42 deer and 20 cow days use/acre (104 ddu/ha and 48 cdu/ha). Deer pellet groups appeared to be from winter use while cattle pats were from the previous year (2002).

Soil on the site is relatively shallow with an effective rooting depth estimated at 12 inches. The soil profile is very rocky with considerable amounts of rock and pavement on the surface. Soil temperature was relatively high averaging 67°F at an average depth of 15 inches in 2003. Soil texture is a sandy clay loam which is neutral in reaction (pH 6.8). Organic matter is limited at 1.3%, the lowest level of all the sites on the unit. The soil is vulnerable to erosion with an average of about 33% bare soil since 1987. Pedestalling around plants, especially the older sagebrush, is evident and small active gullies are found on the site. Litter is limited averaging 38% in 1991, but declining to only 16% in 1997. It is restricted mainly to the area directly beneath the sagebrush canopy.

The key species is Wyoming big sagebrush, which accounts for virtually 100% of the shrub cover. The stand was fairly dense in 1987 with an estimated 5,998 plants/acre. Many of the interspaces were occupied by seedlings (3,433/acre) in 1987. Young plants were also common at that time accounting for 48% of the population. However, sagebrush density dropped by 27% by 1991 to 4,399 plants/acre and the number of decadent plants increased from 9% to 51%. In addition, 72% of the decadent plants were classified as dying (>50% crown death). During the 1997 reading, the population remained relatively stable at 4,420 plants/acre. Percent decadence declined to 12% and recruitment was good with 39% of the population consisting of young plants. Vigor was normal on most plants. Drought conditions in 2003 contributed to a 32% decline in population density to 3,020 plants/acre. Vigor was considered poor on nearly half of the plants sampled (45%) and 80% of the population was classified as decadent. In addition, 54% of the decadent plants sampled were rated as dying. No seedlings were encountered and young plants accounted for only 8% of the population. The stand received considerable use in 1987 when 84% of the shrubs were moderate or heavily hedged. Since then, use has been classified as mostly light to moderate with a few plants exhibiting heavy hedging.

Herbaceous species are lacking in the area. Blue grama is the only abundant grass. It is a warm season species which provides limited forage due to its low growth form. Perennial forbs are nearly absent but weedy annual forbs consisting of goosefoot, nodding eriogonum, and stickseed were abundant in 1997.

1991 TREND ASSESSMENT

Soil trend appears to be stable, but in very poor condition. Recent gullies formed by flash floods are evident and there is potential for gullies to enlarge with the lack of cover in the interspaces. The dominant overstory is Wyoming big sagebrush. Although heavy hedging has decreased by nearly 30%, the sagebrush population went from 9% decadent to 51% decadent, showing a downward trend. The increase in weedy annual forbs and no desirable species is a cause for concern. Grasses have also decreased slightly on the site.

TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - down (1)

herbaceous understory - down slightly (2)

1997 TREND ASSESSMENT

Trend for soil is stable, but still in poor condition. Percent bare ground has declined slightly since 1991 with litter cover also decreasing. Trend for Wyoming big sagebrush is up slightly. Density has remained relatively similar to 1991 estimates. However, utilization is lighter, vigor improved, and percent decadence has declined from 51% to 12%. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has remained similar to 1991 estimates with the frequency of forbs increasing. However, five of the six forbs encountered in 1997 are weedy annuals consisting of goosefoot, nodding eriogonum, and stickseed. These weedy species accounted for more than 99% of the forb cover. The only perennial forb encountered on the site was Utah milkvetch which occurred in only 2 of the 100 quadrats.

TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - up slightly (4)

herbaceous understory - stable, but poor (3)

2003 TREND ASSESSMENT

Trend for soil remains stable but poor. Percent cover of bare ground remains high at 31% while litter and vegetation cover increased slightly. The gentle terrain limits severe erosion and cover of blue grama more than doubled since 1997. Trend for Wyoming big sagebrush is down. Density declined 32% from 4,420 to 3,020 plants/acre. Nearly half (45%) of the sagebrush sampled displayed poor vigor and 80% of the population was classified as decadent. In addition, 54% of the decadent plants sampled were rated as dying (>50% crown death). No seedlings were encountered and young plants accounted for only 8% of the population. Utilization was mostly light to moderate. These trends appear to be caused primarily by drought conditions which have effected this area for the past few years. Spring precipitation (April - June) has been extremely low between 2000 and 2003, averaging only 46% of normal at the Angle, Utah weather station (Utah climate summaries 2004). This lack of spring precipitation with more normal summer rainfall has caused an increase in the warm season perennial grass, blue grama. It increased significantly in nested frequency and more than doubled in average cover from 7% in 1997 to 18% in 2003. Other grasses are rare in their occurrence and forbs remain rare as well. Trend for the herbaceous understory is considered up slightly.

TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - down (1)

herbaceous understory - up slightly but poor (4)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 1

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	<i>Bouteloua gracilis</i>	_{ab} 240	_{ab} 210	_a 203	_b 244	7.00	18.33
G	<i>Bromus tectorum</i> (a)	1	-	-	-	-	-
G	<i>Oryzopsis hymenoides</i>	3	1	-	-	.00	-
G	<i>Sitanion hystrix</i>	2	-	-	-	-	-
G	<i>Sporobolus cryptandrus</i>	_b 15	_{ab} 9	_a 1	_{ab} 12	.01	.38
G	<i>Stipa comata</i>	4	-	1	-	.00	-
Total for Annual Grasses		1	0	0	0	0	0
Total for Perennial Grasses		264	220	205	256	7.02	18.71
Total for Grasses		265	220	205	256	7.02	18.71
F	<i>Astragalus utahensis</i>	-	-	2	-	.01	-
F	<i>Chenopodium fremontii</i> (a)	_b 10	_c 75	_d 194	_a -	6.01	-
F	<i>Chenopodium leptophyllum</i> (a)	-	-	_b 108	_a 1	1.19	.03
F	<i>Eriogonum cernuum</i> (a)	-	_a 3	_b 83	_a 2	1.09	.03
F	<i>Lappula occidentalis</i> (a)	-	-	24	10	.05	.04
F	<i>Salsola iberica</i> (a)	3	-	-	-	-	-
F	<i>Sphaeralcea grossulariaefolia</i>	-	-	-	2	-	.03
Total for Annual Forbs		13	78	409	13	8.35	0.11
Total for Perennial Forbs		0	0	2	2	0.01	0.03
Total for Forbs		13	78	411	15	8.36	0.14

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

BROWSE TRENDS --
Management unit 24 , Study no: 1

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Artemisia tridentata wyomingensis</i>	75	74	6.47	6.05
B	<i>Ceratoides lanata</i>	0	2	-	-
B	<i>Chrysothamnus nauseosus</i>	1	0	-	-
B	<i>Chrysothamnus viscidiflorus</i>	0	1	-	.03
B	<i>Sclerocactus</i>	2	0	-	-
Total for Browse		78	77	6.47	6.08

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 1

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	3.73
Chrysothamnus depressus	1.28

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 1

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	2.2

BASIC COVER --

Management unit 24 , Study no: 1

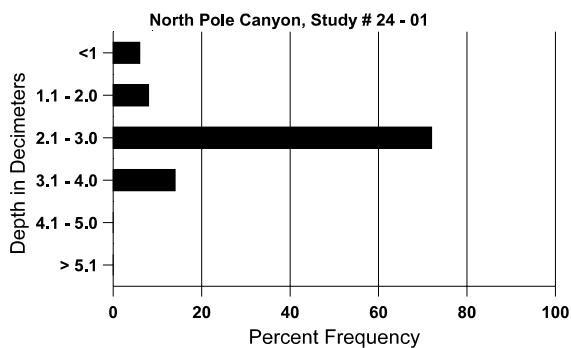
Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	14.50	6.75	21.54	25.59
Rock	6.75	4.75	7.22	9.19
Pavement	15.00	16.25	20.33	21.87
Litter	29.00	38.00	16.26	17.27
Cryptogams	0	0	.18	.22
Bare Ground	34.75	34.25	29.45	31.46

SOIL ANALYSIS DATA --

Management unit 24, Study no: 1, Study Name: North Pole Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.1	67.0 (15.0)	6.8	52.7	22.7	24.6	1.3	12.3	188.8	1.2

Stoniness Index



PELLET GROUP DATA --
 Management unit 24 , Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'03	
Rabbit	7	19	-
Elk	1	-	-
Deer	20	15	42 (104)
Cattle	5	5	20 (48)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 1

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
87	5998	3433	2866	2566	566	-	41	43	9	11	13/18
91	4399	133	1000	1166	2233	-	17	14	51	37	12/19
97	4420	360	1720	2180	520	840	8	.45	12	8	18/26
03	3020	-	240	360	2420	1320	28	5	80	45	15/20
<i>Ceratoides lanata</i>											
87	133	33	33	100	-	-	50	25	0	0	12/2
91	133	-	-	133	-	-	0	50	0	0	7/7
97	0	-	-	-	-	-	0	0	0	0	-/-
03	40	-	-	20	20	-	0	100	50	0	12/10
<i>Chrysothamnus nauseosus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	80	-	-	80	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Chrysothamnus viscidiflorus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	6/4
<i>Sclerocactus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	60	-	40	20	-	-	0	0	-	0	11/11
03	0	-	-	-	-	-	0	0	-	0	1/2

Trend Study 24-2-03

Study site name: Deer Creek Bench.

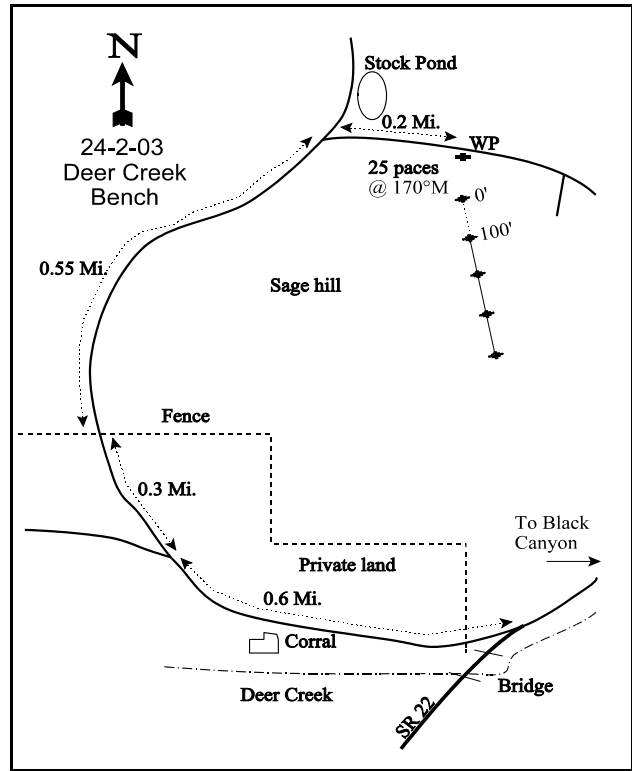
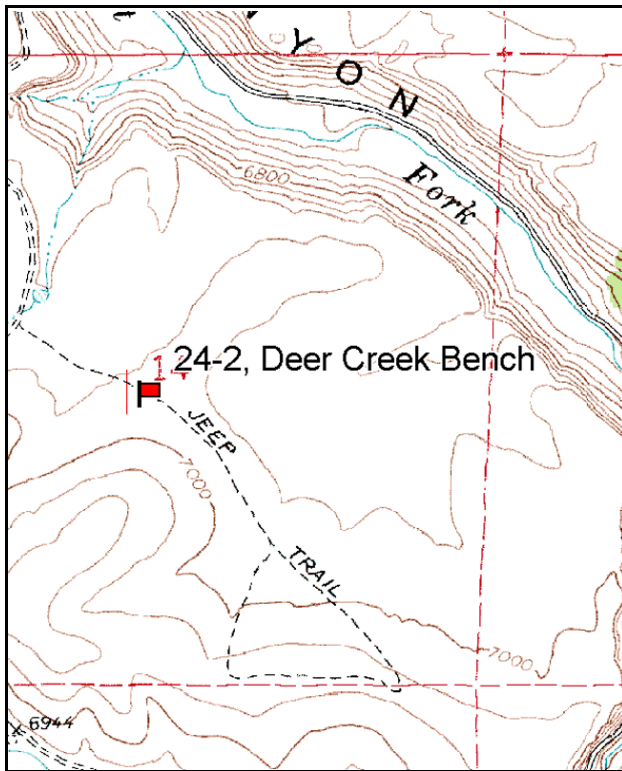
Vegetation type: Black Sagebrush.

Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

From SR22 in the southern end of Black Canyon, follow the highway up Deer Creek to a bridge. Immediately north of the bridge, turn hard left. Take this road, which crosses private land, northwest for 0.6 miles passing a corral to a fork. Bear right, go 0.3 miles to a fence. Continue 0.55 miles to a fork by a stockpond. Turn right onto the jeep trail and proceed 0.2 miles to the study area. There is a witness post located on the right side of the road. Walk approximately 25 paces bearing 170 degrees to the 0-foot baseline stake. The study is marked by 2-foot tall fence posts. The 0-stake is marked by browse tag #9100. The transect runs south up the hill.



Map Name: Antimony

Diagrammatic Sketch

Township 32S, Range 2W, Section 14

GPS: NAD 27, UTM 12S 4208453 N, 414331 E

DISCUSSION

Deer Creek Bench - Trend Study 24-2

The Deer Creek Bench trend study is located on the east side of the unit in an area characterized by a broad, gently sloping (11%) surface with low relief that is situated near the base of steeper slopes that rise up to the Sevier Plateau. The area is covered with alluvial gravel and sand over bedrock. The key browse species are Wyoming big sagebrush and black sagebrush. This is a key winter use area for mule deer that is also utilized by a growing herd of antelope. Numerous deer pellet groups and several antler drops have been found in the area during each reading. Pellet group data from 1997 estimated 121 deer days use/acre (289 ddu/ha). Elk also lightly use the area with 8 elk days use/acre estimated in 1997 (20 edu/ha). Pellet group data from 2003 estimated 64 deer days use/acre (159 ddu/ha). A few deer pellet groups were from spring/summer use but most appeared to be from winter use. Several sage grouse pellets were also encountered. Escape and thermal cover are not present on the site, but some is located one-half mile to the west. It appears that the area is used lightly by livestock with only 6 cow use days/acre estimated in 1997 and 8 in 2003. A stock pond is located about 1/4 of a mile to the north, and Deer Creek is 3/4 of a mile to the south of the study. There are no other known uses of the area and human pressure is assumed to be minimal during the year.

The soils are a coarse textured, sandy loam. A large portion of the surface is covered with erosion pavement and rock. The soil is fairly deep with an effective rooting depth estimated at almost 14 inches. The soils lack a well-developed A horizon. There is an abundance of small pebbles and large gravel on the surface and through the soil profile down to a depth of six to eight inches. Few rocks are found below eight inches. At about 10 to 12 inches in depth, a light colored more sandy horizon is found. Patches of bare ground are interspersed among the rocks, litter, and vegetation. Most of the litter is found beneath the shrub canopy. There is not much evidence of excessive erosion on this site.

A fairly dense stand of black sagebrush occupies the site along with some pygmy sagebrush. Density of black sagebrush has remained stable over the years with a dense population, averaging around 8,500 plants/acre. The stand appears to be dynamic with high numbers of seedlings and young. Use was heavy in 1987 and 1991 but light to moderate in 1997 and 2003. Vigor has been classified as good on most plants during all readings except for 1991 when 21% of the plants sampled displayed poor vigor. The number of decadent plants also peaked at 55% in 1991, but has since declined to 15% in 1997 and 24% in 2003. Low growing pygmy sagebrush was first sampled with the larger sample used in 1997. Density was estimated at 2,500 plants/acre in 1997 and 3,220 in 2003. These shrubs average only 2 inches in height and are mostly unutilized.

Slenderbush eriogonum provides some additional forage on the site with a density of 7,620 plants/acre in 2003. These shrubs are small averaging only 2 inches in height. Small numbers of winterfat also provide some additional forage. Narrowleaf low rabbitbrush, a poor value increaser, is also abundant with a density of 3,060 plants/acre in 1997 and 3,360 in 2003. The population is mostly mature. Broom snakeweed is also found on the site and there may have been some identification problems between it and rabbitbrush during past readings.

Herbaceous plants are rare. Bottlebrush squirreltail, Indian ricegrass, and needle-and-thread are the only perennial grasses found on the site. These three perennial species produced only 4% cover in 1997, increasing to about 7% in 2003. Nine forb species were encountered in 1997, and only 6 species in 2003. Only trailing fleabane and scarlet globemallow occur more than rarely. All forbs combined produced less than 1% cover in 1997 and 2003. They are probably of limited value to mule deer during the spring.

1991 TREND ASSESSMENT

Basal vegetative cover and litter cover have both declined since the last survey, from 9% to 3%, and 25% to 17%, respectively. Collectively, rock and pavement cover have increased somewhat from 47% to 54%. This data would indicate a downward trend for soil. Trend for browse has become somewhat more difficult to determine since the survey in 1987. Black sagebrush density has decreased from 9,999 down to 8,599 plants/acre. The amount of heavy hedging has decreased from 58% to 36% but the sagebrush displaying poor vigor increased from 2% to 21%. The number of decadent plants also increased from 29% to 55% of the population. Trend for browse is considered down slightly even with a notable decrease in the broom snakeweed population. The herbaceous understory is about the same for the grasses, but the forbs are mostly on the decline. The trend would be slightly declining. An extended period of drought has been responsible for much of this downward trend.

TREND ASSESSMENT

soil - slightly downward (2)

browse - slightly downward (2)

herbaceous understory - slightly downward (2)

1997 TREND ASSESSMENT

The soil trend appears to have improved slightly since 1991. Percent bare ground has declined from 24% to 13% and rock/pavement cover has also declined from 54% to 39%. Percent litter cover has remained at similar levels to 1991 estimates. In addition, sum of nested frequency of grasses has increased slightly. Trend for the key browse, black sagebrush, is considered stable. Moderate and heavy use has declined from 81% to 36%, vigor has improved, and percent decadence declined from 55% to 15%. However, seedlings and young plants have steadily decreased since 1987, along with a steady increase in the percentage of decadent plants being classified as dying. Trend for the herbaceous understory is up slightly but still depleted with grasses and forbs producing only 5% total cover.

TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1997. Trend for the key browse species, black sagebrush, remains stable. Density has remained similar since 1987. Use is light to moderate, vigor good on most plants, and percent decadence has remained moderately low at 24%. Recruitment is down however, with no seedlings encountered in 2003 and young plants accounting for only 1% of the population. The population may decline slightly in the future if drought conditions persist. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has increased slightly while frequency of perennial forbs has declined slightly. Cover of perennial grasses did increase from 4% to 7% but overall herbaceous cover remains poor.

TREND ASSESSMENT

soil - stable, but in poor condition (3)

browse - stable (3)

herbaceous understory - stable, but poor (3)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 2

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	Bromus tectorum (a)	-	-	3	2	.00	.00
G	Oryzopsis hymenoides	_a 9	_a 11	_b 73	_b 93	2.04	4.46
G	Sitanion hystrix	126	98	101	138	1.66	1.92
G	Stipa comata	_a -	_{ab} 7	_{bc} 14	_c 28	.26	.49
Total for Annual Grasses		0	0	3	2	0.00	0.00
Total for Perennial Grasses		135	116	188	259	3.96	6.88
Total for Grasses		135	116	191	261	3.97	6.88
F	Antennaria rosea	-	-	2	-	.00	-
F	Arabis spp.	_b 9	_a -	_{ab} 5	_a -	.01	-
F	Astragalus spp.	_b 20	_b 24	_a 4	_a -	.01	-
F	Astragalus utahensis	-	-	6	-	.01	-
F	Chenopodium spp. (a)	-	-	_b 18	_a -	.04	-
F	Cruciferae	5	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	_a -	_b 13	-	.08
F	Erigeron pumilus	_b 48	_a 19	_b 41	_a 8	.31	.05
F	Gayophytum ramosissimum(a)	-	-	_b 35	_a 11	.08	.03
F	Paronychia spp.	_b 19	_b 21	_a -	_a -	-	-
F	Phlox hoodii	_a -	_{ab} 8	_a -	_b 13	-	.06
F	Phlox longifolia	13	12	6	12	.01	.05
F	Senecio multilobatus	1	-	-	-	-	-
F	Sphaeralcea coccinea	_b 60	_{ab} 58	_a 31	_{ab} 37	.20	.26
Total for Annual Forbs		0	0	53	24	0.12	0.10
Total for Perennial Forbs		175	142	95	70	0.56	0.43
Total for Forbs		175	142	148	94	0.69	0.54

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

BROWSE TRENDS --

Management unit 24 , Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	Artemisia nova	93	98	16.65	17.47
B	Artemisia pygmaea	22	23	.82	.88
B	Ceratoides lanata	1	3	-	.03
B	Chrysothamnus viscidiflorus stenophyllus	47	46	2.23	3.05
B	Eriogonum microthecum	53	52	1.14	.76
B	Gutierrezia sarothrae	4	46	-	.45
B	Opuntia spp.	4	5	-	-
B	Pediocactus simpsonii	0	1	-	.01
Total for Browse		224	274	20.87	22.68

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 2

Species	Percent Cover
	'03
Artemisia nova	17.89
Artemisia pygmaea	.73
Chrysothamnus viscidiflorus stenophyllus	2.59
Eriogonum microthecum	.21
Gutierrezia sarothrae	.70

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 2

Species	Average leader growth (in)
	'03
Artemisia nova	1.1

BASIC COVER --

Management unit 24 , Study no: 2

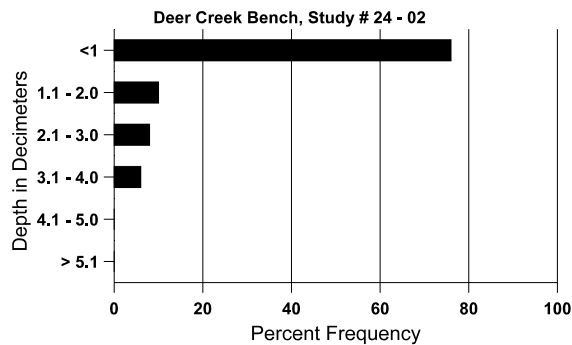
Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	8.50	2.75	25.71	28.83
Rock	16.75	8.75	11.87	17.70
Pavement	30.00	45.25	27.52	27.36
Litter	24.50	17.00	16.72	18.10
Cryptogams	1.50	2.00	.34	.65
Bare Ground	18.75	24.25	13.28	14.39

SOIL ANALYSIS DATA --

Management unit 24, Study no: 2, Study Name: Deer Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.9	62.7 (10.2)	7.1	61.0	23.1	15.9	1.8	13.6	92.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Rabbit	2	11	-	-
Grouse	-	2	-	-
Elk	3	3	8 (20)	-
Deer	46	34	121 (299)	64 (159)
Cattle	3	6	6 (15)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 24 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
87	9999	1800	2333	4733	2933	-	23	58	29	2	14/20
91	8599	666	1333	2533	4733	-	46	36	55	21	11/20
97	5980	220	780	4280	920	780	31	5	15	7	12/23
03	8760	-	100	6520	2140	900	18	0	24	4	11/22
Artemisia pygmaea											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
97	2500	100	160	2340	-	-	24	0	0	0	2/7
03	3220	-	80	3020	120	-	.62	0	4	0	2/6
Atriplex canescens											
87	66	-	-	66	-	-	0	0	0	0	19/20
91	66	-	-	-	66	-	0	100	100	100	-/-
97	0	-	-	-	-	-	0	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
Ceratoides lanata											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	-	20	-	-	100	0	-	0	4/8
03	60	-	-	60	-	-	0	100	-	0	3/4
Chrysothamnus viscidiflorus stenophyllus											
87	66	-	-	66	-	-	0	0	0	0	8/12
91	66	-	-	-	66	-	0	0	100	0	-/-
97	3060	-	140	2880	40	-	1	0	1	.65	6/12
03	3360	-	20	2980	360	-	0	0	11	3	6/12
Eriogonum microthecum											
87	3600	66	200	3400	-	-	0	0	-	0	3/3
91	2266	133	333	1933	-	-	32	15	-	0	2/2
97	5600	180	640	4960	-	-	4	0	-	0	3/5
03	7620	-	220	7400	-	60	11	2	-	0	2/4
Gutierrezia sarothrae											
87	1932	-	666	1266	-	-	0	0	-	0	8/9
91	1133	66	-	1133	-	-	0	0	-	0	5/4
97	80	-	-	80	-	-	0	0	-	0	8/7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
03	1920	20	200	1720	-	-	0	0	-	0	6/5
Opuntia spp.											
87	0	66	-	-	-	-	0	0	-	0	-/-
91	333	66	333	-	-	-	0	0	-	0	-/-
97	80	-	-	80	-	-	0	0	-	0	4/4
03	100	-	-	100	-	-	0	0	-	0	4/9
Pediocactus simpsonii											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	0/1

Trend Study 24-3-03

Study site name: North Bull Rush.

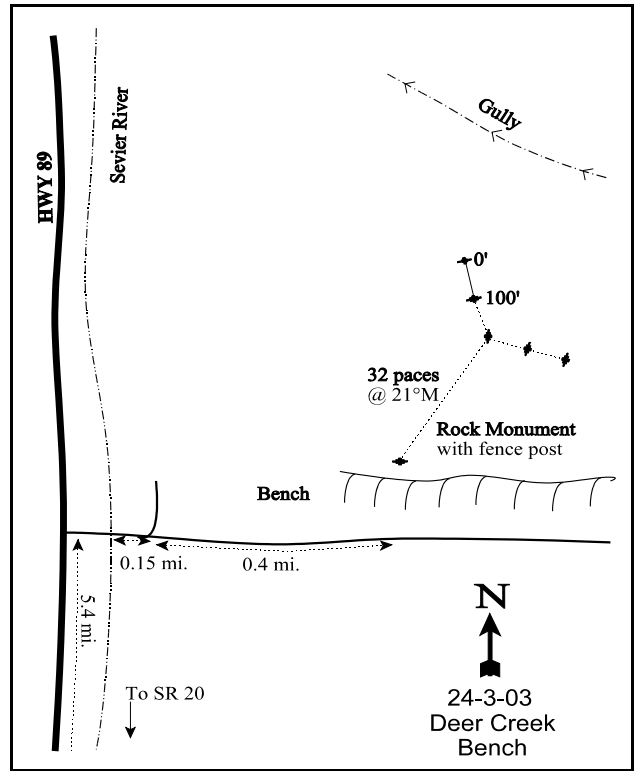
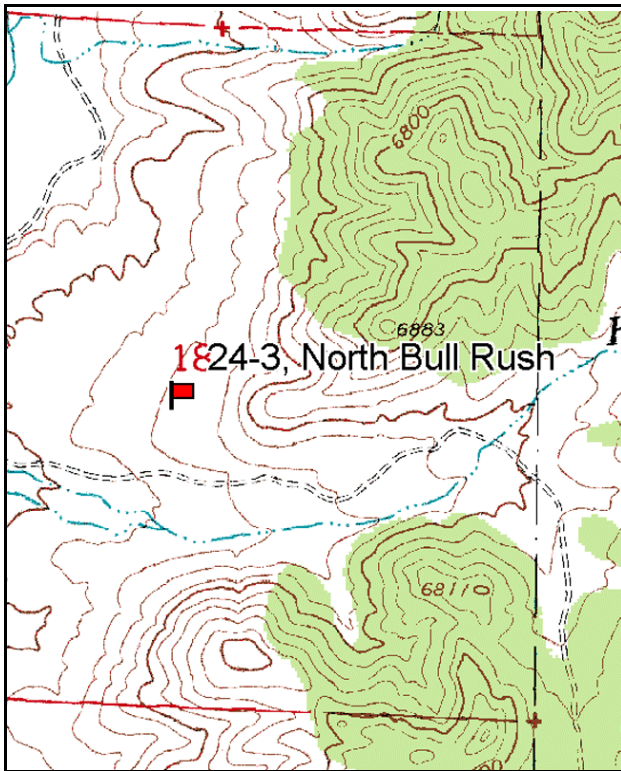
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 348 degrees magnetic. (Lines 3 & 4 96° M)

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

LOCATION DESCRIPTION

From the Highway 89 and SR20 Junction, proceed north on 89 for 5.4 miles. Here at the beginning of Circleville Canyon, turn right off the highway onto a dirt road. Cross the Sevier River, and go 0.15 miles to a gate and intersection. Go straight (east) for another 0.4 miles. Stop here. Walk 18 paces up on the edge of a low bench on the north side of the road at 356 degrees magnetic to a rock monument with a fencepost. Walk approximately 60 paces at 9 degree magnetic to the 100' baseline stake. The 0' stake is marked by browse tag #168.



Map Name: Bull Rush Peak

Diagrammatic Sketch

Township 32S, Range 4 1/2W, Section 18

GPS: NAD 27, UTM 12S 4209604 N, 381687 E

DISCUSSION

North Bull Rush - Trend Study 24-3

The North Bull Rush study samples a sagebrush bench located 1/4 mile west of the Forest Service boundary on BLM land at the mouth of Horse Valley Creek. Bull Rush Creek is located about 1/2 mile to the south. The sagebrush covered bench slopes gradually (3% to 5%) to the northwest at an elevation of 6,500 feet. The Sevier River is 1/2 mile west of the site. Agricultural land is located in the valley bottom between the site and the river. The bench is relatively small, a half mile long and a half mile wide at the widest point, and is dissected by numerous small gullies. This site is a key area for deer during the winter and spring. Deer pellet groups were abundant in 1991 and an antler drop was also found on the site that year. Few elk pellet groups were found and some sheep sign was also noted in 1991. During the 1997 reading, deer pellet groups were abundant with a quadrat frequency of 41%. A few elk pellet groups were also encountered. Pellet group data from 2003 estimated 27 deer days use/acre (66 ddu/ha). About 10% of the deer pellet groups sampled appeared to be from spring use while 90% were from winter use. No elk pellet groups were encountered. This BLM allotment is grazed with cattle by the adjacent private landowner. No sign of cattle was encountered in 1991, but some cattle sign was found in 1997. Cattle use was estimated 25 days use/acre in 2003 (63 cdu/ha). Some of the cattle pats encountered in 2003 were fresh but most appeared to be from the previous grazing season (2002).

The soil has a sandy loam texture with a considerable amount of pavement on the surface which is evidence of a long history of soil loss from the site. Soil at the site is characteristic of the alluvial deposits that form the low-lying foothills on the unit. Effective rooting depth was estimated at just over 13 inches with a high soil temperature (for this elevation) of 75°F at an average depth of nearly 12 inches. High soil temperatures are indicative of dry soil profiles. Average soil temperature in 1997 was about 58°F at about 15 inches in depth. Precipitation during the spring (April to June) of 1997 was 153% of normal at Panguitch while spring precipitation in 2003 was only 48% of normal. Organic matter is limited in the soil at only 1.4%. Phosphorus may also be limiting at only 7.1 ppm where the minimum for normal plant growth and development is thought to be 10 ppm. Some small gullies in the area are experiencing some down-cutting problems and the erosion condition class was determined to be slight in 2003.

Wyoming big sagebrush is both the dominant and key browse species on the site, with blue grama and needle-and-thread grass providing most of the herbaceous cover. Wyoming big sagebrush had a density of 6,666 plants/acre in 1987 declining slightly to 5,440 by 2003. Use was extremely heavy in 1987 and 1991 but more moderate in 1997 and light to moderate in 2003. The number of decadent plants has increased from 17% in 1987 to 67% in 1991 and 54% in 2003. Decadent sagebrush classified as dying has remained high at 31% in 1997 and 34% in 2003. Young recruitment has steadily declined from 14% in 1987 to 3% in 1997 and 0 by 2003. This would indicate that a decline in density will likely occur if recruitment does not improve. A few winterfat are also found on the site.

Herbaceous species diversity is very limited on this site, as is the case with most Wyoming big sagebrush communities. The herbaceous understory is composed mostly of blue grama, bottlebrush squirreltail, and needle-and-thread grass. These three grasses produced 10% cover in 1997 and 12% in 2003. Forbs are almost nonexistent.

1991 TREND ASSESSMENT

The soil trend would be considered slightly downward because of some of the key parameters measured. Vegetative basal cover and litter cover both declined while both pavement and bare ground increased since 1987. Trend for the key browse species, Wyoming big sagebrush, is down. Its population has decreased by

19% with the rate of decadence going from 17% to 67%. The herbaceous understory is slightly declining. The most abundant grass, needle-and-thread, is stable with an 85% quadrat frequency. Nested frequency of blue grama and bottlebrush squirreltail have declined significantly. The forbs are almost nonexistent on this site, but with what few species are present, all have declining quadrat frequencies.

TREND ASSESSMENT

soil - slightly downward (2)

browse - down (1)

herbaceous understory - slightly downward (2)

1997 TREND ASSESSMENT

Trend for the soil is stable but in poor condition due to the lack of herbaceous vegetation and litter cover. Percent bare ground, litter, and pavement cover are similar to 1991 estimates. Trend for Wyoming big sagebrush is slightly down due to a still moderately high percent decadency (48%), decline in percent young age class, and the percentage of decadent plants classified as dying has increased. Recruitment is poor and the population could decline further in the future if the proportion of seedlings and young do not improve. Trend for the herbaceous understory appears stable. Sum of nested frequency of grasses and forbs have remained similar to 1991 estimates. Nested frequency of the dominant grass, needle-and-thread, remains constant but the frequency of blue gramma increased while the nested frequency of bottlebrush squirreltail declined significantly.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is down slightly. Percent cover of vegetation and litter declined slightly while cover of bare ground and rock/pavement increased slightly. There is evidence of some ongoing erosion in the form of flow patterns, gullies, and soil movement. Erosion is not severe however, due to the gentle terrain. Trend for Wyoming big sagebrush is down slightly. Density has declined 6%, vigor is poor on 18% of the plants sampled, and the number of decadent plants has increased from 48% to 54%. In addition, 34% or about 1,000 plants/acre of the decadent sagebrush sampled were classified as dying (>50% crown death). No seedlings or young were encountered in 2003. Without an improvement in recruitment this population will likely decline further by the time this site is reevaluated in 2008. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses declined slightly and no perennial forbs were encountered. The most abundant perennial grasses, blue grama and needle-and-thread, remained at similar nested frequencies. Average cover of perennial grasses rose in 2003 due to a more than 2 fold increase in blue grama cover (2% to 5%). Bottlebrush squirreltail decreased in frequency, as did sand dropseed which was not sampled in 2003.

TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 3

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	<i>Bouteloua gracilis</i>	_b 222	_a 96	_a 114	_a 129	1.88	5.15
G	<i>Bromus tectorum</i> (a)	-	-	-	-	.00	-
G	<i>Sitanion hystrix</i>	_c 138	_b 76	_a 35	_a 4	.70	.05
G	<i>Sporobolus cryptandrus</i>	_a -	_b 16	_b 10	_a -	.10	-
G	<i>Stipa comata</i>	220	236	243	233	7.52	6.94
Total for Annual Grasses		0	0	0	0	0.00	0
Total for Perennial Grasses		580	424	402	366	10.21	12.14
Total for Grasses		580	424	402	366	10.21	12.14
F	<i>Astragalus</i> spp.	_b 16	_{ab} 4	_{ab} 6	_a -	.01	-
F	<i>Chenopodium</i> spp. (a)	-	-	_b 11	_a -	.03	-
F	<i>Cryptantha fulvocanescens</i>	7	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	_a -	_b 8	-	.10
F	<i>Draba</i> spp. (a)	-	-	-	1	-	.00
F	<i>Erigeron pumilus</i>	_b 19	_{ab} 3	_b 7	_a -	.03	-
F	<i>Gilia</i> spp. (a)	-	-	3	-	.00	-
Total for Annual Forbs		0	0	14	9	0.03	0.11
Total for Perennial Forbs		42	7	13	0	0.04	0
Total for Forbs		42	7	27	9	0.07	0.11

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

BROWSE TRENDS --
Management unit 24 , Study no: 3

T y p e	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	91	89	13.67	9.01
B	<i>Ceratoides lanata</i>	1	1	-	-
B	<i>Chrysothamnus viscidiflorus</i> <i>stenophyllus</i>	4	3	.15	.15
B	<i>Opuntia</i> spp.	3	2	.18	.15
B	<i>Pediocactus simpsonii</i>	0	1	-	-
Total for Browse		99	96	14.00	9.30

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 3

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	9.81
Chrysothamnus viscidiflorus stenophyllus	.16

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 3

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.4

BASIC COVER --

Management unit 24 , Study no: 3

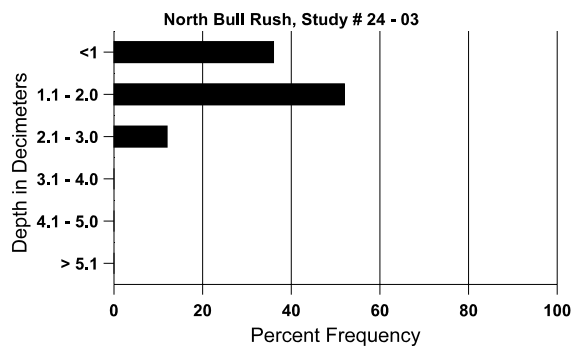
Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	11.75	9.25	25.75	22.20
Rock	2.25	1.00	1.43	3.08
Pavement	30.75	36.25	35.46	39.82
Litter	39.50	30.75	28.81	22.23
Cryptogams	1.25	1.75	.72	.30
Bare Ground	14.50	21.00	17.67	19.64

SOIL ANALYSIS DATA --

Management unit 24, Study no: 3, Study Name: North Bull Rush

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.4	75.0 (11.7)	6.7	60.4	20.1	19.6	1.4	7.1	208.0	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 24 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'03	
Rabbit	8	53	-
Elk	4	2	-
Deer	41	16	27 (66)
Cattle	3	13	25 (63)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
87	6666	66	933	4600	1133	-	15	85	17	3	14/18
91	5400	-	400	1400	3600	-	52	38	67	32	19/23
97	5800	200	180	2840	2780	2720	60	7	48	16	15/28
03	5440	-	-	2500	2940	1280	23	0	54	18	16/24
<i>Ceratoides lanata</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	-	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	100	-	0	7/4
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
87	933	-	-	933	-	-	93	7	0	0	6/7
91	66	-	-	66	-	-	0	100	0	100	2/3
97	100	-	-	100	-	-	0	0	0	0	8/11
03	80	-	-	60	20	-	0	0	25	25	9/9
<i>Opuntia spp.</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	60	-	-	60	-	-	0	0	-	0	6/13
03	40	-	-	40	-	-	0	0	-	50	4/15

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Pediocactus simpsonii</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	1/3
<i>Pinus edulis</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	66	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 24-4-03

Study site name: Mud Spring Chaining .

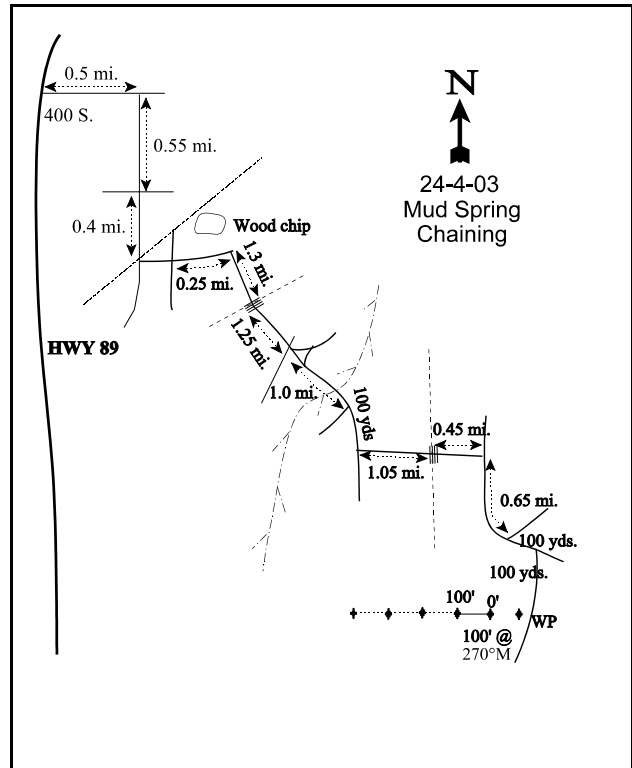
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 270 degrees magnetic.

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

LOCATION DESCRIPTION

At the junction of Highway 89 and 400 south in Circleville go east for 0.5 miles. Turn right (south) 200 feet after crossing a bridge. Continue for 0.55 miles to a four-way fork. Go straight through the fork for 0.4 miles to a canal and 5 forked roads. Take the second left road going off at 45 degree angle towards a wood-chip operation. Continue on a road along a hay field for 0.25 miles and turn right. After 1.3 miles there will be a cattleguard and keep going for 1.25 mile to a fork. Stay right (straight) to another fork 1.0 mile away. Turn left at this fork for 100 yards to another fork. At this fork turn left again. After 1.05 miles you will reach the Forest Service boundary/cattleguard. From here continue for 0.45 miles to a fork, turn right and drive for another 0.65 miles. Continue for another 100 yards and stay right and continue to another fork, stay right again and drive to the witness post. The post is off the right side of the road. The 0-foot baseline stake has browse tag #7887.



Map Name: Mt. Dutton

Diagrammatic Sketch

Township 31S, Range 3W, Section 21

GPS: NAD 27, UTM 12S 4217825 N, 393837 E

DISCUSSION

Mud Springs Chaining - Trend Study 24-4

This trend study samples a chained pinyon-juniper woodland in the northwest portion of the herd unit. The site is located in the Mud Spring area at an elevation of 7,200 feet with a gradual slope (less than 6%) and a northwest aspect. This is a key area for deer during the winter and spring but deer pellet groups were not abundant with a quadrat frequency of only 8% in 1997 and 5% in 2003. Pellet group data from 2003 estimated light deer use at 7 days use/acre (18 ddu/ha). Some sign of livestock was encountered in 1997 and cattle use was estimated at 9 days use/acre (23 cdu/ha) in 2003. All cattle pats encountered in 2003 appeared to be from the 2002 grazing season. Escape and thermal cover is provided by a mature pinyon-juniper woodland that surrounds the chained area and many 4 to 12 foot pinyon and juniper trees are growing on the chained area. A finger of the 2002 Sanford fire burned just east of the study site.

The soil is relatively shallow and very rocky with an effective rooting depth estimated at just under 13 inches. Soil texture is a sandy loam which is neutral in reaction (pH 6.9). Rocks and pavement are common on the surface and in the profile. Soil temperature was high averaging 67°F in 2003 at an average depth of 10 inches. High soil temperatures are indicative of a dry soil profile. A considerable amount of organic matter has built up underneath the trees and shrubs. The area is dissected by several gullies which originate from the canyon to the northeast. The soil at the site is adequately protected by rock, litter, and vegetation. There are some areas of bare ground but they are not large or interconnected. The main erosion problem comes from runoff from the nearby canyon. Runoff events do not appear to be frequent as there is some vegetation growing in the gully bottoms. Runoff events are likely limited to spring and perhaps some high intensity rain events.

The key shrub species is mountain big sagebrush which accounted for 54% of the total browse cover in 1997 and 35% in 2003. It makes up nearly all of the understory shrub cover with a stable density of about 1,000 plants/acre since 1987. Total sagebrush cover averaged just over 6% in 1997 and 7% in 2003. Mountain big sagebrush has been light to moderately utilized in all years, shows good vigor on most plants, and has had low decadence prior to the 2003 reading. Young recruitment has also been good during all readings. Drought conditions in 2003 have caused an increase in decadence to 30% of the population and a decline in the number of sagebrush seedlings. Antelope bitterbrush is also present, although found in such low numbers (20 plants/acre) that it is not a significant component to the community.

Pinyon and juniper have become reestablished and/or released by the chaining. Point-quarter data from 1987 estimated 67 pinyon and 200 juniper trees/acre. Pinyon nearly doubled in density by 1991 to 129 trees/acre while juniper densities declined to 108 trees/acre. Point-quarter data from 1997 estimated 90 pinyon trees/acre and 127 juniper trees/acre. Average diameter of pinyon was 3 inches while that of juniper is 4.2 inches. Pinyon was mostly removed during the chaining, and the seedlings that were present at that time had grown to an average height of two feet by 1987. Point-quarter data from 2003 estimated 123 pinyon and 104 juniper trees/acre. Average diameter of pinyon was similar to 1997 at 2.6 inches but average juniper diameter increased to 5.2 inches. About 55% of the pinyon were in the 1 to 4 foot height class while 35% were 8 to 12 feet in height. Half of the juniper sampled in 2003 were in the 4 to 8 foot height class. Average cover of pinyon and juniper more than doubled between 1997 and 2003 from 5% to 13%. This old chaining needs to be retreated to eliminate the competition of these trees.

The most abundant grass is crested wheatgrass which accounts for 98% of the grass cover. No other seeded species were encountered on the study. Several other perennial grasses and one sedge are found on the site, yet they occur rarely. Forbs are rare.

1991 TREND ASSESSMENT

Percent rock, pavement, and bare ground cover all increased since 1987. Percent cover of litter decreased during the same period. Vegetative basal cover stayed about the same. Erosion is currently evident on the site but severe only in the washes. Trend would be considered slightly down at this time. The key browse species, mountain big sagebrush, has increased its population by 26%, while the increaser, broom snakeweed had decreased its numbers by 68%. This is a good upward trend taking place. The sagebrush density is still quite low at 1,265 plants per acre, but this would be expected to increase through time. The most common grass is crested wheatgrass with a quadrat frequency of 86%. Forbs occur in very low numbers. The herbaceous understory appears to have a stable trend.

TREND ASSESSMENT

soil - slightly downward (2)

browse - upward (5)

herbaceous understory - stable (3)

1997 TREND ASSESSMENT

Trend for soil appears stable with similar amounts of bare ground and litter cover compared to 1991 estimates. Trend for mountain big sagebrush is also stable with a similar density, light to moderate use, good vigor, and low decadence. Recruitment is good with a good reproductive potential (percentage of seedlings in the population) at 17% and 27% of the population consisting of young plants. The herbaceous understory is totally dominated by crested wheatgrass which currently accounts for 96% of the total herbaceous cover. It has remained stable since 1987 with a quadrat frequency ranging from 86% to 91%. Other grasses and forbs are rare. The herbaceous understory trend is stable with poor composition.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 1997. There is still some gully erosion occurring due to runoff from the nearby canyon, but there is little erosion on site. Trend for sagebrush is stable. Density has increased slightly since 1997, but the number of decadent plants increased to 30% of the population. Use has remained mostly light to moderate with a few plants displaying heavy hedging. No seedlings were encountered in 2003 but young recruitment is still good with 16% of the population consisting of young plants. The biggest problem with the browse trend is the increase in cover of pinyon and juniper trees. Density has increased slightly but average cover has more than doubled since 1997 (5% to 13%). Pinyon and juniper currently make up 62% of the total browse cover. Total line intercept canopy cover was estimated at nearly 18% in 2003. This site could use a thinning treatment on pinyon and juniper trees. A continued increase in tree cover will further suppress understory vegetation. Trend for the herbaceous understory is stable but composition is poor. Sum of nested frequency of the dominant grass, crested wheatgrass, declined slightly but not significantly. Other perennial grasses occur rarely. Sum of nested frequency of perennial forbs also declined slightly and forbs remain rare in their occurrence.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 4

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	Agropyron cristatum	257	249	267	234	11.16	8.13
G	Aristida purpurea	-	-	-	4	-	.04
G	Bouteloua gracilis	_b 57	_a 30	_a 10	_a 10	.05	.10
G	Carex spp.	_b 13	_b 20	_{ab} 8	_a -	.02	-
G	Oryzopsis hymenoides	4	5	3	-	.03	-
G	Poa fendleriana	_b 13	_a 1	_a -	_a -	-	-
G	Sitanion hystrix	_b 31	_b 29	_a 9	_a 5	.07	.04
G	Stipa comata	_b 16	_{ab} 10	_a 2	_a -	.00	.00
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		391	344	299	253	11.34	8.31
Total for Grasses		391	344	299	253	11.34	8.31
F	Arabis spp.	_b 19	_a 1	_a 6	_a -	.01	-
F	Astragalus spp.	-	3	-	3	-	.00
F	Cryptantha spp.	7	3	3	-	.01	-
F	Cymopterus spp.	-	-	-	1	-	.00
F	Descurainia pinnata (a)	-	-	-	3	-	.00
F	Erigeron pumilus	_c 19	_{bc} 11	_{ab} 2	_a -	.01	-
F	Hymenopappus filifolius	11	23	23	9	.22	.04
F	Machaeranthera canescens	-	1	2	1	.00	.00
F	Penstemon pachyphyllus	9	4	-	-	-	-
F	Phlox hoodii	3	-	-	-	-	-
F	Streptanthus cordatus	-	-	-	1	-	.00
F	Tragopogon dubius	1	-	-	-	-	-
Total for Annual Forbs		0	0	0	3	0	0.00
Total for Perennial Forbs		69	46	36	15	0.26	0.05
Total for Forbs		69	46	36	18	0.26	0.06

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

BROWSE TRENDS --

Management unit 24 , Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	Artemisia tridentata vaseyana	31	33	6.21	7.33
B	Eriogonum microthecum	1	1	.00	.00
B	Gutierrezia sarothrae	11	18	.08	.34
B	Juniperus osteosperma	5	11	.03	4.46
B	Opuntia spp.	2	5	.03	.15
B	Pinus edulis	13	11	5.18	8.68
B	Purshia tridentata	1	1	-	-
B	Yucca spp.	1	1	.03	.15
Total for Browse		65	81	11.57	21.12

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 4

Species	Percent Cover	
	'97	'03
Artemisia tridentata vaseyana	-	5.05
Gutierrezia sarothrae	-	.20
Juniperus osteosperma	1.79	4.98
Pinus edulis	3.59	12.80

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 4

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	2.0

POINT-QUARTER TREE DATA --

Management unit 24 , Study no: 4

Species	Trees per Acre	
	'97	'03
Juniperus osteosperma	127	104
Pinus edulis	90	123

Average diameter (in)	
'98	'03
4.2	5.2
3.0	2.6

BASIC COVER --

Management unit 24 , Study no: 4

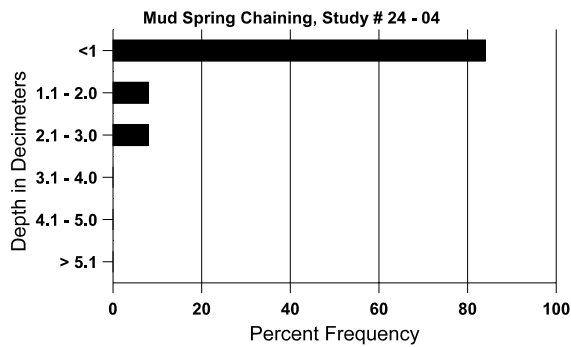
Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	4.25	4.00	26.82	28.81
Rock	20.50	27.50	18.86	23.96
Pavement	4.25	6.75	13.48	12.83
Litter	53.75	41.50	37.68	34.77
Cryptogams	0	0	.06	.39
Bare Ground	17.25	20.25	14.53	16.46

SOIL ANALYSIS DATA --

Management unit 24, Study no: 4, Study Name: Mud Spring Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	67.7 (10.0)	6.9	67.0	18.4	14.6	3.6	38.4	608.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'03	
Rabbit	9	16	-
Elk	-	1	-
Deer	8	5	7 (18)
Cattle	3	2	9 (23)

BROWSE CHARACTERISTICS --
Management unit 24 , Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
87	933	33	833	100	-	-	89	0	0	0	43/43
91	1265	233	833	366	66	-	18	0	5	0	11/13
97	1040	180	280	680	80	40	23	2	8	8	22/37
03	1220	-	200	660	360	60	15	8	30	18	19/28
<i>Chrysothamnus nauseosus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	24/21
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	13/18
<i>Eriogonum microthecum</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	20	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	4/4
<i>Gutierrezia sarothrae</i>											
87	3299	-	433	2800	66	-	1	0	2	2	7/7
91	1066	-	300	633	133	-	0	0	12	3	4/4
97	260	-	20	220	20	-	0	0	8	0	8/12
03	760	20	-	540	220	740	0	0	29	11	7/9
<i>Juniperus osteosperma</i>											
87	199	-	133	66	-	-	0	0	-	0	79/39
91	133	33	100	33	-	-	50	0	-	0	108/33
97	100	20	20	80	-	20	0	0	-	20	-/-
03	220	-	60	160	-	20	0	0	-	0	-/-
<i>Opuntia spp.</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	33	-	33	-	-	-	0	0	-	0	-/-
97	60	-	40	20	-	-	0	0	-	0	6/8
03	120	-	-	120	-	-	0	0	-	0	4/10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	2/2
Pinus edulis											
87	33	33	33	-	-	-	0	0	-	0	-/-
91	33	33	33	-	-	-	0	0	-	0	-/-
97	280	-	60	220	-	20	0	0	-	0	-/-
03	240	-	20	220	-	-	0	0	-	0	-/-
Purshia tridentata											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	-	20	-	-	100	0	-	0	23/52
03	20	-	-	20	-	-	0	100	-	0	30/44
Yucca spp.											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	-	20	-	-	0	0	-	0	7/15
03	40	-	-	40	-	-	0	0	-	0	20/24

Trend Study 24-6-03

Study site name: Table Mountain.

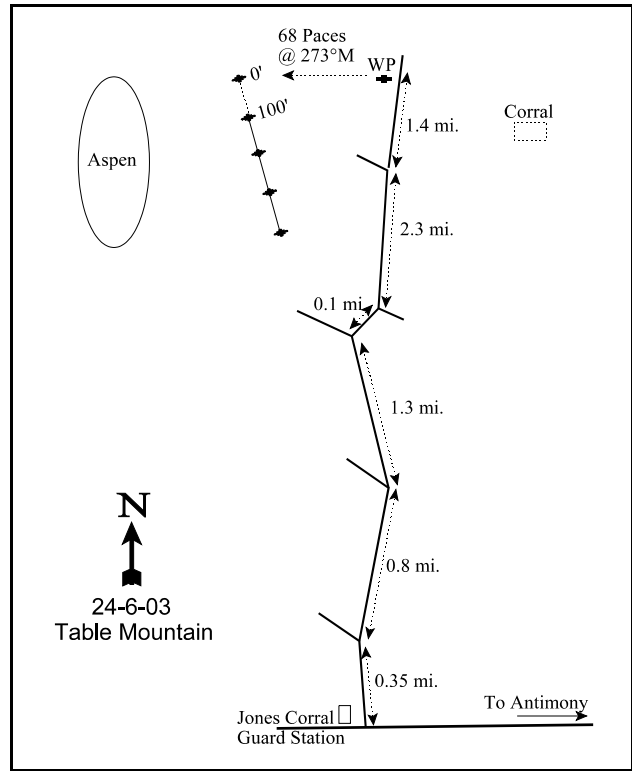
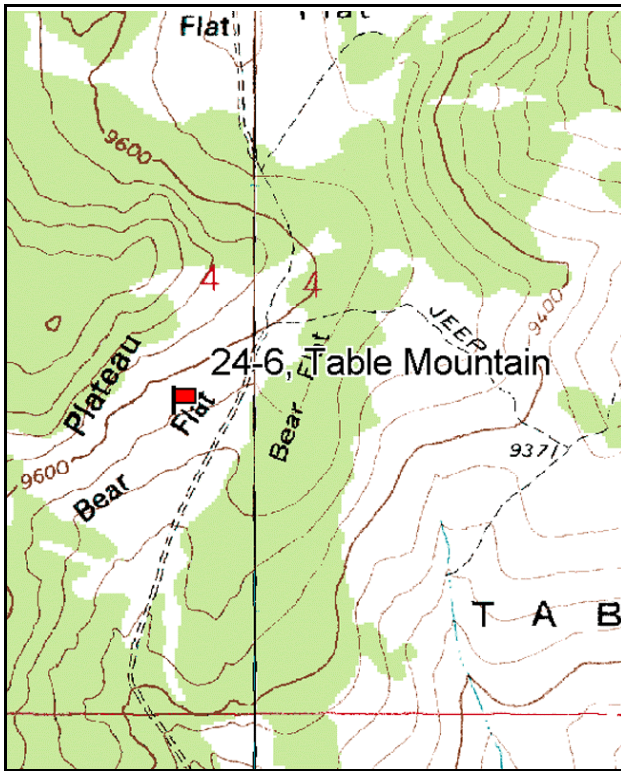
Vegetation type: Burn.

Compass bearing: frequency baseline 163 degrees magnetic.

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

LOCATION DESCRIPTION

From the Jones Corral Guard Station, head north towards Table Mountain. Go 0.35 miles to a fork, stay right and continue 0.8 miles to another fork. Stay right and continue 1.3 miles to a fork and cattleguard. Keep right and go 0.1 miles to another fork. Bear left and continue 2.3 miles to a fork. Stay right and continue north for 1.4 miles to a burned flat surrounded by aspens. Look for a 4ft tall witness post on the left side of the road. From the witness post walk 68 paces at 273 degrees magnetic to the 0'stake. The 0-foot baseline stake is marked by a red browse tag #9004.



Map Name: Junction

Diagrammatic Sketch

Township 31S, Range 2 1/2W, Section 4

GPS: NAD 27, UTM 12S 4221465 N, 401221 E

DISCUSSION

Table Mountain - Trend Study 24-6

This trend study is located on a prescribed burn on Table Mountain at an elevation of 9,500 feet. The terrain slopes gradually to the southeast with a slope of 7%. This is a key area for elk and deer during the summer. The site once supported an extensive stand of mountain big sagebrush which is reestablishing itself on the site. A variety of grasses now dominate and provide good ground cover. Adjacent stands of aspen provide escape cover for big game that use this area. Pellet group data from 1997 estimated 53 deer, 61 elk, and 10 cow use days/acre (131 ddu/ha, 151 edu/ha, and 25 cdu/ha). This is a sheep allotment which is grazed from July 1st to September 30th. This unit was in non-use status for a time. Pellet group data from 2003 estimated light big game use at 16 deer and 3 elk days use/acre (40 ddu/ha and 7 edu/ha). Cattle use, which appears to have occurred during the summer of 2002, was estimated at 13 days use/acre (32 cdu/ha). Sheep were in the area during the 2003 reading on August 7th and had heavily utilized the site. Sheep use was estimated at 84 days use/acre (207 sdu/ha).

The soils are deep, rocky, and derived from volcanic parent material. The soil is well drained and not compacted with an effective rooting depth estimated at almost 15 inches. It has a loam texture and is moderately acidic in reaction (pH 6.1). The vegetation is continuous and intact, leaving little bare ground unprotected. Erosion is not a problem on the site.

Oregon grape and snowberry sprouted after the fire and they dominated the browse composition in 1987 and 1991. Mountain big sagebrush was sparsely distributed over the burn, at a density of only 33 plants/acre in 1987 and 66 in 1991. The much larger sample used in 1997 estimated 1,620 sagebrush plants/acre, 62% of which were young plants. Density of mountain big sagebrush increased slightly in 2003 to 1,760 plants/acre. Average cover doubled since 1997 from 3% to 6% and mature plants are large and vigorous averaging 27 inches in 2003. At this elevation, sagebrush is not highly preferred and use was mostly light in 1997 and 2003.

Snowberry appears to have stabilized at around 1,500 plants/acre. Average cover has remained similar at 6% in 1997 and 5% in 2003. Utilization of snowberry has been moderate to heavy during most years likely due to sheep use. Vigor has remained good and decadence low. Other shrubs found on the site include small numbers of currant and Woods rose.

The herbaceous understory dominates the site with 13 grass species providing 21% cover in 1997 and 20 species of forbs producing an additional 16% cover. The most abundant grass is Letterman needlegrass which provided nearly half (48%) of the grass cover in 1997 and 74% in 2003. Bluebunch wheatgrass, mutton bluegrass, and needle-and-thread are also common. The forb composition is dominated by silvery lupine which produced 53% of the forb cover in 1997 and 76% in 2003. The only other abundant forbs include a phlox and dandelion. Some misidentification between the *Poa* species (*Poa fendleriana*, *Poa pratensis* and *Poa secunda*) appears to have occurred in 1987 causing large changes in nested and quadrat frequencies. In addition, identification problems in 2003 due to heavy sheep use may have underestimated mutton bluegrass and overestimated Letterman needlegrass.

1991 TREND ASSESSMENT

Vegetative basal cover has increased to almost 14% with bare ground going down to about 9%. Percent rock decreased slightly and percent litter increased slightly. Soil trend is improving. For the browse, normally the key species would be mountain big sagebrush, but with only 66 plants/acre it cannot be counted on very much. Snowberry on this site is heavily used. It's density has decreased by 5% with a slight increase in percent decadency. Trend is improving but still poor since the prescribed burn. The trend for the herbaceous

understory is, for the most part improving. However, most of the species for both grasses and forbs are increaser's in habit, which is not an ideal situation. Other species would be more preferred.

TREND ASSESSMENT

soil - slightly upward (4)

browse - slightly upward (4)

herbaceous understory - slightly upward (4)

1997 TREND ASSESSMENT

Trend for soil is stable with excellent protective ground cover. Trend for browse is up for mountain big sagebrush with a 96% increase in density. Reproductive potential and the proportion of young plants in the population have both increased dramatically since 1991. Utilization is mostly light, vigor good with few decadent plants. However, sagebrush is not a key component of summer range. Snowberry has declined in density by 53%, however this appears to be due more to the larger sample size used in 1997 which better estimates shrub densities. The snowberry appears to have a stable, lightly utilized population. Trend for the herbaceous understory is stable even though there was a decline in the sum of nested frequency for both grasses and forbs. Looking at the photo point comparisons between years, it appears that the decline in nested frequency of herbaceous species is a natural thinning process after a flush of growth following the burn. Grasses and forbs are very abundant and produce 37% cover on the site and browse cover, for all species, is only 9%.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is down. There is still enough protective ground cover to prevent most erosion but vegetation cover declined by 20% and litter cover declined by 52%. Cover of bare ground is still fairly low but it increased from 6% to 15% since 1997. Trend for browse is stable but shrubs are not the most important aspect considering this site is summer range. The fire eliminated most of the shrubs on the site prior to the 1987 reading, but shrubs have come back and currently provide 30% of the total vegetative cover. Mountain big sagebrush accounts for 54% of the total browse cover with a density of 1,760 plants/acre. However, at this elevation, it is mostly unutilized. Density of snowberry has increased slightly since 1997. It was heavily utilized by sheep. The key component of the site is the herbaceous understory which is diverse and productive but the composition could be better. Thirteen species of perennial grasses were encountered on the site in 1997 and 9 species were sampled in 2003. Sum of nested frequency of perennial grasses declined 30% since 1997. The most abundant grass is Letterman needlegrass which accounted for 74% of the grass cover in 2003. Other common grasses include needle-and-thread, mutton bluegrass, and bluebunch wheatgrass. Nested frequency of bluebunch wheatgrass and mutton bluegrass declined significantly. Significant drops in nested frequency were also seen in thickspike wheatgrass, Carex, sheep fescue, and bottlebrush squirreltail. Some of the changes in cover and frequency of mutton bluegrass and Letterman needlegrass may be due to difficulty identifying these grasses due to heavy sheep use. The forb composition is also diverse but only a few species, silvery lupine, phlox, and dandelion, are common. Sum of nested frequency of perennial forbs has declined 42% since 1997. Average cover of forbs also declined from 16% in 1997 to 10% in 2003. The herbaceous trend is considered down.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 24 , Study no: 6

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	Agropyron dasystachyum	c ₅₇	b ₁₁	b ₁₃	a ₋	.15	-
G	Agropyron spicatum	a ₃₉	b ₇₉	b ₁₀₃	a ₆	3.33	.18
G	Agropyron trachycaulum	b ₆₄	b ₅₂	a ₃	a ₄	.03	.03
G	Bromus anomalus	bc ₁₄	c ₂₉	ab ₃	a ₋	.02	-
G	Carex spp.	b ₁₇	b ₂₆	b ₃₃	a ₋	.56	-
G	Festuca ovina	c ₁₅₅	b ₈	b ₁₇	a ₋	.22	-
G	Koeleria cristata	a ₅	b ₁₁₂	a ₂₇	a ₁₇	.24	.07
G	Poa fendleriana	ab ₆₀	c ₁₄₈	b ₈₆	a ₄₁	1.69	.62
G	Poa pratensis	a ₇	b ₉₁	a ₄	a ₁₀	.06	.18
G	Poa secunda	b ₁₄₆	a ₈	a ₋	a ₅	-	.18
G	Sitanion hystrix	b ₅₅	b ₅₄	b ₄₆	a ₋	.95	-
G	Stipa columbiana	a ₋	a ₋	b ₁₅	b ₂₄	.78	.71
G	Stipa comata	a ₅	b ₇₇	b ₉₁	b ₉₁	2.86	2.82
G	Stipa lettermani	a ₁₆₃	b ₂₆₆	a ₁₇₈	b ₂₄₂	9.94	13.35
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		787	961	619	440	20.88	18.16
Total for Grasses		787	961	619	440	20.88	18.16
F	Achillea millefolium	b ₇	ab ₆	ab ₃	a ₋	.03	.00
F	Agoseris glauca	a ₋	a ₁	b ₃₉	a ₋	.09	-
F	Antennaria rosea	2	3	-	-	-	-
F	Arabis pulchra	b ₁₆₆	a ₁	a ₁	a ₁	.00	.00
F	Astragalus convallarius	a ₋	c ₄₈	b ₂₃	a ₁	.21	.03
F	Aster spp.	-	-	-	1	-	.00
F	Astragalus spp.	-	-	1	-	.00	-
F	Calochortus nuttallii	-	-	4	-	.01	-
F	Chenopodium album (a)	-	-	14	15	.04	.09
F	Crepis acuminata	-	-	5	-	.06	-
F	Erigeron eatonii	a ₋	b ₁₅	a ₆	ab ₆	.03	.01
F	Eriogonum flavum	-	6	-	-	-	-
F	Eriogonum racemosum	5	10	13	4	.11	.01

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
F	Lupinus argenteus	97	95	105	79	8.69	7.74
F	Lychnis drummondii	a-	b86	a-	a-	-	-
F	Lygodesmia spinosa	-	-	4	-	.01	-
F	Penstemon spp.	b107	a21	a7	a8	.06	.02
F	Phlox pulvinata	b145	b156	a65	a47	4.34	.48
F	Potentilla concinna	6	3	6	4	.06	.06
F	Potentilla diversifolia	a-	a4	b12	a-	.06	-
F	Senecio multilobatus	ab8	a-	b16	a-	.06	-
F	Taraxacum officinale	c303	b228	a139	a115	2.26	1.68
F	Thermopsis montana	-	-	2	-	.03	-
F	Tragopogon dubius	6	6	9	1	.07	.03
F	Unknown forb-perennial	7	-	-	-	-	-
Total for Annual Forbs		0	0	14	15	0.04	0.09
Total for Perennial Forbs		859	689	460	267	16.23	10.09
Total for Forbs		859	689	474	282	16.27	10.18

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

BROWSE TRENDS --

Management unit 24 , Study no: 6

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	Artemisia tridentata vaseyana	38	44	3.08	6.41
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	-	-
B	Mahonia repens	11	12	.34	.34
B	Ribes cereum inebrians	2	2	.15	.03
B	Rosa woodsii	2	2	.03	.03
B	Symphoricarpos oreophilus	43	47	5.71	5.15
Total for Browse		97	107	9.31	11.98

CANOPY COVER, LINE INTERCEPT --
Management unit 24 , Study no: 6

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	10.13
Mahonia repens	.08
Ribes cereum inebrians	.38
Rosa woodsii	.01
Symphoricarpos oreophilus	5.48

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 24 , Study no: 6

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	2.2

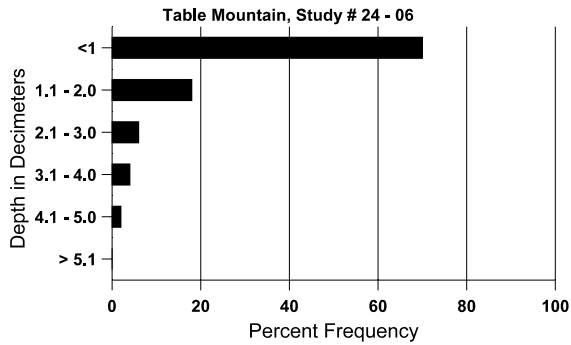
BASIC COVER --
Management unit 24 , Study no: 6

Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	11.75	13.50	52.29	42.05
Rock	7.75	6.25	7.28	23.31
Pavement	19.75	19.75	10.85	9.54
Litter	48.50	52.00	33.23	15.77
Cryptogams	0	0	.39	0
Bare Ground	12.25	8.50	5.76	14.65

SOIL ANALYSIS DATA --
Management unit 24, Study no: 6, Study Name: Table Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.8	58.3 (12.5)	6.1	38.4	35.1	26.6	5.0	47.1	454.4	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 6

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Sheep	-	24	-	84 (206)
Rabbit	4	-	-	-
Elk	15	8	61 (151)	3 (7)
Deer	18	2	53 (131)	16 (40)
Cattle	2	4	10 (25)	13 (32)

BROWSE CHARACTERISTICS --

Management unit 24 , Study no: 6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana											
87	33	33	33	-	-	-	100	0	0	0	-/-
91	66	66	33	33	-	-	50	0	0	0	10/14
97	1620	760	1000	620	-	300	6	0	0	0	22/38
03	1760	60	300	1400	60	80	3	0	3	1	27/37
Chrysothamnus viscidiflorus viscidiflorus											
87	33	-	-	-	33	-	0	100	100	100	-/-
91	66	-	-	66	-	-	0	100	0	0	6/6
97	20	-	-	20	-	-	0	0	0	0	13/14
03	0	-	-	-	-	-	0	0	0	0	16/35

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Mahonia repens											
87	7066	1700	2700	4366	-	-	.94	0	0	0	4/4
91	12198	133	4766	7366	66	-	3	1	1	0	3/3
97	1940	-	100	1840	-	-	0	0	0	0	4/6
03	1840	-	-	1840	-	-	0	0	0	0	2/4
Pseudotsuga menziesii											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Ribes cereum inebrians											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	50	0	-	0	18/19
97	40	-	-	40	-	-	0	0	-	0	42/55
03	40	-	-	40	-	-	50	0	-	0	55/69
Rosa woodsii											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
97	220	-	100	120	-	-	0	0	0	0	8/9
03	160	-	40	100	20	-	75	0	13	13	11/9
Symphoricarpos oreophilus											
87	2833	266	1300	1533	-	-	5	95	0	16	18/20
91	2699	-	633	1800	266	-	56	20	10	4	14/24
97	1260	40	120	1000	140	20	14	5	11	3	17/36
03	1740	-	140	1540	60	20	38	43	3	1	19/37

Trend Study 24-7-03

Study site name: Cow Creek.

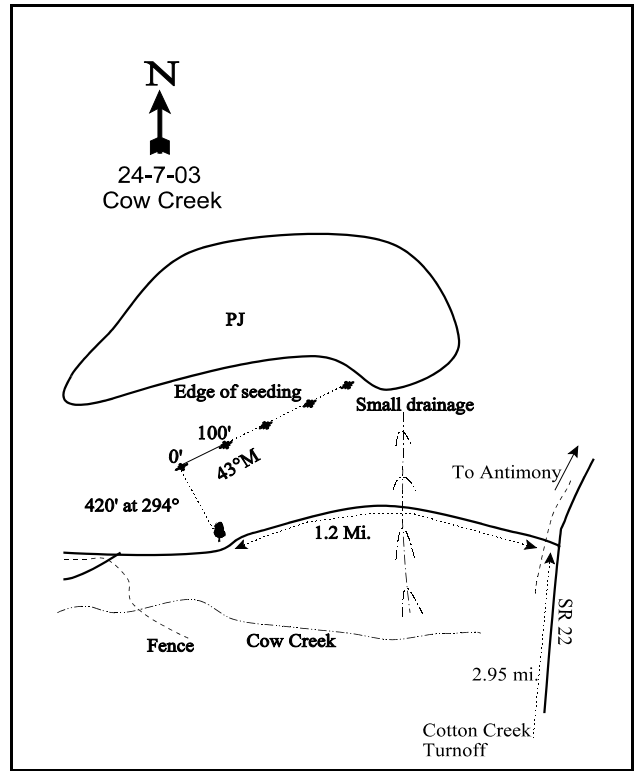
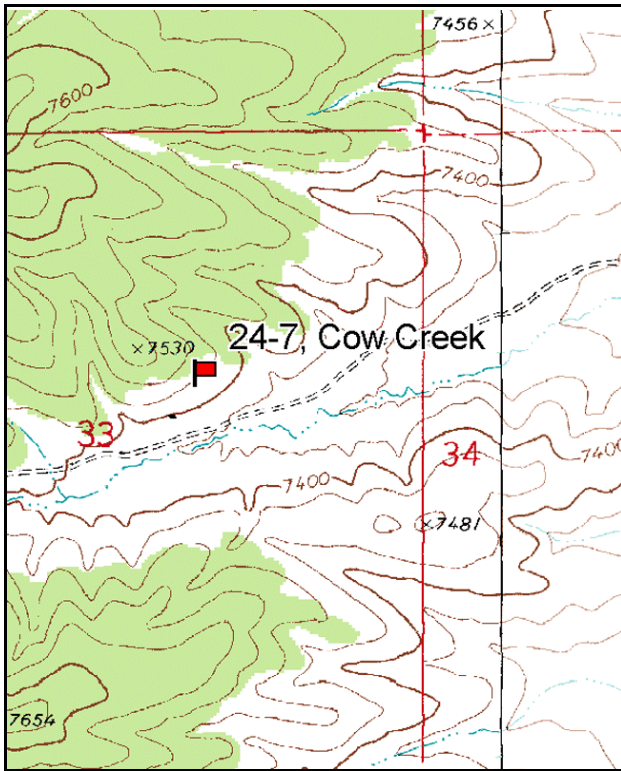
Vegetation type: Chained, Shrubland.

Compass bearing: frequency baseline 43 degrees magnetic.

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

LOCATION DESCRIPTION

From the Cottonwood Creek turnoff of SR22 south of Antimony, proceed north on the highway 2.95 miles to a gate by Cow Creek. Turn west and drive through the seeded pasture up Cow Creek for 1.2 miles to a lone mature juniper right by the road. If you go too far (0.2 more miles) you will come to a fork by a fence. Stop by the lone Juniper and walk up the hill about 140 yards bearing 294 degrees to the start of the baseline and a short fencepost with browse tag #9002. The transect runs east-northeast along the top edge of the seeding.



Map Name: Cow Creek

Diagrammatic Sketch

Township 32S, Range 2W, Section 33

GPS: NAD 27, UTM 12S 4203924 N, 411416 E

DISCUSSION

Cow Creek - Trend Study 24-7

This trend study is located on state trust land at the mouth of Cow Creek at an elevation of 7,500 feet. This is a sagebrush-grass site that was disked and drill seeded prior to study establishment in 1987. It is a key area for elk in the spring and also for deer during the winter and spring. Wyoming big sagebrush occurs on the foothill slopes and basin big sagebrush is found on the deeper soils in the drainage bottoms. The treatment was more effective on Wyoming big sagebrush than the basin big sagebrush. The basin big sagebrush that was not killed has regrown with vigorous vegetative growth and seed stalk production. The site is located on a 12-18% slope that has a southeast exposure. Antelope probably use this area year-round. Pellet group data from 1997 estimated 7 deer, 63 elk and 27 cow days use/acre (17 ddu/ha, 156 edu/ha, and 67 cdu/ha). Sheep sign was also noted in 1997. Pellet group data from 2003 estimated 24 deer and 35 elk days use/acre (60 ddu/ha and 86 edu/ha). About half of the elk pellet groups sampled were from summer use and the deer pellet groups appeared to be from fall and winter use. A couple of cattle pats were also encountered.

The soil at the study site is moderately deep and rocky with an estimated effective rooting depth of almost 18 inches. Texture is a sandy loam which is slightly alkaline (pH 7.4). Erosion pavement is present on the surface, as are rocks of various sizes. Litter from the disked sagebrush and the drill rows of seeded grasses serve to slow overland water movement. However, the higher incidence of pedestalled bunch grasses and small rills indicates that a significant amount of soil movement has taken place in the area. The soil is very loose and easily transported during high intensity summer storms. Although the seeding greatly increased the grass cover, patches of bare ground are prevalent between the drill rows. Some erosion was noted in 2003 and the erosion condition class was determined to be slight.

The key shrub species on this site is Wyoming big sagebrush. Density was estimated at nearly 3,500 plants/acre in 1987, 94% of which were mature or decadent plants which were present prior to the discing treatment. Density declined slightly in 1991 but the number of decadent plants increased from 33% to 60%. In addition, 48% of those decadent sagebrush were classified as dying (>50% crown death). The population declined to 2,280 plants/acre by 1997 apparently due to a die-off of the decadent/dying shrubs sampled in 1991. Vigor improved in 1997 and percent decadence declined to 34%. By 2003, density declined 16% to 1,920 plants/acre. Over 1/3 of the population exhibited poor vigor and 59% were classified as decadent. More than half of the decadent sagebrush sampled were rated as dying. Young recruitment was marginal in 1987 and 1997 and poor during the drought years of 1991 and 2003. Utilization was moderate to heavy in 1987 and 1991 but mostly light to moderate in 1997 and 2003. Annual leader growth of mature Wyoming big sagebrush was good in 2003 averaging 2 inches.

The only other common shrub on the site consists of a widely fluctuating population of broom snakeweed. Snakeweed density has ranged from 220 to 4,133 plants/acre. Pinyon and juniper trees are found scattered throughout the site. Point-quarter data estimated 14 juniper trees/acre and 42 pinyon trees/acre in 1997. Overhead canopy cover of pinyon was estimated at 5%. Point-quarter data from 2003 estimated 44 juniper and 31 pinyon trees/acre with average basal diameters of 3.3 and 6.4 inches respectively. About 40% of the pinyon pine sampled were in the 1 to 4 foot height class while another 50% were trees over 12 feet in height. Juniper trees were younger with 67% of the trees sampled occurring in the 1 to 4 foot height class.

The herbaceous understory is dominated by grasses, the most abundant of which is seeded crested wheatgrass and a warm season native, blue grama. Another seeded species, intermediate wheatgrass, is less abundant and has declined in quadrat frequency from 34% in 1987 to 4% in 1997 and was not found in 2003. This site is probably marginal for intermediate wheatgrass since it is east of Mt. Dutton and within a rain shadow. Forbs are very limited with six species producing only 1% cover in 1997 and less than ½ of 1% in 2003. Rangeland alfalfa was seeded on the site but it has not done well. It had a quadrat frequency of only 3% in 1987 and was

not encountered during later readings. The only common forbs include Newberry milkvetch and a *Cryptantha*.

1991 TREND ASSESSMENT

Both vegetative basal and litter cover have declined dramatically since 1987. Bare ground, pavement, and rock cover have all increased. These respective increases and decreases indicate a downward trend for soil. Population density for the key browse species, Wyoming big sagebrush, has gone from 3,466 to 3,199 plants per acre, an 8% drop. Broom snakeweed has decreased by 36%. Even with the great decrease in broom snakeweed, the trend would still be slightly downward with the increase in the rate of decadency for Wyoming big sagebrush reaching 60%. Plants displaying poor vigor have also increased from 6% to 33%. Trend for the herbaceous understory is down slightly due to a significant decline in the sum of nested frequency of the seeded crested and intermediate wheatgrass. Nested frequency of blue grama increased but this is a less desirable and less productive grass.

TREND ASSESSMENT

soil - slightly down (2)

browse - slightly down (2)

herbaceous understory - slightly down (2)

1997 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1991. Trend for the key browse species, Wyoming big sagebrush, is slightly down. Density has declined by 29% due to a die-off of decadent plants. However, density of mature plants increased slightly. Use is more light to moderate, vigor improved, and percent decadence has declined from 60% to 34%. However, the percentage of decadent plants classified as dying has steadily increased since 1987, indicating further future losses in the population. Recruitment is improved with increased numbers of seedling and young plants, but they are still inadequate to replace those that have died. A positive trend indicator is the 92% decline in the density of broom snakeweed which now numbers only 220 plants/acre. Trend for the herbaceous understory is stable but forbs are still very limited.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 1997 estimates. There is still some limited erosion occurring however, and the erosion condition class was determined to be slight in 2003. Trend for the key browse species, Wyoming big sagebrush continues to be slightly down. Density has declined 16% since 1997, while poor vigor has increased to 32% of the population, and percent decadence has increased to 59%. In addition, more than half (54%) of the decadent sagebrush sampled were classified as dying. No seedlings were encountered in 2003, and young plants were rare. Use remains mostly light to moderate indicating that these trends are primarily driven by drought. Trend for the herbaceous understory is mixed. Sum of nested frequency of perennial grasses has remained stable although nested frequency of crested wheatgrass did decline significantly. Nested frequency of blue grama remained stable but bottlebrush squirreltail and needle-and-thread increased slightly. Sum of nested frequency of perennial forbs declined. However, forbs are rare and provide little cover. Trend is considered stable.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Management unit 24 , Study no: 7

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	<i>Agropyron cristatum</i>	_c 207	_{ab} 169	_{bc} 193	_a 154	6.09	4.76
G	<i>Agropyron intermedium</i>	_b 65	_a 5	_a 9	_a -	.04	-
G	<i>Bouteloua gracilis</i>	_a 90	_{ab} 113	_b 151	_b 150	4.38	6.25
G	<i>Bromus inermis</i>	5	-	-	-	-	-
G	<i>Dactylis glomerata</i>	2	9	-	-	-	-
G	<i>Oryzopsis hymenoides</i>	2	9	6	3	.07	.04
G	<i>Poa fendleriana</i>	_a -	_a -	_a -	_b 16	-	.15
G	<i>Poa secunda</i>	-	-	2	-	.00	-
G	<i>Sitanion hystrix</i>	_b 119	_b 137	_a 51	_a 66	.68	.50
G	<i>Stipa comata</i>	_a 12	_a 11	_{bc} 20	_b 33	.19	.66
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		502	453	432	422	11.48	12.39
Total for Grasses		502	453	432	422	11.48	12.39
F	<i>Antennaria rosea</i>	-	-	-	3	-	.00
F	<i>Astragalus newberryi</i>	_b 22	_b 22	_b 27	_a -	.06	-
F	<i>Chenopodium</i> spp. (a)	-	-	3	-	.00	-
F	<i>Cryptantha</i> spp.	_{ab} 17	_{bc} 31	_b 39	_a 1	.59	.00
F	<i>Descurainia pinnata</i> (a)	-	-	_a -	_b 23	-	.08
F	<i>Gayophytum ramosissimum</i> (a)	-	-	_b 21	_a -	.26	-
F	<i>Gilia</i> spp. (a)	-	-	_a -	_b 14	-	.05
F	<i>Lappula occidentalis</i> (a)	-	-	-	5	-	.04
F	<i>Medicago sativa</i>	4	-	-	-	-	-
F	<i>Sphaeralcea coccinea</i>	-	-	6	7	.01	.04
F	<i>Streptanthus cordatus</i>	-	-	2	-	.03	-
Total for Annual Forbs		0	0	24	42	0.26	0.18
Total for Perennial Forbs		43	53	74	11	0.70	0.05
Total for Forbs		43	53	98	53	0.97	0.23

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

BROWSE TRENDS --

Management unit 24 , Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	Artemisia tridentata wyomingensis	64	56	6.56	7.15
B	Gutierrezia sarothrae	8	27	.04	.58
B	Juniperus osteosperma	1	0	-	-
B	Opuntia spp.	2	3	.03	-
B	Pinus edulis	3	4	6.07	5.25
Total for Browse		78	90	12.72	13.00

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 7

Species	Percent Cover	
	'97	'03
Artemisia tridentata wyomingensis	-	6.25
Gutierrezia sarothrae	-	.41
Opuntia spp.	-	.20
Pinus edulis	4.80	9.28

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 7

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	2.0

POINT-QUARTER TREE DATA --

Management unit 24 , Study no: 7

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	14	44
Pinus edulis	42	31

Average diameter (in)	
'98	'03
N/A	3.3
N/A	6.4

BASIC COVER --

Management unit 24 , Study no: 7

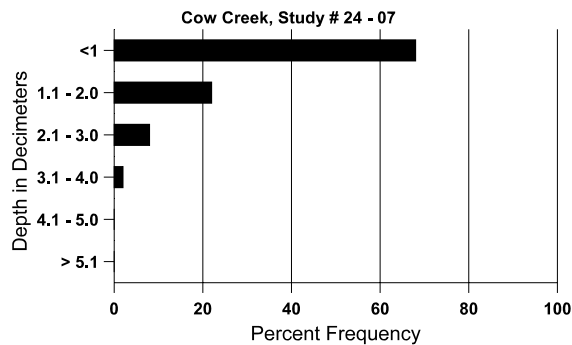
Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	10.00	7.25	26.76	24.88
Rock	4.25	6.25	3.86	5.69
Pavement	20.25	35.25	27.72	36.37
Litter	57.00	39.75	33.72	36.44
Cryptogams	0	0	0	0
Bare Ground	8.50	11.50	9.88	11.88

SOIL ANALYSIS DATA --

Management unit 24, Study no: 7, Study Name: Cow Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.8	74.0 (11.2)	7.4	65.0	20.1	14.9	2.7	19.1	54.4	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 7

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Rabbit	13	39	-	-
Elk	31	32	63 (156)	35 (86)
Deer	17	6	7 (17)	24 (60)
Sheep	-	-	6 (15)	-
Cattle	4	1	27 (67)	1 (2)

BROWSE CHARACTERISTICS --
Management unit 24 , Study no: 7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
87	3466	133	200	2133	1133	-	15	29	33	6	16/17
91	3199	-	66	1200	1933	-	42	21	60	33	13/16
97	2280	40	180	1320	780	1100	28	3	34	19	21/27
03	1920	-	20	760	1140	1280	35	5	59	32	23/30
<i>Gutierrezia sarothrae</i>											
87	4133	1133	933	3200	-	-	0	0	0	0	8/6
91	2665	-	333	1666	666	-	8	0	25	8	5/6
97	220	-	20	200	-	-	0	0	0	0	8/8
03	1800	-	780	1020	-	-	0	0	0	0	7/8
<i>Juniperus osteosperma</i>											
87	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
97	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
87	665	-	466	66	133	-	0	0	20	0	4/7
91	399	-	133	266	-	-	17	0	0	0	3/5
97	40	-	-	40	-	20	0	0	0	0	5/10
03	80	-	-	80	-	-	0	0	0	0	4/15
<i>Pediocactus simpsonii</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	3/12
<i>Pinus edulis</i>											
87	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
97	60	-	20	40	-	-	0	0	-	0	-/-
03	80	20	60	20	-	-	0	0	-	0	-/-
<i>Sclerocactus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	3/11
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 24-8-03

Study site name: Prospect Seeding.

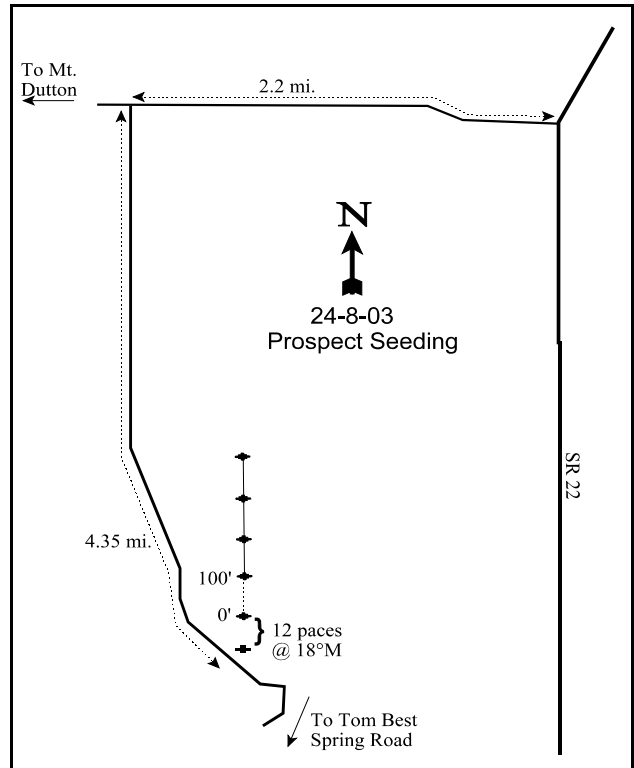
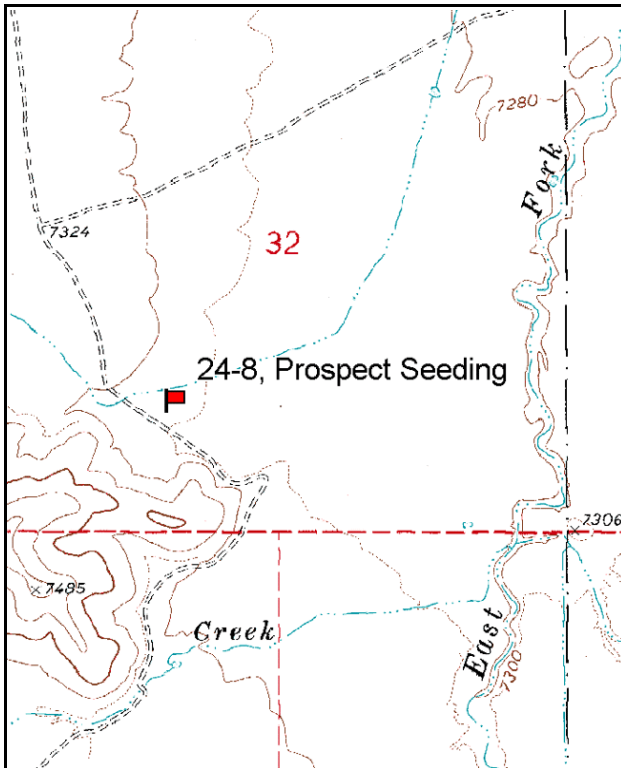
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

From SR22, turn towards Cottonwood Creek (west onto the Mt. Dutton loop road) and travel about 2 miles to a major fork. Turn south towards Tom Best spring (Cottonwood AS is to the right, north) and go 0.3 miles to the U.S. Forest Service boundary fence. Cross the cattleguard and continue on the main road for 4.35 miles. The study area here is marked by a 4 foot green fencepost, and is north of the road in a sage-grass flat. The transect is marked by 1-foot tall fence posts.



Map Name: Cow Creek

Diagrammatic Sketch

Township 33S, Range 2W, Section 32

GPS: NAD 27, UTM 12S 4193647 N, 409124 E

DISCUSSION

Prospect Seeding - Trend Study 24-8

The Prospect Seeding study is located approximately 1/4 mile north of Prospect Creek, and 3/4 of a mile west of the East Fork of the Sevier River, which cuts through the middle of John's Valley. The site is located on level ground at an elevation of 7,300 feet. The area is administered by the BLM. This site is located in the Lower Prospect Pasture of the Widtsoe C & H allotment. The area was disked and seeded in 1968. Wyoming big sagebrush has become reestablished and fairway crested wheatgrass provides nearly all the herbaceous forage. This is becoming a key area for elk during the winter and spring months, and antelope use the area during the summer and fall. This is not a critical winter range for mule deer. Pellet group data from 1997 estimated 48 elk, 13 deer, and 64 cattle days use/acre (119 edu/ha, 32 ddu/ha, and 158 cdu/ha). Some sheep pellet groups were also encountered. Antelope and deer pellet groups are lumped due to the difficulty in differentiating between the two species. Pellet group data from 2003 estimated only 13 elk and 5 deer days use/acre (33 edu/ha and 12 ddu/ha). Cattle use was also lower at 27 days use/acre (66 cdu/ha). Rabbit pellets were abundant with a quadrat frequency of 52%.

The soils are deep with an estimated effective rooting depth of 23 inches. Soil texture is a sandy loam which is neutral in reaction (pH 7.2). There is little rock but some pavement is scattered on the surface. Soil temperature was high averaging 68°F at a depth of 16 inches in 2003, indicating a dry soil profile. Harvester ant mounds are numerous in the area. Bare ground is abundant and although the site is fairly level, sheet erosion has occurred resulting in pedestalling of sagebrush and grasses to a height of about 2-3 inches in much of the area.

This is a Wyoming big sagebrush site with very little diversity in the understory. Sagebrush is a key species for antelope that use the area during the spring, summer, and fall. The stand in 1987 was estimated at 9,066 plants/acre, represented by mostly vigorous, young and mature plants. The population has since steadily declined with each reading to 6,665 plants/acre in 1991, 2,280 by 1997 and only 480 plants/acre in 2003. Use was moderate in 1987 but vigor was normal on most plants and there were few decadent plants. During the drought year of 1991, percent decadence increased to 79% and approximately 933 plants/acre were classified as dying. The population dropped 66% in 1997 but percent decadence declined to 35%. However, 464 decadent plants/acre were still classified as dying and young recruitment was marginal with only 180 young plants/acre estimated. Drought conditions from 2000 to 2003 have caused the sagebrush population to crash to only 480 plants/acre in 2003. Dead sagebrush plants numbered nearly 3,000 plants/acre. The remaining population is in poor vigor and 92% of the population is decadent. About 95% of the decadent plants sampled were classified as dying. No seedlings were encountered and young plants were rare. It appears that the Wyoming big sagebrush population may die-off completely.

The herbaceous understory is poor and dominated by seeded crested wheatgrass. Production of crested wheatgrass was good in 1997 with a cover value of 12%. Drought combined with heavy use have caused crested wheatgrass to decline significantly in nested frequency and cover dropped 4 fold by 2003, from 12% to 3%. The only other grass species encountered were bottlebrush squirreltail and Russian wildrye which occur rarely. Forbs are very rare.

1991 TREND ASSESSMENT

The soil trend for this site is reasonably stable, but it still has over 60% bare ground and should be considered in very poor condition. The key browse, Wyoming big sagebrush, has decreased in numbers by 26%. This decrease could be beneficial later when the extended drought ends. With the lower densities, vigor could be increased, for the density was too high for the site potential. The effect of the drought is still being felt with the rate of decadency increasing from 8% to 79%. Heavy hedging (extended drought is exacerbating this use)

of the sagebrush has drastically increased from 9% to 58%. Trend for browse would be considered down. As for the herbaceous understory, there is only one forb (a weedy increaser) and one major grass being crested wheatgrass. With the drought, it's numbers are decreasing. The trend would be considered slightly downward.

TREND ASSESSMENT

soil - stable, but poor condition (3)

browse - down (1)

herbaceous understory - slightly downward (2)

1997 TREND ASSESSMENT

Trend for soil is stable (because of the level terrain), but with the abundance of unprotected bare soil, it is in poor condition. Trend for browse slightly down. Population density has declined further by 66%. This reduction comes almost entirely from a die-off of decadent plants resulting in a smaller but healthier population. Percent decadence has declined from 79% in 1991 to 35% currently. However, again the percentage of decadent plants classified as dying has steadily increased since 1987, where it has now at 58%. Currently 40% of the population is dead. Utilization is more moderate. Recruitment is still poor and the population will continue to decline in the future for there are not enough seedlings and young to replace the dead plants. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of crested wheatgrass. Forbs are still severely lacking.

TREND ASSESSMENT

soil - stable, but poor condition (3)

browse - slightly downward (2)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is down. Average relative percent cover of vegetation declined 4 fold while litter cover increased slightly due to the addition of dead sagebrush. Cover of bare ground increased to 63%. Some erosion is occurring but it is not severe due to the level terrain. Trend for Wyoming big sagebrush is down and it appears that the population will completely die-off in the near future. The population has declined 79% since 1997 and there are only 480 plants/acre left on the site. Dead sagebrush is abundant at nearly 3,000 plants/acre. Approximately 88% of the surviving sagebrush exhibit poor vigor and 92% are decadent. In addition, 95% of the decadent plants sampled or 420 of the 480 living sagebrush/acre on the site were classified as dying. No seedlings were encountered in 2003 and young plants were rare at an estimated density of only 20 plants/acre. With the loss of sagebrush, this area cannot be considered critical winter range for deer. Trend for the herbaceous understory is also down due to a significant decrease in the nested frequency of crested wheatgrass which is the only abundant herbaceous plant. Average cover also declined from 12% in 1997 to 3.5% in 2003. Forbs are rare. The decline in crested wheatgrass is obviously partly due to drought, but continued livestock and rabbit use have an added effect. Heavy rabbit use has been noted in other areas of the state during this drought period.

TREND ASSESSMENT

soil - down (1)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
 Management unit 24 , Study no: 8

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	Agropyron cristatum	_{bc} 215	_b 191	_c 258	_a 145	12.21	2.74
G	Elymus junceus	_a -	_a 3	_a -	_b 20	-	.74
G	Sitanion hystrix	3	7	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		218	201	258	165	12.21	3.48
Total for Grasses		218	201	258	165	12.21	3.48
F	Chenopodium album (a)	_a 8	_{ab} 16	_b 36	_a 3	.33	.18
F	Cryptantha spp.	-	-	1	-	.00	-
F	Descurainia pinnata (a)	-	-	-	2	-	.01
F	Senecio multilobatus	-	-	-	1	-	.00
Total for Annual Forbs		8	16	36	5	0.33	0.19
Total for Perennial Forbs		0	0	1	1	0.00	0.00
Total for Forbs		8	16	37	6	0.34	0.20

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

BROWSE TRENDS --
 Management unit 24 , Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	Artemisia tridentata wyomingensis	63	21	2.80	.89
B	Chrysothamnus nauseosus	1	2	-	-
Total for Browse		64	23	2.80	0.88

CANOPY COVER, LINE INTERCEPT --
 Management unit 24 , Study no: 8

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	.10

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 24 , Study no: 8

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.8

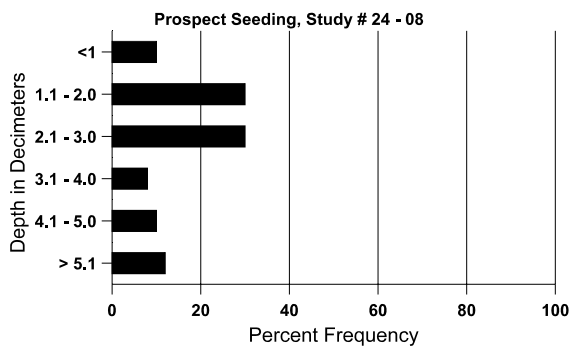
BASIC COVER --
 Management unit 24 , Study no: 8

Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	4.50	5.25	15.66	4.46
Rock	0	0	.11	.08
Pavement	3.50	8.25	11.48	15.22
Litter	25.00	26.00	13.57	22.26
Cryptogams	0	0	.46	.01
Bare Ground	67.00	60.50	46.99	63.09

SOIL ANALYSIS DATA --
 Management unit 24, Study no: 8, Study Name: Prospect Seeding

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
23.1	68.3 (16.0)	7.2	54.4	30.1	15.6	1.8	12.7	921.6	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 24 , Study no: 8

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Sheep	1	-	8 (20)	-
Rabbit	37	52	-	-
Elk	21	9	48 (119)	13 (33)
Deer	12	3	13 (31)	5 (12)
Cattle	8	15	64 (158)	27 (66)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
87	9066	66	2333	6000	733	-	66	9	8	1	14/12
91	6665	-	533	866	5266	-	34	58	79	16	8/9
97	2280	40	180	1300	800	1480	40	4	35	22	13/17
03	480	-	20	20	440	2940	50	0	92	88	17/24
<i>Chrysothamnus nauseosus</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
97	20	-	-	20	-	-	100	0	0	0	-/-
03	40	-	-	20	20	-	50	50	50	0	10/10

Trend Study 24-9-03

Study site name: Mud Spring.

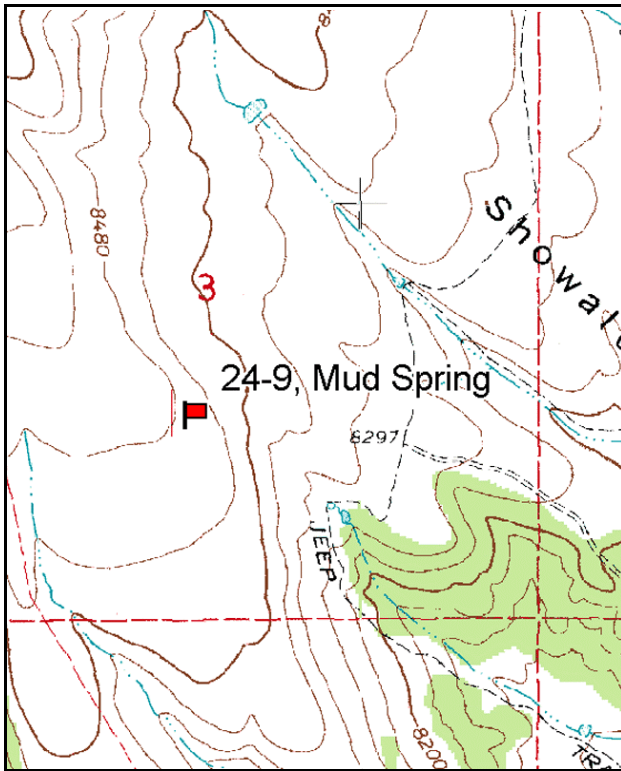
Vegetation type: Black Sagebrush.

Compass bearing: frequency baseline 167 degrees magnetic.

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

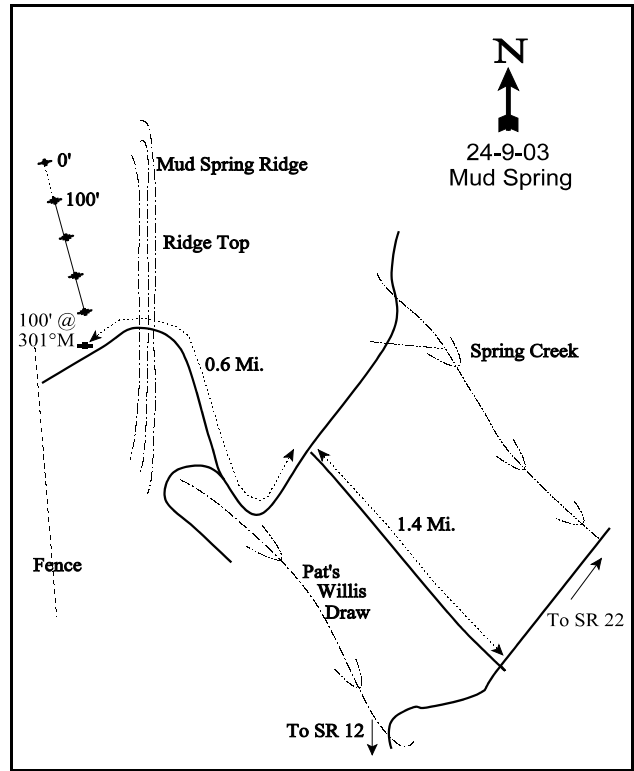
LOCATION DESCRIPTION

From SR 22, about 1^{1/2} miles south of Widstoe Junction, turn west onto the road leading to Tom Best Spring and Highway 12. Proceed 4.2 miles to the U.S. Forest Service boundary. Continue on the main road for 5.3 miles to an intersection at Showalter Creek. Continue on the main road 1 mile to a faint road on the right. Turn and go up towards Mud Spring Ridge 1.4 miles to a T-intersection. Turn left and go 0.6 miles up a faint, rough road to the top of the ridge and a witness post identifying the study area. The 400 foot stake is 100 feet northwest of the witness post. The start of the transect is actually 400 feet north, and runs back south towards the road. Study markers are 1-foot tall fence posts.



Map Name: Flake Mountain West

Township 35S, Range 4W, Section 3



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4182640 N, 393177 E

DISCUSSION

Mud Spring - Trend Study 24-9

The Mud Spring study site is located on a gently sloping (3-5%) sagebrush covered bench. Site aspect is to the southeast at an elevation of 8,480 feet. Spring Creek is east of the site and Pat Willis Draw lies to the southeast. The southern aspect, coupled with sufficient wind, limits snow depth on this area during much of the winter. Black sagebrush is the dominant shrub on this site and a variety of grasses and forbs occupy the understory. This is a key wintering area for elk. Several deer were seen near the site in 1997 and there was evidence that moderately high numbers of deer and elk have been using the site. Quadrat frequency of deer pellet groups was 22% in 1997 while elk numbered 34%. Cattle also use the area and were seen in the vicinity by a stock pond in 1997. Pellet group data from 2003 estimated 32 elk and 32 deer days use/acre (79 edu/ha and 79 ddu/ha). Cattle had used the site during the spring of 2003, estimated at 16 days use/acre (39 cdu/ha).

Soil depth is moderately shallow, as evidenced by the predominance of the shallow rooted black sagebrush. Effective rooting depth is estimated at almost 12 inches. Soil texture at the site is a sandy clay loam which is slightly acidic (pH 6.1). Rocks are common on the surface and throughout the profile. They are generally less than three inches in diameter. Erosion pavement is present on the soil surface, indicating some sheet erosion has taken place over time. Many plants are pedestalled, but overall, the erosion potential on this site is currently low, given the rocky soil and gentle slope. Ground cover appears adequate to limit surface runoff and to promote infiltration.

The key shrub species is black sagebrush. There is also some isolated patches of mountain big sagebrush on the site where the soils are invariably deeper. Black sagebrush accounted for 63% of the browse cover in 1997, increasing to 72% in 2003 with average cover values of 12% and 21% respectively. The population is dense and dynamic. Density has fluctuated from a high of 22,733 plants/acre in 1991 to nearly 10,000 plants/acre in 1997. Density was estimated at 18,820 plants/acre in 2003. Use of the low growing sagebrush has been mostly light since 1987. Vigor has remained good on most plants during all years and percent decadence low. Young recruitment has been excellent during each reading.

The site also supports several other shrubs which offer additional browse forage including mountain big sagebrush, dwarf rabbitbrush, rubber rabbitbrush, Parry rabbitbrush, and small numbers of bitterbrush. All of these species have increased in density since 1997. The small populations of mountain big sagebrush and bitterbrush were moderately hedged in 2003. The increaser, stickyleaf low rabbitbrush, also occurs on the site in moderate numbers.

The herbaceous understory is diverse and fairly abundant for a black sagebrush site. Seven perennial grasses and one sedge combined to produce over 13% cover in 1997 and 2003. The most common grasses include mutton bluegrass, Letterman needlegrass, and a Carex. The forb composition is also diverse and productive. Twenty-seven forbs were identified in 1997 and 22 species were found in 2003. Common species include rose pussytoes, Eaton fleabane, redroot and sulfur eriogonum, silvery lupine, and lobeleaf groundsel.

1991 TREND ASSESSMENT

Most basic cover parameters are almost unchanged since 1987, but two of the more important have changed. Litter cover has declined from 54% to 46% while bare ground has increased from 19% to 29%. This would indicate a slightly downward trend, making the soil more susceptible to erosion with late summer high intensity storms. Trend for the browse component of the community would be up, because the key species, black sagebrush, has almost doubled it's population with only a slight increase in percent decadency. Because of the high diversity for both forbs and grasses on the site and that on average, about half increased and the

other half decreased in quadrat frequency, the trend appears stable at this time.

TREND ASSESSMENT

soil - slightly downward (2)

browse - upward (5)

herbaceous understory - stable (3)

1997 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground declined slightly but litter cover also continued to decline. Trend for the key browse species, black sagebrush, is down slightly. Density has declined 56% since 1991, and there has been an obvious substantial reduction in density from all age classes. The lack of large numbers of dead plants suggests that some of the change in density, of mature and decadent plants, is due to the much larger sample size used in 1997. The current population of 9,920 plants/acre is at a more sustainable level. However, the percentage of decadent plants classified as dying has continued to increase since 1987, with it being at a high of 63% at this time. There has also been a decline in the densities of rabbitbrush and prickly phlox, two less desirable increaser shrubs. Trend for the herbaceous understory appears to be stable. Sum of nested frequency for grasses has remained similar since 1991.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 1997. There is adequate protective ground cover to prevent most erosion. The gentle terrain also limits soil loss. Trend for browse is up. The key species, black sagebrush, has doubled in density from 9,920 to 18,820 plants/acre. Use is mostly light, vigor good, and percent decadence low. Young recruitment is good. However, density is higher than what would be preferred and cover has nearly doubled from 12% in 1997 to 21% in 2003. Other preferred shrubs occur in smaller numbers but have also increased in density. Trend for the herbaceous understory is mixed. Trend for perennial grasses is basically stable. Sum of nested frequency of perennial grasses has declined slightly with each reading since 1991, but nested frequency has only declined 4% since 1997. Nested frequency of Carex declined significantly while frequency of mutton bluegrass increased significantly. Some of the increase in mutton bluegrass is likely due to identification problems with Sandberg bluegrass. Cover of perennial grasses has also remained stable since 1997 at about 13.5%. Sum of nested frequency of perennial forbs has declined more significantly with each reading since 1987, and sum of nested frequency fell 20% since 1997. Cover of forbs has declined slightly from 7% in 1997 to 5% in 2003. Total sum of nested frequency of perennial grasses and forbs has declined 12% since 1997. With this in mind, trend for the herbaceous understory is considered down slightly.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 9

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	Agropyron smithii	3	7	6	7	.18	.04
G	Agropyron trachycaulum	-	-	7	-	.16	-
G	Bouteloua gracilis	29	23	20	22	.15	.27
G	Carex spp.	a62	b102	ab79	a58	2.15	1.22
G	Poa fendleriana	a-	a-	b158	c248	3.26	7.83
G	Poa secunda	c211	c218	b44	a-	1.27	-
G	Sitanion hystrix	b102	a65	a33	a34	.21	.19
G	Stipa columbiana	-	-	-	5	-	.03
G	Stipa comata	51	34	43	28	.86	.32
G	Stipa lettermani	a146	ab179	b219	ab181	5.17	3.73
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		604	628	609	583	13.44	13.65
Total for Grasses		604	628	609	583	13.44	13.65
F	Antennaria rosea	a14	ab16	bc42	c45	1.27	.74
F	Arabis spp.	b20	a3	a1	a-	.00	-
F	Astragalus humistratus	c151	b14	a-	a-	-	-
F	Astragalus newberryi	-	4	-	-	-	-
F	Aster spp.	-	-	3	1	.00	.00
F	Astragalus spp.	a-	b29	c96	a3	.73	.03
F	Balsamorhiza ssp.	-	3	-	-	-	-
F	Castilleja linariaefolia	b42	a1	a3	a8	.02	.01
F	Chaenactis douglasii	4	-	4	-	.00	-
F	Cirsium spp.	b46	ab35	a23	a18	.37	.35
F	Crepis acuminata	a-	ab7	a-	b9	-	.07
F	Cryptantha spp.	-	3	1	-	.03	-
F	Erigeron eatonii	c246	b215	a31	a29	.20	.19
F	Erigeron flagellaris	-	-	-	1	-	.00
F	Erigeron pumilus	a-	a-	b16	b29	.06	.30
F	Eriogonum racemosum	b223	b214	ab185	a172	1.45	1.68
F	Eriogonum umbellatum	75	80	57	47	.56	.70
F	Galium boreale	-	-	5	-	.01	-
F	Gayophytum ramosissimum(a)	-	-	-	7	-	.01
F	Hymenoxys acaulis	-	-	6	-	.04	-
F	Hymenopappus filifolius	-	4	-	2	-	.03

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
F	<i>Linum lewisii</i>	-	-	1	-	.03	-
F	<i>Lotus utahensis</i>	_b 24	_{ab} 14	_a 1	_b 22	.00	.12
F	<i>Lupinus pusillus</i> (a)	3	-	-	-	-	-
F	<i>Lupinus sericeus</i>	_b 65	_a 38	_{ab} 51	_a 27	1.33	.29
F	<i>Lygodesmia spinosa</i>	10	14	16	5	.10	.19
F	<i>Microsteris gracilis</i> (a)	-	-	2	-	.00	-
F	<i>Orthocarpus</i> spp. (a)	-	-	_a 2	_b 19	.01	.10
F	<i>Penstemon comarrhenus</i>	_b 16	_a 4	_a 5	_a -	.01	-
F	<i>Phlox longifolia</i>	_a -	_a -	_b 19	_{ab} 10	.04	.02
F	<i>Potentilla diversifolia</i>	7	2	10	9	.22	.07
F	<i>Polygonum douglasii</i> (a)	-	-	_b 23	_a -	.05	-
F	<i>Senecio integerrimus</i>	-	-	-	3	-	.00
F	<i>Senecio multilobatus</i>	_b 71	_a 4	_a 21	_b 47	.18	.35
F	<i>Sphaeralcea coccinea</i>	_a -	_a -	_b 11	_a 4	.04	.04
F	<i>Taraxacum officinale</i>	-	2	3	-	.00	-
Total for Annual Forbs		3	0	27	26	0.06	0.11
Total for Perennial Forbs		1014	706	611	491	6.76	5.25
Total for Forbs		1017	706	638	517	6.82	5.37

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

BROWSE TRENDS --

Management unit 24 , Study no: 9

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Artemisia nova</i>	78	100	12.12	21.05
B	<i>Artemisia tridentata vaseyana</i>	13	17	1.64	1.72
B	<i>Chrysothamnus depressus</i>	45	35	3.40	2.66
B	<i>Chrysothamnus nauseosus hololeucus</i>	6	19	.01	.95
B	<i>Chrysothamnus parryi</i>	2	38	.03	.40
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	28	45	1.90	1.97
B	<i>Gutierrezia sarothrae</i>	1	0	-	-
B	<i>Leptodactylon pungens</i>	12	22	.02	.43
B	<i>Purshia tridentata</i>	0	4	-	.03
B	<i>Symphoricarpos oreophilus</i>	1	1	.00	-
B	<i>Tetradymia canescens</i>	1	3	-	.15
Total for Browse		187	284	19.15	29.37

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 9

Species	Percent Cover
	'03
<i>Artemisia nova</i>	18.03
<i>Artemisia tridentata vaseyana</i>	1.45
<i>Chrysothamnus depressus</i>	1.10
<i>Chrysothamnus nauseosus hololeucus</i>	1.04
<i>Chrysothamnus parryi</i>	.05
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.96
<i>Leptodactylon pungens</i>	.11
<i>Purshia tridentata</i>	.10
<i>Symphoricarpos oreophilus</i>	.26

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 24 , Study no: 9

Species	Average leader growth (in)
	'03
Artemisia nova	1.1
Artemisia tridentata vaseyana	1.6
Purshia tridentata	2.5

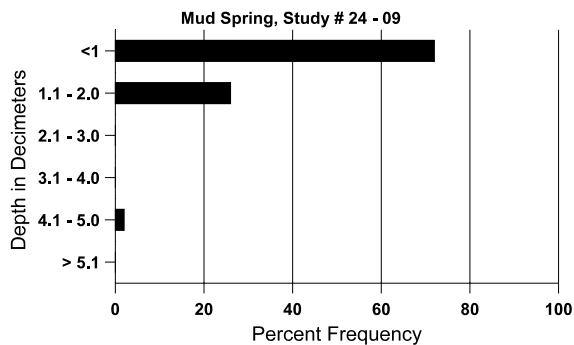
BASIC COVER --
 Management unit 24 , Study no: 9

Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	10.75	10.50	29.07	46.79
Rock	8.00	9.25	8.10	10.64
Pavement	8.25	4.75	6.79	5.69
Litter	53.75	46.25	30.77	28.35
Cryptogams	0	.25	.13	.13
Bare Ground	19.25	29.00	22.82	25.11

SOIL ANALYSIS DATA --
 Management unit 24, Study no: 9, Study Name: Mud Spring

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.6	62.3 (10.4)	6.1	48.7	25.4	25.8	2.7	11.9	275.2	0.5

Stoniness Index



PELLET GROUP DATA --
 Management unit 24 , Study no: 9

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'03	
Rabbit	8	20	-
Grouse	-	2	-
Elk	34	14	32 (79)
Deer	22	10	32 (79)
Cattle	8	5	16 (39)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 9

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
87	12065	2400	3666	7266	1133	-	18	.55	9	11	11/13
91	22733	17400	7800	10533	4400	-	16	.58	19	3	13/14
97	9920	480	1440	6840	1640	680	4	0	17	11	12/19
03	18820	80	2280	14040	2500	520	3	0	13	4	13/18
Artemisia tridentata vaseyana											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	66	-	-	66	-	-	0	0	0	0	10/11
97	340	80	-	220	120	60	18	0	35	6	24/34
03	460	-	20	360	80	60	61	0	17	4	26/36
Chrysothamnus depressus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	3040	20	580	2460	-	-	0	0	-	0	5/8
03	3980	-	-	3980	-	-	0	0	-	0	4/7
Chrysothamnus nauseosus hololeucus											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	999	-	333	266	400	-	20	53	40	0	5/6
97	180	-	100	80	-	-	0	0	0	0	7/10
03	1280	-	-	1220	60	-	8	0	5	2	6/10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	80	-	20	60	-	-	0	0	-	0	9/10
03	1480	-	20	1460	-	-	18	26	-	0	6/8
Chrysothamnus viscidiflorus viscidiflorus											
87	9333	266	3000	6133	200	-	0	.71	2	6	4/6
91	14666	800	3733	9933	1000	-	7	43	7	2	5/8
97	1880	-	-	1860	20	-	2	0	1	1	14/23
03	2960	-	80	2780	100	-	0	0	3	1	7/10
Gutierrezia sarothrae											
87	66	-	-	66	-	-	0	0	-	0	5/3
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	-	20	-	-	0	0	-	0	6/6
03	0	-	-	-	-	-	0	0	-	0	-/-
Leptodactylon pungens											
87	2266	-	266	2000	-	-	0	0	0	0	5/3
91	8265	133	4133	4066	66	-	.80	0	1	2	4/5
97	460	20	-	440	20	-	0	0	4	4	6/7
03	880	-	-	780	100	-	0	0	11	5	6/7
Opuntia spp.											
87	66	-	-	66	-	-	0	0	-	0	5/4
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	2/5
03	0	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
97	0	-	-	-	-	-	0	0	0	0	-/-
03	100	-	-	80	20	-	0	100	20	20	10/22
Symphoricarpos oreophilus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	-	20	-	-	100	0	-	0	12/30
03	40	-	-	40	-	-	0	0	-	0	10/24

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Tetradymia canescens</i>											
87	199	-	133	66	-	-	33	0	-	0	8/6
91	200	-	200	-	-	-	0	0	-	0	-/-
97	20	-	20	-	-	-	0	0	-	0	-/-
03	80	-	-	80	-	-	0	0	-	0	7/9

Trend Study 24-12-03

Study site name: Marshall Basin.

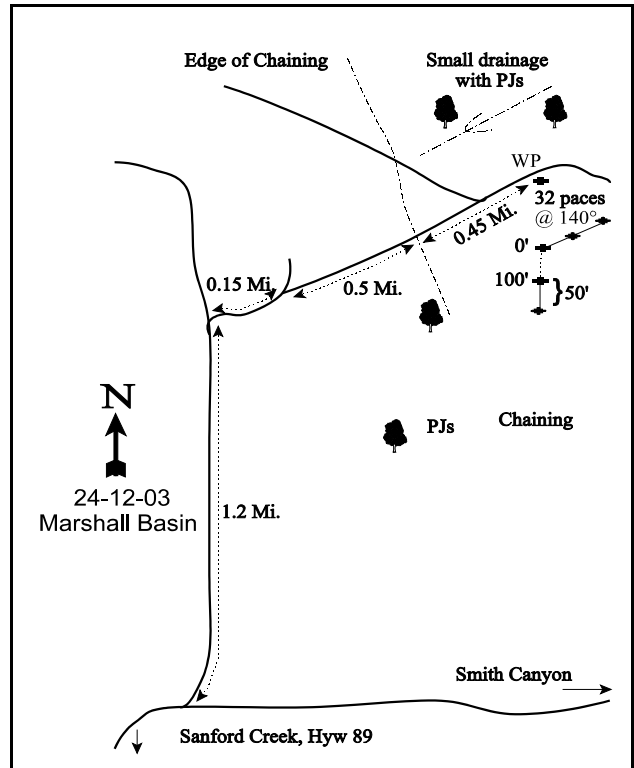
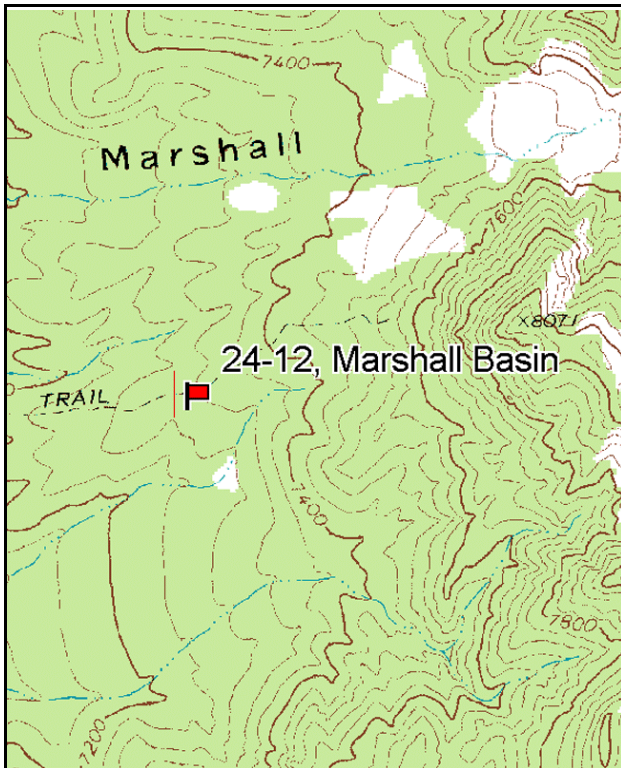
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

About 8 miles north of Panguitch on Highway 89 (or 1.7 miles south of the SR20 and Highway 89 junction) turn east onto the Sanford Creek Road. Travel 4 miles east on the main road to a fork. Bear left towards Smith Canyon. Go 1.5 miles to a fork just below the mouth of Smith Canyon, turn left. Continue 1.2 miles to a fork. Stay right and go 0.15 miles to another fork. Stay right and continue 0.5 miles to the edge of a chaining. Continue 0.45 miles east into the chaining to the study area. The witness post is on the right side of road. From the witness post walk 32 paces at 140 degrees magnetic to the 0' stake. The 0' baseline stake is marked by browse tag #9003.



Map Name: Blind Spring Mountain

Diagrammatic Sketch

Township 32S, Range 4 1/2W, Section 34

GPS: NAD 27, UTM 12S 4204198 N, 384056 E

DISCUSSION

Marshall Basin - Trend Study 24-12

This site monitors a chained and seeded pinyon-juniper area in Marshall Basin. It is located on the western slope of the herd unit. Approximately 900 acres were chained and seeded in the fall of 1984 as part of a cooperative project involving the Powell Ranger District and the Division of Wildlife Resources. Elevation of the site is approximately 7,300 feet. The chained area consists of alluvial benches which gradually slope westward toward the Sevier River. Steep, wooded slopes provide a significant amount of cover above the chaining. Protective cover is also present in the draws which traverse the chained area. This is thought to be a key wintering area for mule deer. Quadrat frequency of deer and elk pellet groups were fairly abundant in 1997 at 20% and 21% respectively. Pellet group data from 2003 estimated low wildlife use at only 1 deer and 16 elk days use/acre (3 ddu/ha and 40 edu/ha). A few old cattle pats were also encountered in 2003.

Soil is deep with an effective rooting depth estimated at nearly 18 inches. Texture is a sandy loam. The soil surface is quite loose and much of it is exposed. Erosion pavement is quite common and was present prior to the chaining. Soil temperature is high averaging 71°F at a depth of nearly 14 inches indicating a dry soil profile. Litter makes up a large part of the groundcover on this site, around 40% in 1997 and 2003. Scattered debris from the chaining and litter buildup from ungrazed grasses help to stabilize the soil on this site but total protective ground cover is marginal. Some erosion is apparent and the erosion condition class was determined to be slight in 2003.

The chaining project was initiated to increase browse on deer winter range, but shrubs have been slow to become established on this chaining. The area is presently more valuable to deer during the spring and fall, at which time the area provides quality, succulent herbaceous forage. Shrubs found on the site include very low numbers of mountain big sagebrush and bitterbrush (only 20 plants/acre). The less preferred but more abundant rubber rabbitbrush is increasing on the site from 220 plants/acre in 1997 to 340 by 2003.

The herbaceous understory provides over 80% of the total vegetation cover on the site. The only abundant species is crested wheatgrass. It provided 86% of the grass cover in 1997 and 97% in 2003. Intermediate wheatgrass was seeded but it is not very abundant indicating that the site is too dry for the intermediate wheatgrass. The site supported a variety of forbs in 1987 but many were weedy increasers. Since then many forbs have disappeared from the site and only 3 species were encountered in 2003.

1991 TREND ASSESSMENT

Basic cover trends did show some notable changes that should not be considered good even though percent bare ground did decrease since 1987 from 17% to 12%. Vegetative cover also declined during this same period along with the combined value for rock and pavement increasing from 17% up to 32%. Trend should be considered slightly downward. There are no noteworthy browse species of any consequence on the site at this time, but through time sagebrush should come onto the site. Seeded crested wheatgrass still dominates the site. The herbaceous understory has lost many forbs since 1987. The forbs have gone from 14 species down to 6 in 1991. The seeded alfalfa and small burnet were not found in 1991. However, some of the forbs which have disappeared from the site include weedy early seral species. This was probably a direct result of the extended drought along with increased competition from crested wheatgrass. Another seeded grass, intermediate wheatgrass, did not increase, but stayed at almost the same frequencies as noted in 1987. It has been too dry for this species to increase its presence on this site. Trend for herbaceous understory is considered stable due to the loss of weedy forbs and a similar sum of nested frequency for grasses.

TREND ASSESSMENT

soil - slightly downward (2)

browse - stable but lacking (3)

herbaceous understory - stable (3)

1997 TREND ASSESSMENT

Trend for soil is considered stable even though percent bare ground increased from 12% to 21%. Pavement and rock cover both declined substantially. Litter cover also declined but this would be expected as litter debris from the churning deteriorates over time. Vegetative cover is moderately abundant with an average cover value of 16%. Nearly all (87%) of this cover comes from herbaceous plants which are more effective at protecting the soil. Trend for browse is slightly up with some sagebrush and bitterbrush sampled in 1997. They occur in very small numbers but will likely increase in time. Trend for the herbaceous understory is stable with a change in composition. Nested frequency of crested wheatgrass increased significantly, but nested frequency of bottlebrush squirreltail and blue grama declined significantly. In 1987, squirreltail had a nested frequency slightly higher than crested wheatgrass, 88 compared to 103. In 1991, nested frequency of squirreltail was 106 and quadrat frequency was 44%. By 1997, nested frequency declined to only 3 and quadrat frequency to 1%. Forbs are still rare.

TREND ASSESSMENT

soil - stable (3)

browse - up slightly but rare (4)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is down slightly since 1997. Cover of bare ground increased from 21% to 30% while vegetation and litter cover declined. Some erosion is occurring but it is not severe and the erosion condition class was determined to be slight in 2003. Shrubs are still rare on the site with the most preferred species, mountain big sagebrush and bitterbrush, occurring at a density of only 20 plants/acre. No seedlings or young were encountered for either species. The only fairly common shrub is white rubber rabbitbrush which was estimated at only 340 plants/acre. Browse trend is considered stable, but shrubs are still not abundant enough to provide much winter browse forage for deer and elk. The herbaceous understory is poor with crested wheatgrass providing virtually all of the herbaceous cover. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses declined 29% with a significant decrease in the nested frequency of crested wheatgrass. Forbs remain rare and have declined slightly in nested frequency.

TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 24 , Study no: 12

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'97	'03	'97	'03
G	<i>Agropyron cristatum</i>	_a 88	_a 124	_c 225	_b 165	11.48	7.84
G	<i>Agropyron intermedium</i>	2	3	8	3	.07	.03
G	<i>Bouteloua gracilis</i>	_c 100	_b 55	_a 17	_a 10	.21	.19
G	<i>Bromus tectorum</i> (a)	-	-	_b 86	_a 4	1.47	.04
G	<i>Festuca ovina</i>	4	-	-	-	-	-
G	<i>Oryzopsis hymenoides</i>	_{ab} 3	_b 8	_{ab} 1	_a -	.01	-
G	<i>Poa secunda</i>	5	6	-	-	-	-
G	<i>Sitanion hystrix</i>	_b 103	_b 106	_a 3	_a 2	.03	.01
Total for Annual Grasses		0	0	86	4	1.47	0.04
Total for Perennial Grasses		305	302	254	180	11.80	8.07
Total for Grasses		305	302	340	184	13.28	8.11
F	<i>Astragalus</i> spp.	_a 1	_b 16	_a -	_a -	-	-
F	<i>Chenopodium fremontii</i> (a)	12	3	2	12	.01	.11
F	<i>Cryptantha fulvocanescens</i>	_c 24	_{bc} 21	_{ab} 10	_a 2	.05	.00
F	Cruciferae	-	1	-	-	-	-
F	<i>Descurainia</i> spp. (a)	-	-	2	-	.00	-
F	<i>Eriogonum hookeri</i> (a)	_b 51	_a -	_a -	_a -	-	-
F	<i>Erigeron pumilus</i>	1	-	1	-	.00	-
F	<i>Ipomopsis aggregata</i>	4	-	-	-	-	-
F	<i>Lactuca serriola</i>	_b 118	_a -	_a -	_a -	-	-
F	<i>Lesquerella ludoviciana</i>	3	8	-	-	-	-
F	<i>Medicago sativa</i>	_b 11	_a -	_a -	_a -	-	-
F	<i>Nicotiana attenuata</i> (a)	-	-	_a -	_b 51	-	1.76
F	<i>Phlox longifolia</i>	-	-	1	-	.00	-
F	<i>Salsola iberica</i> (a)	_{bc} 91	_b 12	_a -	_a -	-	-
F	<i>Sanguisorba minor</i>	8	-	-	-	-	-
F	<i>Taraxacum officinale</i>	3	-	-	-	-	-
F	<i>Tragopogon dubius</i>	1	-	-	-	-	-
Total for Annual Forbs		154	15	4	63	0.01	1.87
Total for Perennial Forbs		174	46	12	2	0.06	0.00
Total for Forbs		328	61	16	65	0.07	1.88

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

BROWSE TRENDS --

Management unit 24 , Study no: 12

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	Artemisia pygmaea	0	0	.18	-
B	Artemisia tridentata vaseyana	1	1	-	.15
B	Chrysothamnus nauseosus hololeucus	9	13	.30	1.92
B	Gutierrezia sarothrae	4	4	.21	.18
B	Juniperus osteosperma	1	0	.85	-
B	Opuntia spp.	6	2	.24	.15
B	Pinus edulis	3	1	.15	-
B	Purshia tridentata	1	1	-	-
Total for Browse		25	22	1.94	2.40

CANOPY COVER, LINE INTERCEPT --

Management unit 24 , Study no: 12

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	.50
Chrysothamnus nauseosus hololeucus	2.93
Pinus edulis	.10

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24 , Study no: 12

Species	Average leader growth (in)
	'03
Purshia tridentata	3.0

BASIC COVER --

Management unit 24 , Study no: 12

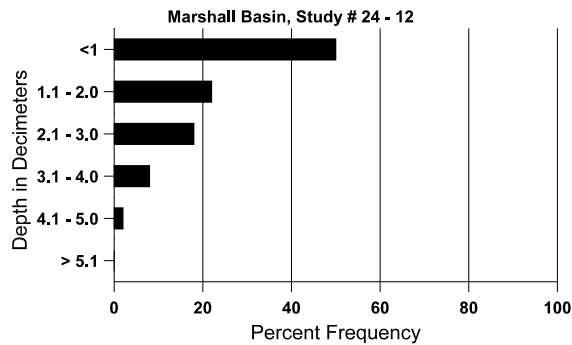
Cover Type	Average Cover %			
	'87	'91	'97	'03
Vegetation	6.75	4.00	16.23	12.96
Rock	7.25	4.25	2.74	6.09
Pavement	9.75	28.25	18.25	18.93
Litter	59.00	51.50	41.13	39.43
Cryptogams	0	0	.09	0
Bare Ground	17.25	12.00	21.42	30.42

SOIL ANALYSIS DATA --

Management unit 24, Study no: 12, Study Name: Marshall Basin

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.8	71.3 (13.7)	N/A	57.3	24.1	18.6	2.0	24.6	188.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 12

Type	Quadrat Frequency		Days use per acre (ha)
	'97	'03	
Rabbit	8	42	-
Cow	-	-	2 (5)
Elk	20	15	16 (40)
Deer	21	9	1 (3)

BROWSE CHARACTERISTICS --
Management unit 24 , Study no: 12

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
97	20	-	-	20	-	-	0	0	0	0	-/-
03	20	-	-	-	20	-	0	0	100	0	-/-
<i>Chrysothamnus nauseosus hololeucus</i>											
87	66	-	-	66	-	-	0	0	0	0	19/13
91	66	-	-	66	-	-	0	0	0	0	28/17
97	220	-	100	100	20	60	0	0	9	9	32/45
03	340	-	-	320	20	-	6	0	6	0	29/44
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	13/20
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Gutierrezia sarothrae</i>											
87	466	-	100	366	-	-	0	0	0	0	9/10
91	932	-	33	866	33	-	14	4	4	11	7/8
97	200	-	-	200	-	-	0	0	0	0	9/13
03	160	280	120	40	-	40	0	0	0	0	6/5
<i>Juniperus osteosperma</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
97	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Opuntia spp.</i>											
87	66	-	66	-	-	-	0	0	-	0	-/-
91	33	-	-	33	-	-	0	0	-	0	3/7
97	120	-	20	100	-	-	0	0	-	0	3/13
03	40	-	-	40	-	-	0	0	-	0	4/11
<i>Pinus edulis</i>											
87	33	-	33	-	-	-	0	0	-	0	-/-
91	33	-	33	-	-	-	0	0	-	0	-/-
97	60	20	60	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Purshia tridentata</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
97	20	-	20	-	-	-	100	0	0	0	18/40
03	20	-	-	-	20	-	0	0	100	100	22/60

Trend Study 24-13-03

Study site name: Jones Corral.

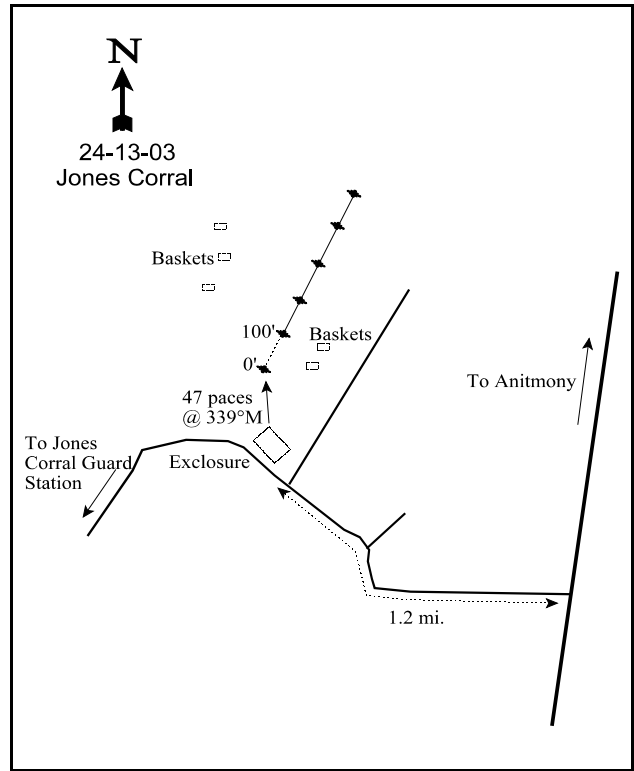
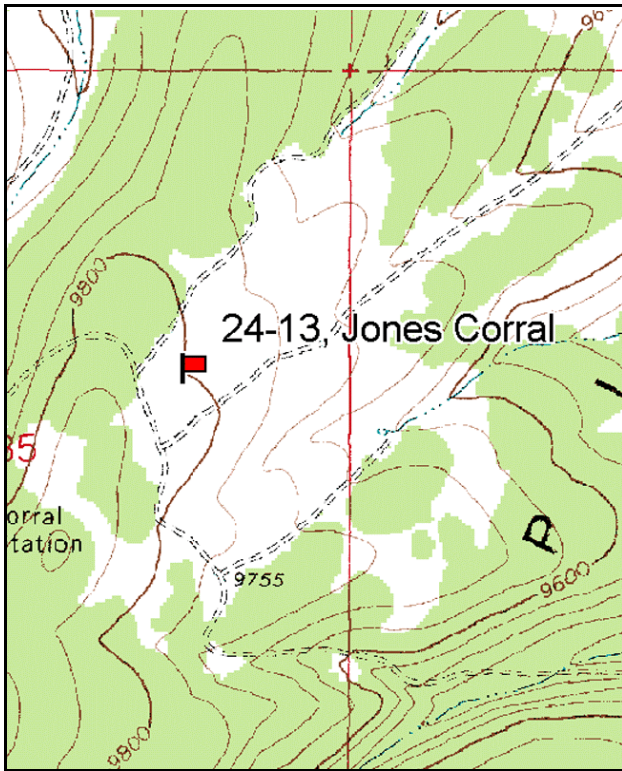
Vegetation type: Mountain Meadow.

Compass bearing: frequency baseline ~40 degrees magnetic.

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

LOCATION DESCRIPTION

From the town of Antimony, drive on Mt. Dutton road for approximately 10 miles towards the Jones Coral Guard Station to a fork. Turn right (west) and drive 1.2 miles towards the guard station. Stop at the enclosure on the right side of the road. From the northwest corner of the enclosure walk 47 paces at 339 degrees magnetic to the 0' stake. The 0' stake is marked by browse tag #162.



Map Name: Mt. Dutton

Diagrammatic Sketch

Township 31S, Range 3W, Section 35

GPS: NAD 27, UTM 12S 4214475 N, 398207 E

DISCUSSION

Jones Corral - Trend Study 24-13

This is a new trend study which samples a mountain meadow surrounded by aspen about ½ mile northeast of the Jones Corral Forest Service guard station. Elevation of the site is 9,800 feet with a north aspect and a gentle slope of 6%. The small Jones Corral enclosure is found about 200 feet to the southeast. This site replaces the Suicide trend study, 24-5, which was suspended in 2003. The Jones Corral site samples an area which receives heavy elk use, especially during the spring. Pellet group data from 2003 estimated 58 elk days use/acre (143 edu/ha). Deer use was low at only 3 days use/acre. The area is also grazed by cattle during the summer and use was estimated at 23 days use/acre (57 cdu/ha). Cattle pats appeared to be from the previous summer (2002). A long term grazing study was established on this area by the Division of Wildlife Resources in 1993 and continued until 2000 to quantify elk and cattle use. Pellet group data from that study estimated an 8 year average (1993-2000) of 53 elk days use/acre per year (131 edu/ha), mostly from spring use. Livestock use had an 8 year average of 40 days use/acre (99 cdu/ha). The highest use occurred between 1993 and 1998 with an average of 47 cow days use/acre (116 cdu/ha). Use by cattle declined to 16 days use/acre (40 cdu/ha) in 1999 and 23 (57 cdu/ha) in 2000.

Soil at the site is moderately deep with an effective rooting depth of nearly 13 inches. Parent material is basalt. Soil texture is a loam which is slightly acidic in reaction (pH 6.47). Organic matter is high at 3.4%. Phosphorous is low at only 7 ppm when 10 ppm is considered minimum for normal plant growth and development. Rock and pavement are abundant on the surface with a combined cover value of 22%. Some localized erosion is evident but it is not severe. There is considerable soil disturbance by gopher activity.

This area is summer range so shrubs are not the key aspect. The only shrubs found on the site are a very few mountain big sagebrush plants.

The herbaceous understory is diverse and abundant but composition and production are poor. Production estimates from the grazing study of this area estimated herbaceous production between 1,400 and 1,900 lbs/acre between 1995 and 1999, averaging 1,702 lbs/acre. Drought conditions in 2000, especially during the spring period (April-June), reduced herbaceous production to only 523 pounds/acre, a 3 fold decrease. Considering the elevation at this site, proximity to aspen, and site potential, herbaceous production should be much higher.

Perennial grasses provided about 21% cover in 2003 with smooth brome, Kentucky and Sandberg bluegrass, and subalpine and Letterman needlegrass providing nearly all of the grass cover. Of these species, Sandberg bluegrass was the most abundant, providing 45% of the total grass cover. Forbs produced nearly as much cover as grasses with forbs providing nearly 17% cover in 2003. However, composition was also poor with the most abundant species being low growing increasers such as rose pussytoes, Pacific aster, cinquefoil, and white clover. All of these species are increasers under heavy grazing pressure.

2003 APPARENT TREND ASSESSMENT

Soil conditions are marginal considering the elevation of this site. Protective ground cover is barely adequate to prevent severe erosion. There is no browse to speak of and this site is summer range so shrubs are not the key component. The herbaceous understory is diverse but composition is poor. Increaser grasses and forbs dominate the understory. Nearly all of the common perennial forbs are low growing and increasers under heavy grazing.

HERBACEOUS TRENDS --
Management unit 24 , Study no: 13

Type	Species	Nested Frequency	Average Cover %
		'03	'03
G	Bromus inermis	113	3.07
G	Carex spp.	7	.06
G	Poa pratensis	72	2.66
G	Poa secunda	299	9.45
G	Sitanion hystrix	24	.60
G	Stipa columbiana	53	2.38
G	Stipa lettermani	100	2.44
G	Trisetum spicatum	26	.30
Total for Annual Grasses		0	0
Total for Perennial Grasses		694	20.98
Total for Grasses		694	20.98
F	Agoseris glauca	4	.01
F	Antennaria rosea	88	2.29
F	Aster chilensis	100	1.42
F	Astragalus spp.	92	3.06
F	Collinsia parviflora (a)	16	.05
F	Erigeron eatonii	27	.32
F	Erigeron pumilus	2	.01
F	Polygonum douglasii (a)	21	.09
F	Potentilla gracilis	70	1.59
F	Taraxacum officinale	3	.00
F	Trifolium repens	248	7.69
Total for Annual Forbs		37	0.14
Total for Perennial Forbs		634	16.43
Total for Forbs		671	16.56

BASIC COVER --

Management unit 24 , Study no: 13

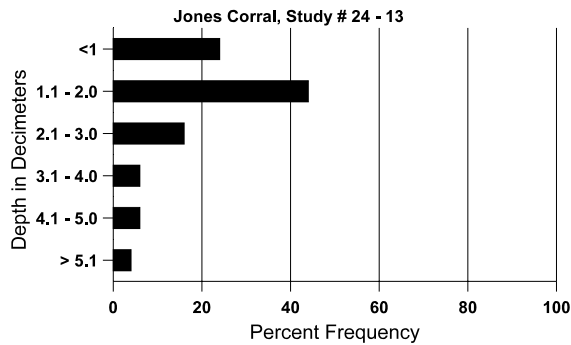
Cover Type	Average Cover % '03
Vegetation	44.15
Rock	8.19
Pavement	13.68
Litter	12.75
Cryptogams	.99
Bare Ground	23.89

SOIL ANALYSIS DATA --

Management unit 24, Study no: 13, Study Name: Jones Corral

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	57.4 (13.2)	6.5	42.6	32.7	24.7	3.4	7.0	483.2	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 24 , Study no: 13

Type	Quadrat Frequency '03	Days use per acre (ha) '03
Rabbit	1	-
Elk	30	58 (144)
Deer	6	3 (7)
Cattle	5	23 (57)

BROWSE CHARACTERISTICS --
 Management unit 24 , Study no: 13

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
03	0	-	-	-	-	-	0	0	-	0	10/18

Trend Study 24R-1-03

Study site name: Sanford.

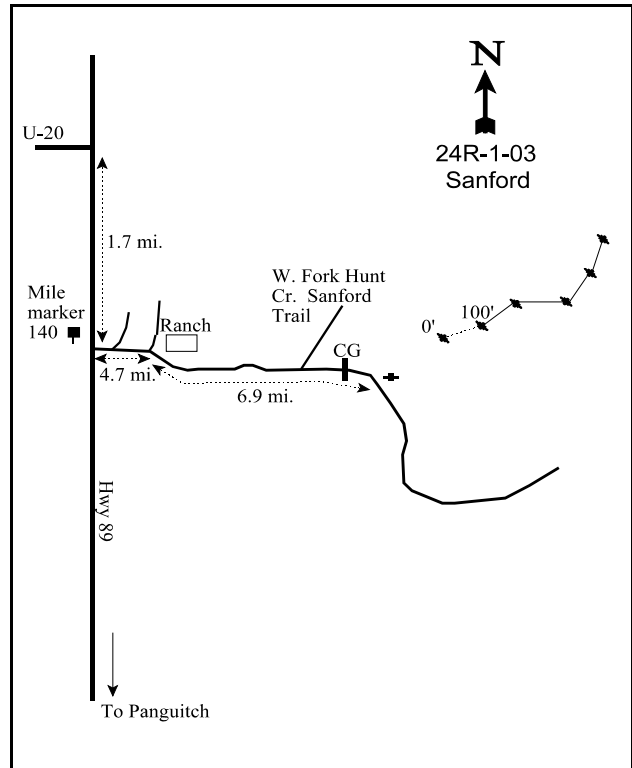
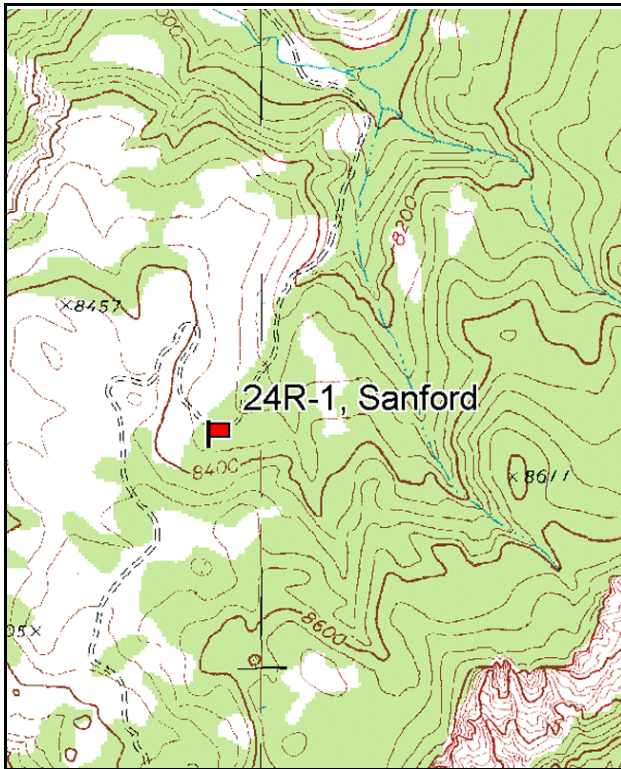
Vegetation type: Aspen-Conifer Burn.

Compass bearing: frequency baseline 87 degrees magnetic (line 2, 74°M, line 3, 93°M, line 4, 68°M, line 5, 7°M).

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

LOCATION DESCRIPTION

From the junction of highway 89 and U-20, travel south on highway 89 for 1.7 miles to a left turn. Travel 4.7 miles east keeping right at all forks until you come to a fork with a sign to Sanford Creek. Turn right at the fork. Travel 6.9 miles up Sanford Creek Canyon to the witness post on the left side of the road. You will cross the creek several times as you go up the canyon. Stay right at the fork part way up the canyon. The 0' stake is 27 paces at 185 degrees magnetic from the witness post. The 0' stake is a half-high steel post marked by browse tag #167 and the other stakes are rebar.



Map Name: Blind Spring Mtn

Diagrammatic Sketch

Township 33S, unsurveyed

GPS: NAD 27, UTM 12S 4197647 N, 390002 E

DISCUSSION

Sanford - Trend Study 24R-1

This trend study was established in 1998 up the right fork of Sanford Creek to monitor a prescribed burn which occurred in 2002. The site has an elevation of 8,390 feet with a north aspect and a slope of 12%. Prior to the burn the area was dominated by Douglas fir with small numbers of aspen. This site would be considered summer range for deer and elk, but pellet group data shows only light use. Pellet group data from 1998 estimated 17 deer days use/acre (41 ddu/ha) while elk use was estimated at less than 1 day use/acre (2 edu/ha). After the burn, deer use has declined 5 days use/acre (12 ddu/ha) in 2003. Elk use remained very low at less than 1 day use/acre (2 edu/ha). A few fresh cattle pats were seen in 2003, likely due to trespass livestock, but none occurred within the pellet group transect.

Soil at the site is deep with an effective rooting depth of 18.5 inches. There is little rock or pavement on the surface. Soil texture is a sandy loam which is strongly acidic (pH 5.4). Organic matter is high at nearly 5%. Prior to the burn, litter cover was abundant covering 94% of the ground surface with most being in the form of conifer needles. Little bare ground was exposed. After the burn, cover of bare ground increased to 26% and litter cover declined from 94% to 70%. In areas where the fire did not burn very hot, needle litter still covers the ground but soil is exposed in places where the fire burned hotter. Vegetation cover has declined from 33% to 7% and there is potential for severe erosion. However, at the time the study was reread on July 10th of 2003, erosion appeared minimal and the erosion condition class was determined to be stable.

The site was dominated by an overstory of Douglas fir prior to the burn. Shrub density strip data estimated a population of 1,440 trees/acre, 72% of which were young trees. Overhead canopy cover was estimated at 35%. Aspen was scattered through the site at a density of 680 trees/acre. Only 21%, or 140 trees/acre, were mature. Overhead canopy cover was variable but averaged 15% in 1998. Density of Douglas fir declined 6 fold to only 240 trees/acre after the fire. Dead Douglas fir was estimated at 1,140 trees/acre. Most of the surviving fir trees were located in an unburned area. Line intercept canopy cover averaged 5.4%. Aspen responded favorably to the fire with numerous aspen suckers sprouting after the burn. Density of aspen increased more than 3 fold from 680 to 2,220 plants/acre. Suckers were mostly unutilized. A few Ponderosa pine trees also occupy the site.

Understory shrubs included mountain common juniper, Oregon holly grape, Woods rose, and snowberry. All of these shrubs combined produced approximately 13% cover in 1998, with common juniper providing 41% of the understory shrub cover and snowberry accounting for an additional 38%. All species declined substantially in cover and density after the fire with the exception of Woods rose which dropped in average cover but remained similar in density. All of these shrubs did not appear to be utilized during either reading.

The herbaceous understory was poor prior to the burn with perennial grasses providing only about 3% total cover. The most abundant species were mountain brome, Kentucky bluegrass, and subalpine needlegrass. The forb composition was moderately diverse but total forb production was poor with forb cover estimated at only about 6% in 1998. The more common species included columbine, milkvetch, western yarrow, rose pussytoes, and dandelion. In 2003, the first growing season after the burn, perennial grasses and forbs were lacking. Total grass cover declined to less than 1%. The most abundant species was subalpine needlegrass. Individual grass plants were large and robust but spotty in their distribution. Some seeded grasses were encountered in small numbers. Total forb cover was estimated at less than 2%, and perennial forb cover was estimated at less than 1%. The most abundant forb found on the site in 2003 was Fremont goosefoot, an early seral annual, which made up 46% of the total forb cover. Herbaceous abundance and production will increase with time due to good site potential and the removal of the conifer overstory.

1998 APPARENT TREND ASSESSMENT

This site will be part of a prescribed burn. The site is currently dominated by Douglas fir with scattered aspen. Soil conditions appear stable with abundant litter cover from conifer needles. Erosion is low. The browse composition is composed of Douglas fir and aspen in the overstory with several shrubs found in the understory. One of the purposes of the prescribed burn is to rejuvenate aspen which is the key browse component of this site. The herbaceous understory is lacking and not particularly diverse considering the site potential. Production is also poor with total herbaceous cover estimated at only about 9%. This should also improve after the burn.

2003 TREND ASSESSMENT

This site was first read prior to a prescribed burn and reread during the first growing season after the burn. After the fire, the soil trend is down due to a reduction in protective ground cover. There is still adequate protective ground cover to prevent severe erosion and erosion on site is minimal at the present time. Trend for browse is slightly up with the improvement for aspen, the key species on this site. The goals of the prescribed burn treatment are being accomplished with the reduction of the Douglas fir overstory from an average cover value of 35% in 1998 to 5% in 2003. Remaining Douglas fir cover comes from an unburned area along the baseline. Total aspen cover declined from 15% in 1998 to about 5% in 2003, however, aspen density increased 69% after the fire from 680 plants/acre to 2,220 due to a flush of aspen suckers. Understory shrubs, mountain common juniper, Oregon hollygrape, and snowberry declined but these species are not key species, especially on summer range. Trend for the herbaceous understory is down due to a substantial decline in the sum of nested frequency of perennial grasses and forbs. Herbaceous plants are large and robust where found but are spotty in their distribution. The site was read during the first growing season after the fire and the herbaceous understory should improve in the future.

TREND ASSESSMENT

soil - down (1)

browse - slightly up (4)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 24R, Study no: 1

T y p e	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	Bromus carinatus	_b 67	_a -	1.77	-
G	Bromus inermis	-	2	-	.03
G	Carex spp.	3	-	.03	-
G	Dactylis glomerata	_b 20	_a -	.28	-
G	Festuca ovina	8	-	.03	-
G	Poa fendleriana	-	6	-	.01
G	Poa pratensis	_b 36	_a 2	.32	.03
G	Secale montanum	_a -	_b 22	-	.32
G	Stipa columbiana	_b 40	_a 28	.42	.41

T y p e	Species	Nested Frequency		Average Cover %	
		'98	'03	'98	'03
G	<i>Stipa lettermani</i>	11	-	.01	-
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		185	60	2.89	0.81
Total for Grasses		185	60	2.89	0.81
F	<i>Achillea millefolium</i>	_b 35	_a 6	.87	.07
F	<i>Antennaria rosea</i>	_b 35	_a 3	1.25	.06
F	<i>Androsace septentrionalis</i> (a)	4	11	.01	.05
F	<i>Aquilegia caerulea</i>	_b 52	_a -	1.48	-
F	<i>Arabis</i> spp.	3	-	.00	-
F	<i>Arenaria fendleri</i>	_b 14	_a -	.10	-
F	<i>Astragalus</i> spp.	_b 33	_a 6	.95	.07
F	<i>Castilleja</i> spp.	2	-	.03	-
F	<i>Chenopodium fremontii</i> (a)	_a -	_b 31	-	.79
F	<i>Collomia linearis</i> (a)	-	7	-	.04
F	<i>Erigeron eatonii</i>	21	11	.22	.07
F	<i>Fragaria virginiana</i>	2	6	.03	.05
F	<i>Geranium</i> spp.	3	-	.03	-
F	<i>Lotus utahensis</i>	3	-	.00	-
F	<i>Lupinus argenteus</i>	3	-	.03	-
F	<i>Orthocarpus luteus</i> (a)	1	-	.00	-
F	<i>Polygonum douglasii</i> (a)	5	13	.01	.10
F	<i>Potentilla</i> spp.	5	-	.04	-
F	<i>Taraxacum officinale</i>	_b 33	_a 9	.65	.21
F	<i>Thalictrum fendleri</i>	-	2	-	.15
F	<i>Tragopogon dubius</i>	4	-	.03	-
F	<i>Viola</i> spp.	10	2	.12	.03
Total for Annual Forbs		10	62	0.02	0.99
Total for Perennial Forbs		258	45	5.88	0.72
Total for Forbs		268	107	5.90	1.71

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

BROWSE TRENDS --

Management unit 24R, Study no: 1

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Juniperus communis	13	0	5.31	-
B	Mahonia repens	25	12	2.38	.36
B	Pinus ponderosa	2	1	.15	-
B	Populus tremuloides	19	43	.24	1.62
B	Pseudotsuga menziesii	48	5	9.44	.64
B	Rosa woodsii	5	6	.41	.03
B	Symphoricarpos oreophilus	75	21	4.86	.84
Total for Browse		187	88	22.81	3.49

CANOPY COVER, LINE INTERCEPT --

Management unit 24R, Study no: 1

Species	Percent Cover	
	'98	'03
Mahonia repens	-	.16
Pinus ponderosa	-	2.00
Populus tremuloides	15.19	4.81
Pseudotsuga menziesii	35.20	5.44
Rosa woodsii	-	.08
Symphoricarpos oreophilus	-	.60

BASIC COVER --

Management unit 24R, Study no: 1

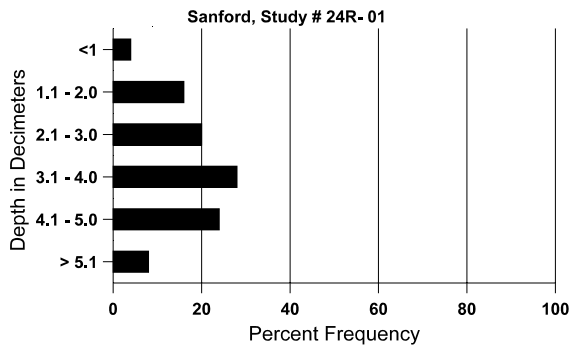
Cover Type	Average Cover %	
	'98	'03
Vegetation	33.26	6.65
Rock	.22	.67
Pavement	.01	.01
Litter	94.35	69.68
Cryptogams	.22	.00
Bare Ground	.19	26.14

SOIL ANALYSIS DATA --

Management unit 24R, Study no: 1, Study Name: Sanford

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
18.5	56.3 (17.7)	5.4	58.0	23.4	18.6	4.9	20.9	425.6	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 24R, Study no: 1

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Deer	1	3	17 (42)	5 (12)
Elk	-	-	1 (2)	1 (2)
Cattle	2	-	-	-

BROWSE CHARACTERISTICS --

Management unit 24R, Study no: 1

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Juniperus communis											
98	760	-	80	660	20	-	0	0	3	11	24/32
03	0	-	-	-	-	-	0	0	0	0	-/-
Mahonia repens											
98	4740	-	620	4120	-	-	3	0	-	0	6/9
03	1820	-	920	900	-	-	0	0	-	0	4/6
Pinus ponderosa											
98	60	20	40	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Populus tremuloides											
98	680	-	540	140	-	60	0	0	-	0	-/-
03	2220	-	2220	-	-	200	0	0	-	0	19/13
Pseudotsuga menziesii											
98	1440	280	1040	400	-	120	0	0	0	0	-/-
03	240	20	180	40	20	1140	0	0	8	17	-/-
Rosa woodsii											
98	220	-	160	60	-	-	0	0	-	0	20/23
03	240	20	140	100	-	-	0	0	-	0	4/4
Symphoricarpos oreophilus											
98	6060	260	2360	3700	-	-	0	0	-	0	14/15
03	940	-	720	220	-	-	0	0	-	0	11/19

SUMMARY

WILDLIFE MANAGEMENT UNIT 24 - MT DUTTON

Eleven trend studies were read in the Mount Dutton Wildlife Management unit in 2003. Nine of these studies were originally established in 1987 and reread in 1991, 1997, and 2003. Seven of these trend studies sample winter ranges. One site, Mud Spring, monitors a transitional range and Table Mountain and the new site at Jones Corral, sample summer range. A special study, Sanford (24R-1), established in 1998 samples an aspen/conifer area which was burned in 2002. This site was reread in 2003.

Unit trends are very similar to 1991 which was at the end of a drought period. Each site's trends are rated on a 1 to 5 scale; 1 being a down trend, 2 being a slightly down trend, 3 is stable, 4 is slightly up, and 5 is up. Average soil trends are slightly down overall with an average value of 2.2. Five of the trend studies had stable soil trends while 5 sites displayed declining soil trends. One unit wide trend noted in 2003 was an increase in average soil temperature. Average soil temperature for all sites in 1997 was 54.4°F increasing to 67.3°F in 2003, a 13 degree increase. This would indicate dry soil profiles in 2003 which makes shrub recruitment especially difficult and causes stress on herbaceous plants. The reason for the difference in average soil temperature is precipitation trends. Weather station data from around the unit (see precipitation graph below) show that spring precipitation (April - June) in 1997 was 136% of normal. In 2003, spring precipitation was only about 45% of normal. In addition, spring precipitation has been well below normal, averaging only 46.5% of normal, for the past 4 years (2000-2003). The year 2002 was especially dry. Annual precipitation in 2002 was only 77% of normal and spring precipitation was only 22% of normal. Precipitation is the main driving force for the trends on the unit.

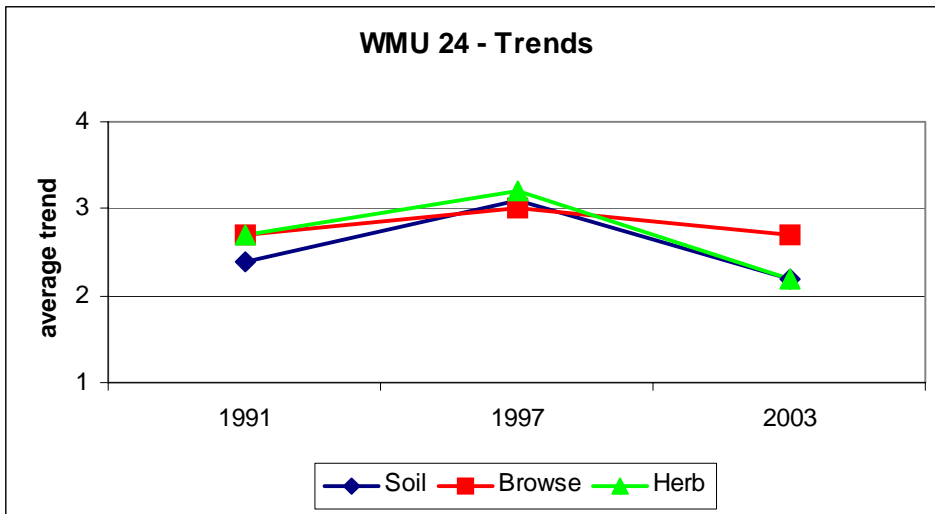
Browse trends averaged 2.7 or slightly down. Four sites had downward trends for browse, 4 others were stable, and 2 sites showed improving trends. Average percent decadence of sagebrush, the key browse species, on the winter range sites more than doubled, increasing from 25% in 1997 to 56.5% in 2003. Young recruitment, on winter range sites, dropped nearly 6 fold from an average of 553 young plants/acre per site to 97 plants/acre.

Herbaceous trends were slightly down overall averaging 2.2. Six trend studies had a downward herbaceous trend while 3 sites were stable and only 1 site, North Pole Canyon, was upward. The upward herbaceous trend on North Pole Canyon was due to an increase in the warm season grass, blue grama. Poor spring but more normal summer precipitation caused warm season grasses to increase on a few sites while cool season grasses have declined on 4 sites. Three trend studies, Mud Spring Chaining (24-4), Prospect Seeding (24-4), and Marshall Basin (24-12), had a decline in the cover and frequency of crested wheatgrass. Overall, average cover of perennial grasses remained similar to 1997 (11.4% to 11.3%). Sum of nested frequency declined slightly overall. Winter ranges on this unit all have very poor forb cover and frequency. Average forb cover was poor at less than ½ of 1% estimated at only 0.23% in 1997, declining to 0.08% in 2003. Forb cover and frequency were much higher on the summer and transitional range trend sites but drought conditions have caused a decline here as well. The summer range site at Table Mountain showed a 37% decline in forb cover since 1997 while forb cover at the transitional range site, Mud Spring, declined 22%.

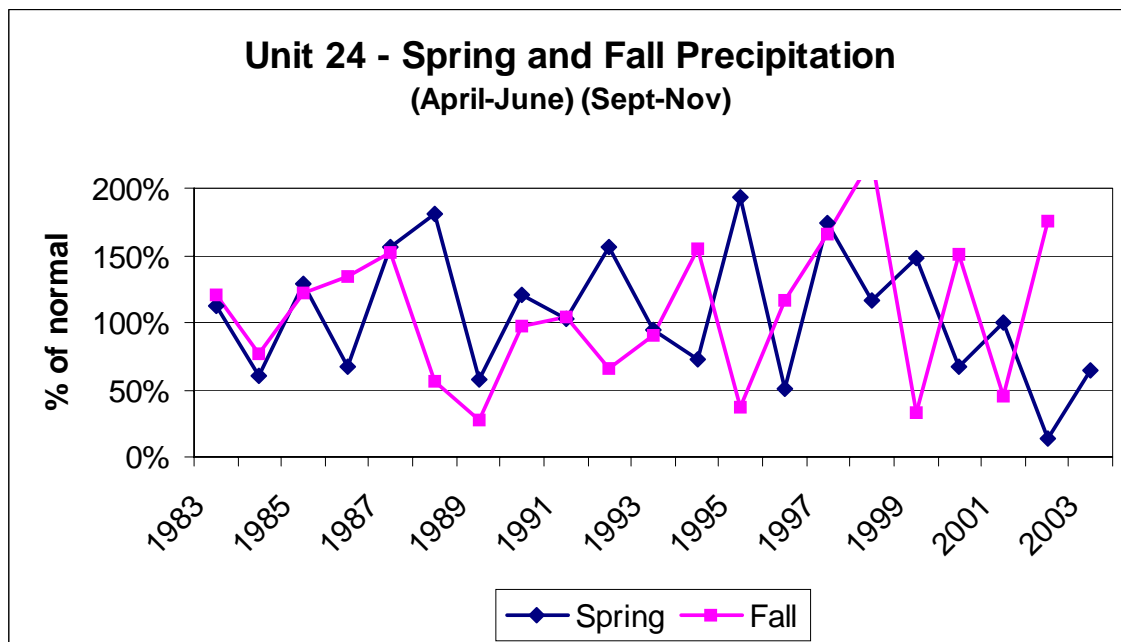
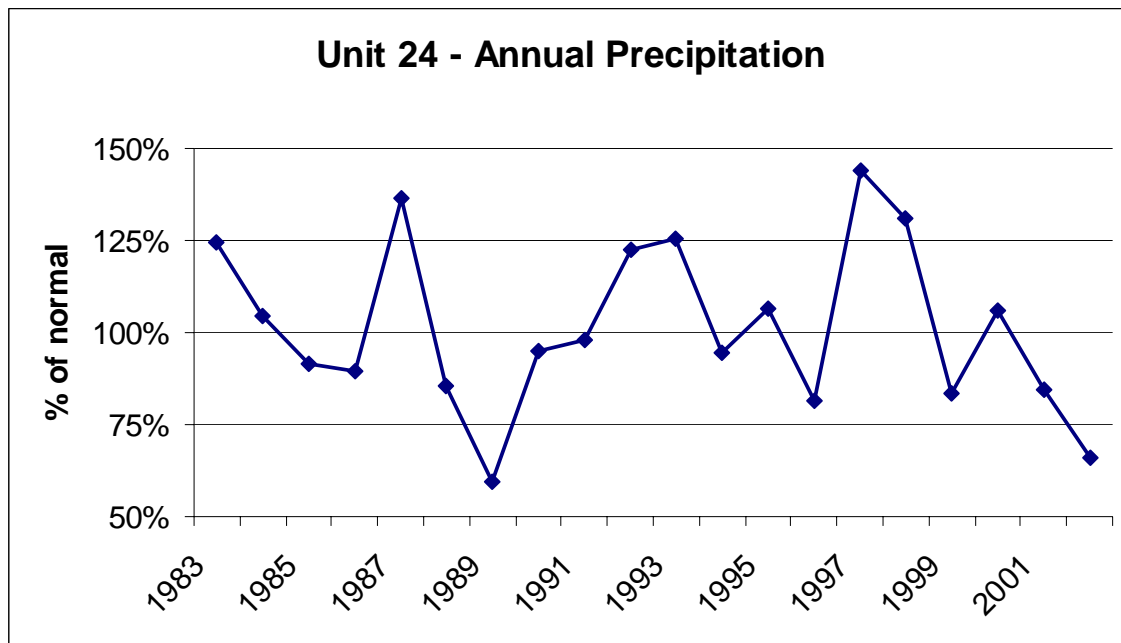
North Bull Rush (24-3) and Prospect Seeding (24-8) are the only regular trend studies that showed declining trends in all categories. The Wyoming big sagebrush at Prospect Seeding is in extremely poor condition and it appears that sagebrush will die out completely in the near future. The special study, Sanford, samples an aspen/conifer prescribed burn. It was first read prior to the fire and the downward soil and herbaceous trends found in 2003 are due to the burn treatment. Precipitation graphs and trends for each study site can be found below.

Unit 24 Average Trends

	1991	1997	2003
Soil	2.4	3.1	2.2
Browse	2.7	3.0	2.7
Herb	2.8	3.2	2.2
	9 sites	9 sites	10 sites



Below are precipitation graphs for the Dutton unit. Data represents percent of normal precipitation averaged for 4 weather stations which include Angle, Bryce National Park, Circleville, and Panguitch (Utah Climate Summaries 2004).



Trend Summary

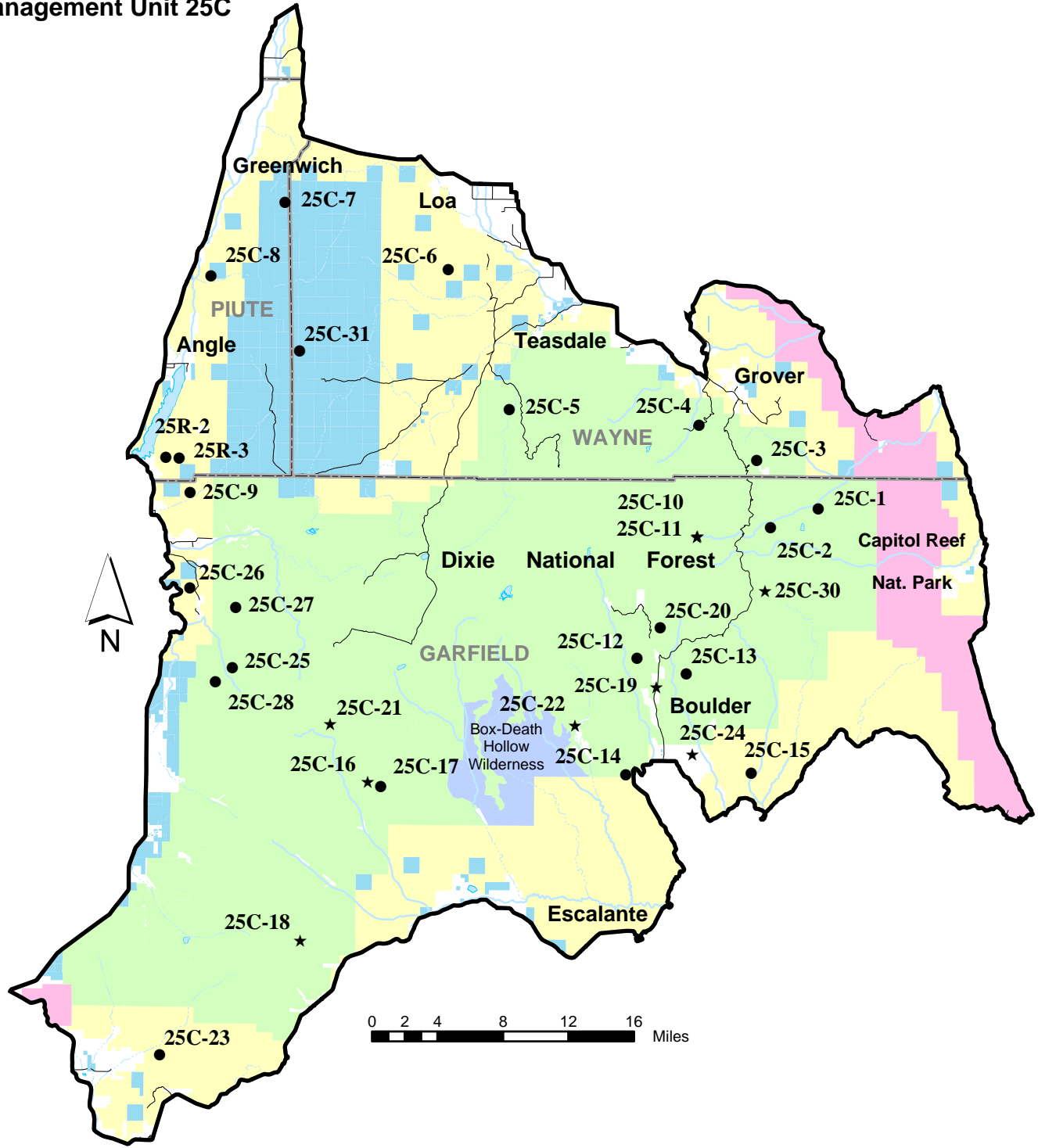
	Category	1987	1991	1997	2003
24-1 North Pole Canyon	soil	est	3	3	3
	browse	est	1	4	1
	herbaceous understory	est	2	3	4
24-2 Deer Creek Bench	soil	est	2	4	3
	browse	est	2	3	3
	herbaceous understory	est	2	4	3
24-3 North Bull Rush	soil	est	2	3	2
	browse	est	1	2	2
	herbaceous understory	est	2	3	2
24-4 Mud Spring Chaining	soil	est	2	3	3
	browse	est	5	3	3
	herbaceous understory	est	3	3	3
24-6 Table Mountain	soil	est	4	3	1
	browse	est	4	5	3
	herbaceous understory	est	4	3	1
24-7 Cow Creek	soil	est	2	3	3
	browse	est	2	2	2
	herbaceous understory	est	2	3	3
24-8 Prospect Seeding	soil	est	3	3	1
	browse	est	1	2	1
	herbaceous understory	est	2	4	1
24-9 Mud Spring	soil	est	2	3	3
	browse	est	5	2	5
	herbaceous understory	est	3	3	2

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

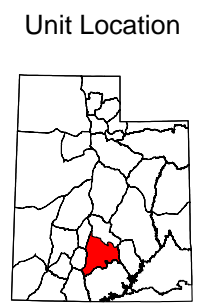
	Category	1987	1991	1997	2003
24-12 Marshall Basin	soil	est	2	3	2
	browse	est	3	4	3
	herbaceous understory	est	3	3	2
24-13 Jones Corral	soil				est
	browse				est
	herbaceous understory				est
	Category			1998	2003
24R-1 Sanford	soil			est	1
	browse			est	4
	herbaceous understory			est	1

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

Management Unit 25C



- Transect location
- ★ Suspended site
- Forest Service
- BLM
- State of Utah
- Private
- Wilderness Area
- National Park
- Water body
- County boundary
- Stream or river
- Intermittent stream
- Road



WILDLIFE MANAGEMENT UNIT 25C - PLATEAU, BOULDER

Boundary Description

Wayne, Garfield and Piute counties - Boundary begins at the junction of Highway SR-62 and Highway SR-24; east on SR-24 to the Notom Road; south on the Notom Road to the Burr Trail; west on the Burr Trail to Highway SR-12 in Boulder; west on SR-12 to the Antimony-Widtsoe Road; north on this road to Highway SR-22; north on SR-22 to Highway SR-62; north on SR-62 to SR-24 and beginning point.

In 1991, herd unit 51A (North Boulder) and 51B (South Boulder) were combined and renamed deer herd unit 44 (Boulder) in 1993. The unit was enlarged slightly and again renamed in 1996 as 25C (Boulder), which is now a subunit of Wildlife Management Unit 25. The other two subunits in Wildlife Management Unit 25 are 25A Fishlake and 25B Thousand Lake. Herd Unit 51B formerly included the high country of the Aquarius Plateau, which is commonly known as Boulder Mountain. It slopes down to the south and west through variable desert terrain that makes up the major portion of the winter range in Unit 25C. Herd unit 51A formerly enclosed areas to the north including Parker Mountain (Awapa Plateau), Boulder Mountain, Miners Mountain, and portions of the Waterpocket Fold and Capitol Reef National Park. Parker Mountain is an open rolling plateau with a maximum elevation of 9,600 feet and northeast exposure. The Aquarius Plateau is a high, lava-capped mountain plateau rising to 11,322 feet in elevation on Boulder Mountain. Miners Mountain is a large anticline located in the northeast corner of the unit. A small section along the west side of Parker Mountain drains west into Otter Creek. The remainder of the unit drains to the north into the Fremont River. Unit 25C now encompasses approximately 752,000 acres of summer range which is managed entirely by the Forest Service, and 896,700 acres of winter range, about 70% of which is managed by the BLM (Jense et al. 1992).

Precipitation ranges between 5 to 7 inches at Capitol Reef, 10 to 12 inches at Boulder and Escalante on the southern border, and 25 to 30 inches on Boulder Mountain. Municipalities located along the unit boundaries are Koosharem and Antimony on the west; Loa, Lyman, Bicknell, Teasdale, and Torrey on the north; with Escalante and Boulder on the south side.

The private land is found in the valleys around the small communities of Antimony, Escalante, Boulder, and Bryce Valley. This land is used mainly for ranching, livestock grazing, and alfalfa production. Land uses on the federally managed winter range includes grazing and oil-gas exploration. Impacts to management can also come from wilderness designation, the proposed CO₂ project for the Antone Flat-Death Hollow area, and road building associated with resource extraction projects, including logging.

Winter Range Description

The winter range is large enough to support all of the deer summering on the unit. With a few localized exceptions, it is in mostly good condition. Huff and Coles (1966) drew the upper limits of the winter range between 8,000 and 8,400 feet and the lower limits between 6,500 and 7,000 feet. The pinyon-juniper and sagebrush types with various combinations of the two, dominates the winter range. An exception is the Ponderosa pine-bitterbrush type which also reportedly receives a significant amount of deer use during mild winters. South of Boulder Mountain, there is abundant winter range. However, much of the country is slickrock canyons and mesas that support few deer. Most wintering takes place on the lower slopes and at the base of the mountain. The upper limits of the normal winter range are fairly uniform at 8,000 feet across the south slopes of the Boulder Mountain. Seven thousand feet is the usual upper limit during severe winter conditions. The lower limit for most wintering deer on the south side of the unit is Highway 12.

On the west side of the Aquarius Plateau between Antimony and Widtsoe, winter range is more restricted. The mountain drops off steeply from Griffin Top to the river valley. Deer can typically utilize vegetation up to 9,000 feet during normal winters, but are limited to an upper limit of around 8,000 feet during severe winters. The lower boundary for severe winters is the bottom of the valley on the Sevier River, which is approximately 6,500 feet.

Pinyon-juniper encroachment and deer depredation of alfalfa fields and haystacks in Grover, Teasdale, and Government Creek areas have been reported to be problems. Revegetation projects by both the Forest Service and BLM have helped reduced the depredation problems and provided another important source of winter and spring forage. Further improvements are needed in Government Creek, Pine Creek, Birch Spring, Rabbitbrush Spring, Happy Valley, and Dry Bench.

Pinyon-juniper is the prevalent range type on most of the unit. There are different subtypes depending on elevation. These vegetative types range from dense pinyon-juniper on mountain slopes to sparse pinyon-juniper-grass, sparse pinyon-juniper-sagebrush-grass, and pinyon-juniper-mountain brush on slickrock. The sparse pinyon-juniper-sage-grass type covers the most land. Ponderosa pine and mountain brush occupy the upper edges of the winter range. The amount of open sagebrush flats is limited, but they are especially critical for survival in severe winters. Burned or chained and seeded areas provide important winter range. Most of these treatments were not completed before the initial range inventory in 1965.

Summer Range

Summer range is limited to specific areas on Parker Mountain and Boulder Mountain. Boulder Mountain contains approximately 50,000 acres above 10,500 feet (Christensen and Bogedahl 1983). This high summer range is unsuitable for fawning and receives only light deer use in late summer. Most fawning and summer use is concentrated underneath the lava rock rim where stands of aspen, fir, and Englemann spruce are interspersed with sage flats and meadows. As a result of fire suppression, the trend is toward a more dense Englemann spruce climax community. Logging and/or prescribed burns will be necessary in the future to maintain this important habitat in a seral stage, which is more productive and more favorable to big game. Lower down the slopes, ponderosa pine with its associated mountain brush understory receives insignificant summer use. Summer range on Parker Mountain is more limited to the higher southern end, where aspen stands in association with big sagebrush and antelope bitterbrush provide excellent fawning areas.

Key Areas

All along the south and west sides of Boulder Mountain there are areas that, due to their pattern of use, forage value, and location, have demonstrated their importance to big game in mild and severe winters. Key areas on the south side include burns in the Deer Mountain area, ponderosa-mixed mountain brush flats, and ridges at around 8,000 feet at Nazer Draw, Whites Flat, and Allen Canyon. Chained areas are also key to their winter survival, and in severe winters, low pinyon-juniper-sage mesas are utilized. On the west side, deer winter at higher elevations if available. In hard winters, native range is severely limited with the low bench above Black Canyon being a key area.

The key areas for severe winter range on the south side of the unit are represented by studies on Antone Flat, Black Ridge, Steep Creek Bench, and New Home Bench. Salt Gulch is an important area for deer in late winter and much like New Home Bench, is managed by the Forest Service and allocated for summer cattle grazing. There is practically unlimited, low elevation pinyon-juniper range on BLM land. This type was not as thoroughly surveyed as the other types because of its almost unlimited abundance. One study was put in this type on Steep Creek Bench because cattle are moved through this area in spring and winter. Antone Flat supports one of the few large sagebrush flats on the south side and is used heavily by wintering deer. Due to access difficulties, the Antone Flat study was located outside the key area on a ponderosa pine-mountain

brush-slickrock site. The flat has not been grazed by domestic livestock for 20 years. The study on Black Ridge, just southeast of Boulder, samples a small sagebrush flat. This mesa is privately owned and was up for sale at the time the study was established in 1985. The mesa top has since been developed and subdivided for houses. The one study on the Kanab Resource Area, Coal Bench, is a chained-seeded area grazed by cattle in the spring on a 3 pasture deferred-rotation grazing system.

The severe winter range sampled on the west side near Antimony is represented by the Black Canyon trend study. The area is open black sagebrush-Wyoming big sagebrush benches. The land is managed by the BLM and much is adjacent to privately owned hay fields. The BLM and state land is grazed by cattle in the spring.

Two studies were set up to monitor trends in the important aspen type on summer range. Some of the aspen areas are used heavily by both big game and cattle. The trend study areas receive deferred rotation summer cattle grazing. Timber harvest is on going or completed on areas near these study sites.

The winter range studies on the Boulder unit can be put into 3 general key vegetative types; low pinyon-juniper-sagebrush mesas, mid-elevation burns and chainings, and mixed mountain brush ranges up to 8,000-9,000 feet. Some general conclusions can be made with regard to these community types. The desired plant community for the lower elevation types would most likely have Wyoming big sagebrush as the key species. Low precipitation is the major limiting factor to the density and vigor of the vegetation. The key burned areas are important in the spring for their herbaceous component for deer and elk. These areas should support a high percentage of grasses, with suitable quantities of grass forage left standing after livestock grazing. Desirable browse species can be seeded or planted. The chainings provide some increased productivity and diversity to an understory typically almost nonexistent with the dense mature stands of pinyon-juniper. However, a monoculture of crested wheatgrass would also not be the most desirable for big game. Desirable species such as bitterbrush, cliffrose, serviceberry, and big sagebrush should be encouraged. Perennial forbs such as alfalfa, sweet clover and others are also desirable additions on the treated areas. The higher elevation ranges were sampled with five trend studies, which support a variety of range types and vegetation. The key browse species for these higher elevational ranges are bitterbrush and mountain big sagebrush. These sites typically have high diversity and a good mix of grasses, forbs, and browse.

Herd Unit Management Objectives

The management objective for the entire Plateau unit (subunits A, B, & C) is to reach a winter population of 25,000 deer (DeBloois 2001). The objective for the Boulder subunit, 25C is to reach a target winter deer herd size of 8,500 with a post season herd composition of 15 bucks to 100 does and 30% of those bucks being 3 point or better (DWR 1998). The estimated 1996 population for subunit 25C was 6,000 deer.

Elk are not subjected to the same winter constraints as deer, therefore, the elk herd is wintering well on most of the unit and increasing in numbers. This elk herd is the result of 87 elk that were transplanted from the Manti Unit in 1977 and another 72 more were brought from the same source in 1978. The first hunt took place in 1980 when 25 limited entry bull permits were issued. The herd has continued to increase and expand, allowing more liberal hunts until open bull hunts began in 1984. Most of these elk are located on the south side of the unit, but some elk do reside year-round on the east side of Boulder Mountain and a smaller number summer above Antimony. These elk winter near Otter Creek and on the northwest end of Parker Mountain. A number of elk which summer on the Fish Lake unit also winter on Parker Mountain. The population objective for subunit 25C is to achieve a winter population of 1,500 elk with a minimum post season composition of 8 bulls to 100 cows and at least 4 of these bulls being 2½ years of age or older (DWR 1998).

The Parker Mountain area of unit 25C contains an excellent antelope herd which is the result of transplants into the area in 1964 and 1965. Browse-forb dominated plant communities and a rigorous predator control

program have created favorable conditions for the antelope to increase. Over 1,100 antelope have been moved from this unit to other areas of the state in the past.

Study Establishment

Interagency personnel, including Forest Service, BLM, and DWR employees met in Teasdale in July 1985 and in Escalante in July 1987 to select several sites for permanent range trend studies. These sites include areas used by antelope, elk, and deer and were considered critical areas for monitoring range trend. Each site was read during the summer of either 1985 or 1987 and most were read again in 1991, 1994, 1998 and 2003. Two special studies were established in 1997 north of Antimony to monitor winter range that was being heavily utilized by both elk and livestock. These studies were reread in 2003 and are contained in this report. One additional study was established in 2003 on Parker Mountain to monitor the recovery of a mountain big sagebrush community following a meadow aerator treatment.

Trend Study 25C-1-03

Study site name: Yergy.

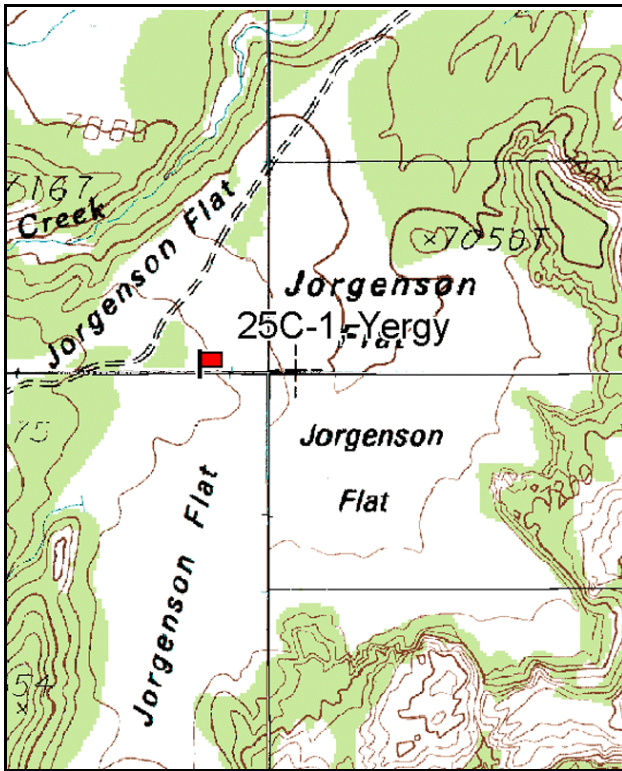
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). Rebar: belt 1 on 15ft

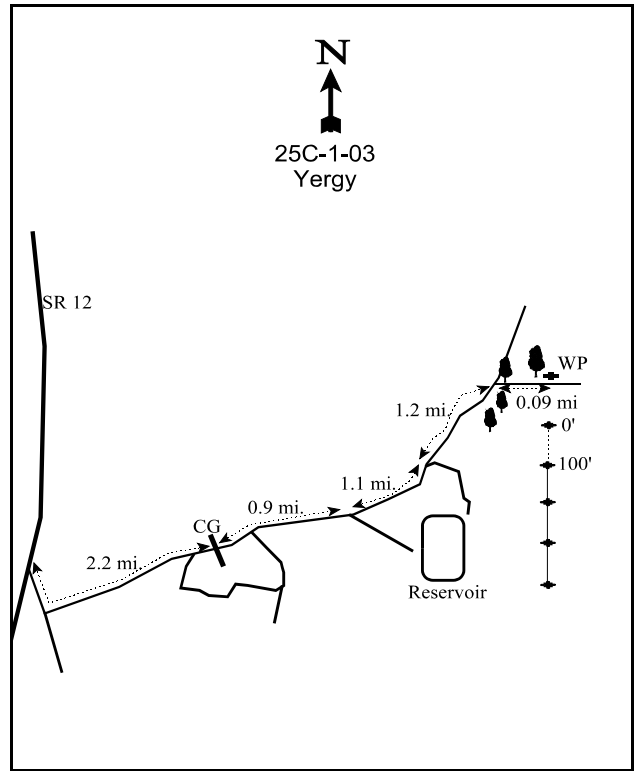
LOCATION DESCRIPTION

From the Pleasant Creek Campground on the Boulder Grover Road, go south 100 feet to a left turn off the main road. Go down this road 2.2 miles to a cattleguard. From the cattleguard, go 0.9 miles to a fork and go left towards Tantalus Creek. Go 1.1 miles on this road to a fork, stay left (the sign says toward Jorgenson Flat). Go 1.2 miles past a corral on the right to a cattleguard. Go 0.1 miles past the cattleguard to a faint road off to the right. Turn on this road and go 0.09 miles through a gate and out to a lone pinyon on the left. The frequency baseline starts 100 feet south of the lone pine. The 0-foot stake is a rebar tagged #7117.



Map Name: Lower Bowns Res

Township and Range Unsurveyed



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4219492 N, 477931 E

DISCUSSION

Yergy - Trend Study No. 25C-1

The Yergy trend study is located in an open flat surrounded by slickrock cliffs and dense pinyon and juniper woodland. The flat is now a sagebrush-grass type which was chained and seeded in 1970. The site is nearly flat, with a slight slope to the south. The elevation is approximately 7,100 feet, well within the normal and severe winter range limits on the east side of Boulder Mountain. Pellet group data taken along the study site baseline in 1998 estimated only 1 deer day use/acre (2 ddu/ha), but elk used the area in larger numbers at 21 elk days use/acre (52 edu/ha). Pellet group data from 2003 estimated 11 deer days use/acre and only 1 elk day use/acre (28 ddu/ha and 2 edu/ha). Deer are found in the area year-round but most of the pellet groups appeared to be from winter use. Pellet group quadrat frequency data from 1994 to 2003 indicate a large number of rabbits are also utilizing the site. Cattle graze the area on a deferred rotation grazing system. Cattle use was estimated at 41 cow days use/acre (101 cdu/ha) in 1998 and 24 days use/acre (59 cdu/ha) in 2003. Cattle pats counted in 1998 and 2003 appeared to be from the previous summers of 1997 and 2002 respectively. Harvester ant hills are fairly common over much the area.

The soil depth is moderate and very sandy with a texture which is 84% fine red sand. Effective rooting depth is estimated at almost 11 inches. Rock and pavement are uncommon on the soil surface and throughout the profile. Effective depth measurements were limited by the heavy texture of the soil which was very compacted at 10 to 12 inches in depth. There did not appear to be any restrictive rooting barriers. Soil texture is a loamy sand which is slightly acidic in reaction (pH 6.2). Due to the high sand content and dryness of the soil profile, average soil temperature was high at 74°F at a depth of 12 inches in 1998. Soil temperature was lower in 2003 averaging 63°F at a depth of 13.5 inches. There is a thin layer of litter, mainly from grasses, which has averaged 39% cover between 1985 and 2003. The ratio of protective ground cover to bare ground is marginal but erosion is minimal due to the levelness of the terrain.

Although the flat is dominated by seeded grasses, sagebrush increased substantially between 1985 and 1991. There were very few mature sagebrush plants sampled in 1985 but seedling and young plants were abundant. Data from 1991 showed a large increase in sagebrush density, from 8,000 to 11,531 plants/acre. Density of mature plants increased from 200 plants/acre to 4,133. Young plants were still the most common age class, yet no seedlings were found in 1991. With the much larger sample size taken in 1994, the population was estimated at only 2,400 sagebrush plants/acre. This is a more accurate estimate of the true density of sagebrush on the flat since the shrubs grow in aggregated clumps with large areas of grass in between. The old method used three small 1/200 acre circular plots to estimate shrub density. The original frequency baseline was also placed in an area with few sagebrush, while the density plots happened to be in areas of fairly dense sagebrush and therefore overestimated the actual density of the sagebrush in the area. The population remained at similar densities in 1998 (2,320 plants/acre) and 2003 (2,500 plants/acre). Utilization of the sagebrush has been light to moderate since 1985 with some heavier use reported in 1991. Vigor has remained normal on most plants and percent decadence has remained relatively low. Sagebrush sampled in 2003 was healthy and vigorous with abundant seedheads and good annual leader growth which averaged 1.6 inches.

Other browse species include small numbers of pinyon pine, broom snakeweed, and rabbitbrush. Point-quarter data taken in 1998 estimated a total of only 14 pinyon and juniper trees/acre with average basal diameters of 3.1 and 2.8 inches respectively.

The herbaceous understory is totally dominated by crested wheatgrass which has made up over 95% of the grass cover, and over 90% of the total herbaceous cover since 1994. Blue grama and Russian wildrye are present in low numbers. Forbs are very sparse and make up less than 1% cover.

1985 APPARENT TREND ASSESSMENT

The soil appears stable and trend will improve as vegetative cover increases with an accompanying buildup of litter. The vegetative community is changing as the sagebrush density appears to be increasing with a very high reproductive potential. An increase in mature sagebrush will be good for the winter range, as use is now quite concentrated in the more dense stands of the larger sagebrush. The crested wheatgrass provides spring forage and should continue to be a predominant part of the vegetation as long as it is not overgrazed during the early summer.

1991 TREND ASSESSMENT

The soil trend appears to be declining because percent bare ground has increased from 36% to 49% and litter has decreased from 56% to 39%. Basal vegetation cover has increased however, from 8% to 12%. Percent cover of bare ground should decrease with the end of the drought and a return to normal precipitation patterns. Browse trend is improving from 1985 with increased density for sagebrush and the disappearance of broom snakeweed. Herbaceous understory has declined in production, but nested frequencies have remained stable. The forb component of the herbaceous understory is still almost nonexistent.

TREND ASSESSMENT

soil - down slightly (2)

browse - up (5)

herbaceous understory - stable but forbs lacking (3)

1994 TREND ASSESSMENT

Ground cover characteristics have continued to decline due to increased percent bare ground and reduced litter cover. Even with the increased bare ground, erosion is not a problem on this site. The browse trend is stable for now. The new larger sample size used in 1994 gives a better idea of actual population density of sagebrush on the entire flat. Percent decadency of the sagebrush is very low and vigor is good. Trend for the herbaceous understory is stable. Nested frequency of crested wheatgrass has remained stable since 1985. Production also looks much better than 1991. A few more forb species were picked up with the larger sample taken in 1994, but they are still very scarce.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil has improved with above normal precipitation during the 1997 and 1998 seasons. Percent bare ground declined from 54% in 1994 to 47% in 1998. Litter cover also increased from 28% to 45% and vegetative cover increased from 22% to 38%. Erosion is not a problem on the site due to adequate vegetation and litter cover combined with the level terrain and the high infiltration capacity of the soil. It appears that the population of basin big sagebrush has stabilized at about 2,300 plants/acre. Utilization is currently moderate, vigor normal, and percent decadence low at 18%. No seedlings were encountered but young plants represent 15% of the population, numerous enough to maintain the stand with good survival. The herbaceous understory trend is stable. Crested wheatgrass still dominates the site by providing 96% of the grass cover and 77% of the total vegetation cover. Production is up as grass cover is nearly double that of 1994. However, the sum of nested frequency of grasses and forbs has remained similar to 1994 levels. Forbs are still lacking with only two species found in 1998.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - stable, but forb component is very poor (3)

2003 TREND ASSESSMENT

Trend for soil is down slightly. Average cover of vegetation and litter have declined while cover of bare ground has increased. Total herbaceous vegetation cover, which makes up the majority of the vegetation cover, has declined 52% due to drought. Erosion is not a problem on this site however. There is still a good amount of herbaceous vegetation cover and the level terrain helps minimize soil movement. Trend for browse is stable. Density has remained similar to 1998 estimates. Utilization is light, vigor is normal, and the portion of the population classified as decadent is small. Young recruitment is low but no sagebrush appear to be dying. Most mature plants are vigorous and producing abundant seedheads and annual leader growth averaged 1.6 inches. Herbaceous understory trend is down slightly. Sum of nested frequency of perennial grasses has declined slightly but, more importantly, nested frequency of crested wheatgrass has declined significantly. Average cover also declined 55% since 1998. Herbaceous production was poor in 2003 due to very dry conditions during the springs of 2002 and 2003, which averaged only 31% and 68% or normal respectively. A return to normal precipitation patterns will reverse this trend.

TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 1

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	Agropyron cristatum	ab ³¹¹	ab ³¹²	ab ³¹¹	b ³²⁶	a ²⁸²	16.90	29.39	13.37
G	Agropyron elongatum	3	-	-	-	-	-	-	-
G	Agropyron intermedium	3	-	-	-	-	-	-	-
G	Agropyron smithii	a ⁻	b ²³	a ⁻	a ⁻	a ⁻	-	-	-
G	Bouteloua gracilis	41	60	48	55	42	.29	.87	.53
G	Elymus junceus	b ²⁷	b ²⁶	a ⁶	ab ⁷	a ⁶	.18	.18	.18
G	Munroa squarrosa (a)	-	b ¹⁶	a ⁻	a ⁻	a ⁻	-	-	-
G	Poa secunda	-	-	3	-	-	.00	-	-
G	Sitanion hystrix	1	-	-	-	-	-	-	-
G	Sporobolus cryptandrus	b ¹⁴	ab ⁷	a ⁻	a ⁻	a ⁻	-	-	-
G	Vulpia octoflora (a)	-	-	-	1	-	-	.00	-
Total for Annual Grasses		0	16	0	1	0	0	0.00	0
Total for Perennial Grasses		400	428	368	388	330	17.38	30.45	14.10
Total for Grasses		400	444	368	389	330	17.38	30.46	14.10

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
F	Cordylanthus spp. (a)	-	-	a-	a-	b15	-	-	.18
F	Eriogonum cernuum (a)	-	-	4	-	-	.01	-	-
F	Erigeron pumilus	-	-	4	-	-	.01	-	-
F	Lupinus argenteus	a-	a-	b13	b18	ab7	.22	.20	.07
F	Orobanche fasciculata	-	-	-	-	6	-	-	.01
F	Penstemon spp.	-	-	-	-	-	.00	-	-
F	Portulaca oleracea (a)	-	-	a-	a-	b13	-	-	.03
F	Sphaeralcea coccinea	9	14	7	12	16	.20	.08	.28
F	Sphaeralcea parvifolia	-	2	-	-	-	-	-	-
Total for Annual Forbs		0	0	4	0	28	0.00	0	0.20
Total for Perennial Forbs		9	16	24	30	29	0.44	0.28	0.36
Total for Forbs		9	16	28	30	57	0.45	0.28	0.56

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

BROWSE TRENDS --

Management unit 25C, Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia tridentata tridentata	43	50	52	4.75	7.37	10.52
B	Chrysothamnus viscidiflorus viscidiflorus	1	1	1	-	-	-
B	Gutierrezia sarothrae	0	0	1	-	-	.03
B	Opuntia spp.	1	0	0	-	-	-
Total for Browse		45	51	54	4.75	7.37	10.55

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 1

Species	Percent Cover
	'03
Artemisia tridentata tridentata	12.61
Chrysothamnus viscidiflorus viscidiflorus	.11

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 1

Species	Average leader growth (in)
	'03
Artemisia tridentata tridentata	1.6

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 1

Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniper osteosperma	6	N/A	2.8	N/A
Pinus edulis	8	N/A	3.2	N/A

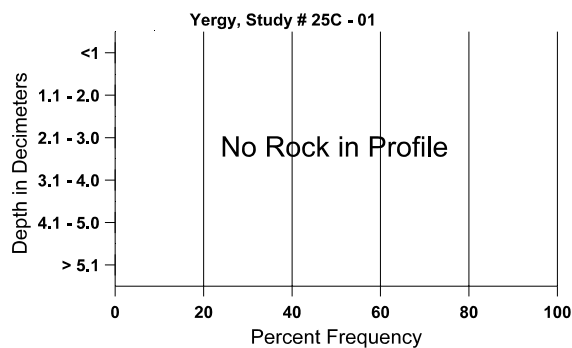
BASIC COVER --
Management unit 25C, Study no: 1

Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	8.00	12.00	21.68	38.29	25.52
Rock	0	0	.16	.15	.15
Pavement	0	.25	.06	.22	1.91
Litter	56.25	39.25	27.68	44.88	27.21
Cryptogams	0	0	0	0	0
Bare Ground	35.75	48.50	54.40	47.36	55.17

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 1, Study Name: Yergy

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.8	63.0 (13.5)	6.2	84.0	7.4	8.6	1.1	10.8	64.0	0.5

Stoniness Index



PELLET GROUP DATA --
 Management unit 25C, Study no: 1

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	51	58	73
Elk	3	8	3
Deer	32	38	8
Cattle	10	19	21

Days use per acre (ha)	
'98	'03
-	-
21 (52)	1 (2)
1 (2)	11 (28)
41 (101)	24 (59)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 1

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata tridentata</i>											
85	8000	3666	7800	200	-	-	.83	0	0	3	10/8
91	11533	-	6000	4133	1400	-	43	26	12	12	12/12
94	2400	60	80	2260	60	100	31	0	3	.83	28/41
98	2320	-	340	1560	420	60	49	3	18	3	23/34
03	2500	-	120	2040	340	60	8	0	14	0	27/46
<i>Chrysothamnus nauseosus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	35/71
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	20	-	-	20	-	-	0	0	0	0	22/10
98	20	-	-	20	-	-	0	0	0	0	18/19
03	20	-	-	-	20	-	0	0	100	100	21/32
<i>Gutierrezia sarothrae</i>											
85	2332	466	1466	733	133	-	0	0	6	0	7/7
91	0	-	-	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	8/9
98	0	-	-	-	-	-	0	0	0	0	-/-
03	20	-	-	20	-	-	0	0	0	0	9/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
94	20	-	-	20	-	-	0	0	-	0	1/2
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Pinus edulis											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 25C-2-03

Study site name: Wildcat.

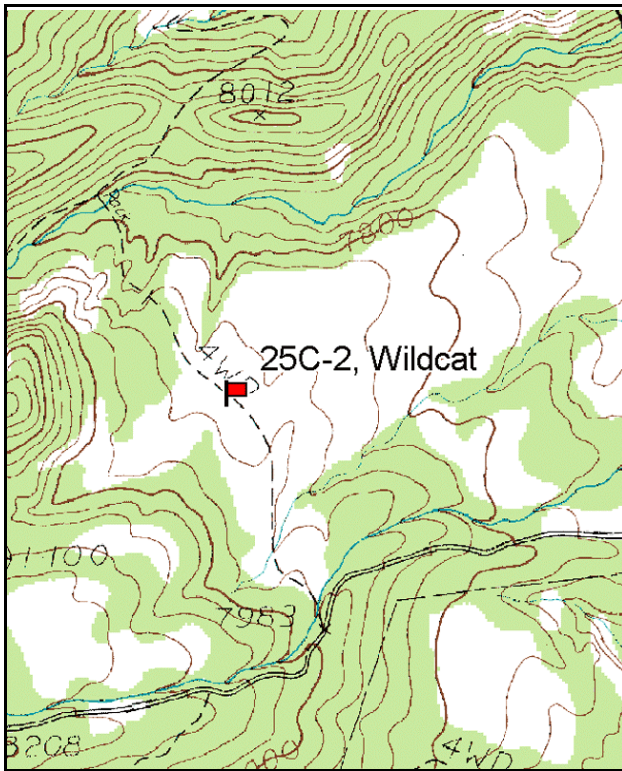
Vegetation type: Chained, Shrubland.

Compass bearing: frequency baseline 165 degrees magnetic.

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

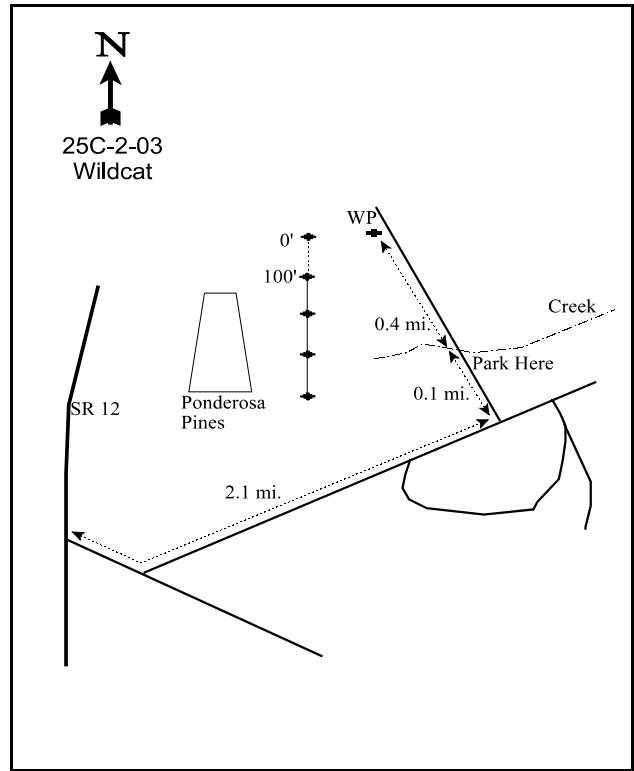
LOCATION DESCRIPTION

On SR12 south of Torrey, go about 50 yards south of Pleasant Creek Campgrounds then turn east onto the Lower Bowns Reservoir Road. Proceed 2.1 miles and turn left. Continue 0.1 miles. From here the road is closed. Walk across the creek and down the ATV trail approximately 0.4 miles to the witness post on the left side of the road. The stakes are full-high fenceposts. The 0-foot stake is marked by browse tag #71116. Ignore the fencepost that was misplaced near the south end of the baseline.



Map Name: Lower Bowns Res

Township and Range Unsurveyed



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4217657 N, 473256 E

DISCUSSION

Wildcat - Trend Study No. 25C-2

The Wildcat study area was chained and seeded in 1970 and is now a sagebrush-grass type. This open flat is bordered by large ponderosa pine and scattered pinyon-juniper at an elevation of 7,900 feet. It has a slight slope to the northeast. The nearby DWR Wildcat seeding pellet group transect indicates that winter deer use varies considerably from year to year, with a low of <1 deer days use/acre in 1976-77 and a high of 43 days use/acre (106 ddu/ha) the next winter, 1977-78 (Jense et al. 1981). An average of 25 deer days use/acre (62 ddu/ha) was recorded between 1985 and 1990 (Jense et al. 1991). Some deer use occurs during the summer as well. Pellet group data taken along the study site baseline in 1998 estimated 17 deer, 45 elk and 33 cattle days use/acre (42 ddu/ha, 111 edu/ha, and 82 cdu/ha). Pellet group data from 2003 estimated 46 deer, 29 elk, and 41 cow days use/acre (92 ddu/ha, 58 edu/ha, and 102 cdu/ha). Most of the deer pellet groups appeared to be from late winter and spring use, while elk use appeared to be mostly from spring. About ½ of the cattle use was from the 2002 season while the other half was from 2003. Due to the high elevation of this site, the area is used during mild winters and as transitional range.

Soil at the site is moderately deep with an effective rooting depth of just over 18 inches. The surface is smooth, with few large rocks or pavement. Soil texture is a loamy sand which is slightly acidic (pH 6.4). There are some very small gullies through the area and some wind and water erosion was evident in 1991. Cover of bare ground is moderately high but well dispersed by perennial grass and litter cover. Erosion is not a problem on this site.

The key browse species is Wyoming big sagebrush which is the dominant and most abundant browse present. Some black sagebrush is also mixed in and is hybridizing with the population. All sagebrush was classified as Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) in 1994, but both black sagebrush and Wyoming big sagebrush were listed in the other readings. Density of Wyoming big sagebrush was estimated at 2,860 plants/acre in 2003, while black sagebrush numbered 880 plants/acre. These populations appear stable to slowly increasing with good young recruitment during most readings and moderate numbers of decadent plants. Vigor has remained normal on most shrubs during all readings. Utilization has been mostly light to moderate over the years with the exception of heavier use reported in 1991.

Broom snakeweed was also common in 1985 and 1991, but declined considerably in density in 1994. Gray horsebrush is also fairly common and has displayed moderate to heavy use since 1994. It appears to have a stable population of around 800 plants/acre. Slenderbush eriogonum also occurs in small numbers. It provides some additional forage and displayed heavy use in 1991 and 2003.

The grass composition is made up mostly of blue grama and seeded crested wheatgrass. Together they make up almost 100% of the grass cover. Crested wheatgrass is abundant and produces substantial amounts of forage especially in the spring since it greens-up early. Blue grama, a native warm season grass, is also quite abundant, but due to its low growing habit, provides limited forage. Both grasses are vigorous and lightly to moderately utilized.

The forb component is diverse, but only a few species occur more than occasionally. The most prominent forb species is silvery lupine which accounted for 92% of the forb cover in 1998. Due to drought conditions during the spring of 1994, production was limited with forbs combining to produce less than 2% cover and grasses only 15%. More normal precipitation patterns in 1997 and 1998 dramatically increased production doubling grass cover to 32% and increasing forb cover to 13%. A return to drier than normal conditions caused perennial grass and forb cover to decline in 2003 as well as sum of nested frequency values.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable. Cover will increase if grazing is closely regulated. There appears to be excessive camping and ORV use in the area which should be monitored to insure that irreversible soil and vegetation damage is not allowed. Vegetative trend appears upward with a healthy, moderately used, and diverse key species population. The increaser species do not appear to be increasing at unmanageable levels.

1991 TREND ASSESSMENT

In the last survey, it was noted that there was excellent basal vegetative cover, which has now gone down to only 10%. Percent bare ground has increased from 31% to 47%. This trend should be monitored closely for the soil trend would have to be considered down with this latest information. However, this could turn around quickly with a return to normal precipitation patterns. The browse trend would be considered up with the increase for sagebrush. The herbaceous understory would also be considered up slightly with a slight increase in nested frequency of perennial grasses. There was a slight decrease in the forbs, but they make up less than 10% of the herbaceous cover.

TREND ASSESSMENT

soil - down (1)

browse - up (5)

herbaceous understory - slightly up (4)

1994 TREND ASSESSMENT

Ground cover characteristics have improved since 1991 with percent bare ground decreasing from 47% to 35%. Litter has continued to decline. Trend for black/Wyoming big sagebrush is stable. Population density has declined slightly mostly due to the larger sample used in 1994. The decadence rate has remained low. Broom snakeweed and gray horsebrush have also declined significantly. Photos indicate a definite decrease in production of grasses since 1985, but the sum of nested frequencies for perennial grasses and forbs have remained fairly stable since 1991 indicating a stable trend. Spring precipitation in 1994 was only 59% of normal and is the primary cause for the decline in herbaceous production. Normal precipitation patterns will improve future production and cover values.

TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

The soil trend continues to improve as percent cover of bare ground declined from 35% to 28% and percent litter cover increased from 31% to 48%. In addition, vegetation cover more than doubled since 1994 from 25% to 55%. Erosion is not currently a problem on the site. Density of the combined black and Wyoming big sagebrush populations has declined slightly, but percent decadence is lower, vigor improved and utilization is mostly light to moderate. Recruitment is currently adequate to maintain the population. Trend is considered stable. Trend for the herbaceous understory is up slightly due to a slight increase in the sum of nested frequency of perennial grasses and a large increase in frequency of forbs. In addition, production increased dramatically since 1994, with cover of grasses doubling and cover of forbs increasing from 2% to 13%. The increase in forb cover and nested frequency comes primarily from silvery lupine.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is slightly down. Relative percent cover of vegetation declined slightly while cover of bare ground increased. Relative percent cover of litter remained stable. Herbaceous production has declined 49% due primarily to 4 consecutive dry spring periods. Some localized erosion is apparent but not excessive and the erosion condition class was determined to be stable in 2003. Trend for browse continues to be stable. Density of Wyoming big sagebrush has increased slightly. Use remains light to moderate, vigor normal on most plants, and percent decadence moderate at 22%. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses has declined 16% while cover dropped 46% (32% to 17%). Nested frequency of crested wheatgrass declined significantly. Since 1994, blue grama has provided an increasing portion of the perennial grass cover (23%, 59%, 61%) while crested wheatgrass has steadily declined (51%, 41%, 39%). This trend is most likely caused by a combination of early summer cattle grazing and drier than normal spring periods for the past 4 years. Sum of nested frequency of perennial forbs also declined and cover fell from 13% to 4%. Most of the change is due to a decline in the nested frequency and cover of silvery lupine. Several other perennial forbs are found on the site but they occur rarely.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 2

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	<i>Agropyron cristatum</i>	ab268	c302	bc293	c303	a237	7.61	13.10	6.69
G	<i>Aristida purpurea</i>	-	-	-	3	3	-	.03	.00
G	<i>Bouteloua gracilis</i>	a186	b234	bc255	c282	bc263	7.39	18.85	10.53
G	<i>Sitanion hystrix</i>	b44	a9	a4	a4	a-	.01	.00	-
G	<i>Sporobolus cryptandrus</i>	-	-	3	6	-	.00	.06	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		498	545	555	598	503	15.02	32.04	17.23
Total for Grasses		498	545	555	598	503	15.02	32.04	17.23
F	<i>Allium</i> spp.	6	3	-	2	-	-	.00	-
F	<i>Antennaria rosea</i>	3	3	-	-	-	-	-	-
F	<i>Arenaria fendleri</i>	a-	a-	a-	b27	a-	-	.15	-
F	<i>Artemisia ludoviciana</i>	-	3	-	-	-	-	-	-
F	<i>Astragalus</i> spp.	2	1	-	2	-	-	.00	-
F	<i>Cryptantha</i> spp.	a-	a-	ab1	b12	a-	.00	.02	-
F	<i>Descurainia pinnata</i> (a)	-	-	1	-	11	.00	-	.02
F	<i>Eriogonum alatum</i>	2	2	-	-	2	-	-	.03
F	<i>Erigeron pumilus</i>	9	5	-	3	-	-	.00	-
F	<i>Eriogonum racemosum</i>	a12	b25	ab19	ab25	b29	.18	.26	.21
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	6	-	-	.01	-
F	<i>Gilia hutchinifolia</i> (a)	-	-	b52	a-	a-	.19	-	-
F	<i>Lepidium</i> spp. (a)	-	-	a-	b71	a-	-	.21	-
F	<i>Lupinus argenteus</i>	b139	a59	a81	b128	a92	.94	11.93	3.35
F	<i>Lygodesmia</i> spp.	3	1	-	2	3	-	.00	.03
F	<i>Oenothera pallida</i>	a-	ab2	ab4	c22	bc17	.02	.23	.03
F	<i>Orthocarpus luteus</i> (a)	-	-	a20	a14	b131	.08	.03	1.82
F	<i>Penstemon</i> spp.	ab11	b15	a1	a3	a3	.00	.01	.00
F	<i>Phlox longifolia</i>	bc28	c46	bc20	ab6	a3	.05	.02	.00
F	<i>Polygonum douglasii</i> (a)	-	-	a2	b26	a-	.00	.07	-
F	<i>Sphaeralcea coccinea</i>	-	4	2	1	1	.00	.00	.00
F	<i>Tragopogon dubius</i>	-	-	-	1	-	-	.00	-
F	Unknown forb-perennial	-	4	-	-	-	-	-	-
Total for Annual Forbs		0	0	75	117	142	0.28	0.31	1.84
Total for Perennial Forbs		215	173	128	234	150	1.21	12.67	3.69
Total for Forbs		215	173	203	351	292	1.50	12.99	5.53

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

BROWSE TRENDS --

Management unit 25C, Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia nova	0	17	21	-	1.29	1.64
B	Artemisia tridentata wyomingensis	92	79	75	9.67	6.50	10.67
B	Chrysothamnus nauseosus	0	1	1	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	3	0	4	.00	-	.18
B	Eriogonum microthecum	9	3	6	.09	.06	.04
B	Gutierrezia sarothrae	12	5	8	.07	.07	.18
B	Leptodactylon pungens	0	0	1	-	-	-
B	Opuntia spp.	2	0	9	.01	-	.03
B	Pinus edulis	0	0	0	.30	-	-
B	Tetradymia canescens	26	27	25	.45	.21	.41
Total for Browse		144	132	150	10.60	8.14	13.17

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 2

Species	Percent Cover
	'03
Artemisia nova	1.63
Artemisia tridentata wyomingensis	14.80
Eriogonum microthecum	.05
Gutierrezia sarothrae	.20
Opuntia spp.	.01
Tetradymia canescens	.13

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 2

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	2.0

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 2

Species	Trees per Acre	
	'98	'03
Juniper osteosperma	6	N/A
Pinus edulis	8	N/A

Average diameter (in)	
'98	'03
1.2	N/A
3.7	N/A

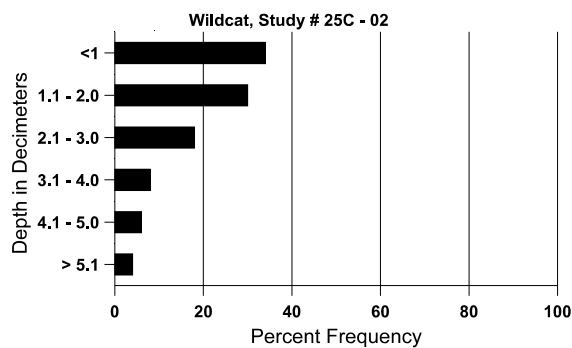
BASIC COVER --
Management unit 25C, Study no: 2

Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	19.50	9.50	25.40	55.13	36.59
Rock	2.00	2.75	1.31	2.17	1.34
Pavement	3.75	1.25	2.27	3.62	2.98
Litter	44.25	39.50	31.28	47.79	39.74
Cryptogams	0	.25	0	0	.63
Bare Ground	30.50	46.75	34.77	27.63	32.24

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 2, Study Name: Wildcat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
18.4	63.0 (16.3)	6.4	82.0	9.4	8.6	1.2	13.6	91.8	0.6

Stoniness Index



PELLET GROUP DATA --
 Management unit 25C, Study no: 2

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	28	17	27
Elk	41	41	27
Deer	32	31	39
Cattle	18	16	23

Days use per acre (ha)	
'98	'03
-	-
45 (111)	29 (58)
17 (42)	46 (92)
33 (82)	41 (101)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 2

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	25/37
98	0	-	-	-	-	-	0	0	-	0	40/52
03	0	-	-	-	-	-	0	0	-	0	36/41
<i>Artemisia nova</i>											
85	1199	666	533	533	133	-	0	0	11	0	14/13
91	2199	133	133	1933	133	-	21	0	6	3	11/18
94	0	-	-	-	-	-	0	0	0	0	-/-
98	940	140	260	520	160	40	47	2	17	2	14/21
03	880	-	-	780	100	20	34	2	11	2	14/22
<i>Artemisia tridentata wyomingensis</i>											
85	5066	200	1400	2666	1000	-	13	5	20	1	23/20
91	5399	-	733	3533	1133	-	58	21	21	5	15/21
94	5320	40	580	3400	1340	240	40	4	25	16	15/24
98	2640	100	320	1860	460	240	31	5	17	5	22/30
03	2860	-	100	2140	620	340	21	3	22	8	24/33
<i>Chrysothamnus nauseosus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	100	0	-	0	-/-
03	20	-	-	20	-	-	0	100	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus											
85	66	-	66	-	-	-	0	0	-	0	-/-
91	133	-	-	133	-	-	0	100	-	0	2/3
94	80	-	20	60	-	-	75	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	8/22
03	80	-	-	80	-	-	0	0	-	0	8/8
Eriogonum microthecum											
85	132	-	66	66	-	-	0	0	-	0	6/7
91	333	-	133	200	-	-	40	0	-	0	5/6
94	500	-	20	480	-	-	0	84	-	0	3/5
98	240	-	60	180	-	-	25	0	-	0	4/7
03	220	-	-	220	-	-	18	73	-	0	4/6
Gutierrezia sarothrae											
85	4666	-	1400	3266	-	-	0	0	0	0	10/8
91	6332	-	733	5466	133	-	1	0	2	2	6/6
94	280	-	40	220	20	-	0	0	7	0	5/4
98	120	40	-	120	-	-	17	0	0	0	10/8
03	340	-	-	320	20	-	0	0	6	0	7/7
Leptodactylon pungens											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
85	332	333	266	66	-	-	0	0	-	0	2/5
91	532	1733	466	66	-	-	0	0	-	0	2/5
94	40	-	20	20	-	-	0	0	-	0	3/11
98	0	40	-	-	-	-	0	0	-	0	-/-
03	400	-	-	400	-	-	0	0	-	5	2/4
Tetradymia canescens											
85	2666	-	1333	933	400	-	3	0	15	5	7/7
91	1999	-	800	666	533	-	33	10	27	7	6/10
94	800	20	260	460	80	-	28	33	10	13	4/5
98	820	60	280	460	80	-	41	32	10	2	5/8
03	880	-	140	680	60	-	23	18	7	2	7/8

Trend Study 25C-3-03

Study site name: Happy Valley .

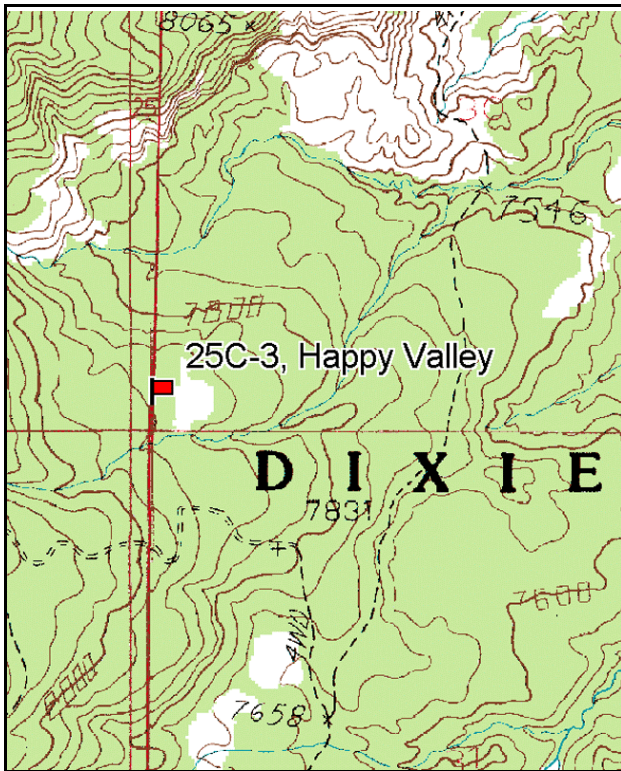
Vegetation type: Logged Ponderosa Pine .

Compass bearing: frequency baseline 170 degrees magnetic.

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

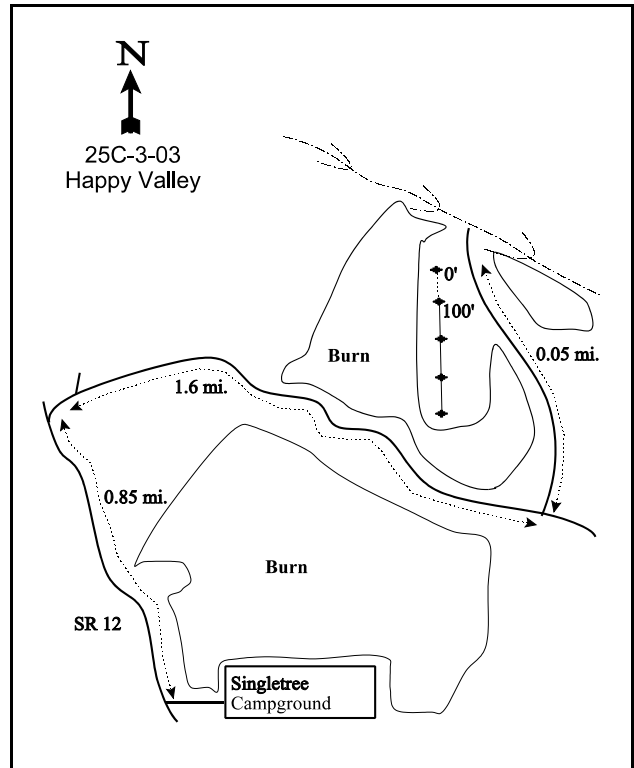
LOCATION DESCRIPTION

From the entrance to Singletree Campground on SR12, drive 0.85 miles north to the turnoff to Happy Valley. Turn east and go 1.6 miles staying on the main road until a minor fork. Turn left onto a faint two-track road and go 0.05 miles to a ponderosa pine and a rebar witness stake located 15 feet off the left side of the road. The baseline starts 75 feet west of the witness post and then runs south. The 0-foot baseline stake is marked with browse tag #7066.



Map Name: Grover

Township 30S, Range 6E, Section 26



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4224250 N, 471865 E

DISCUSSION

Happy Valley - Trend Study No. 25C-3

The Happy Valley trend study is located in a ponderosa pine area that burned in late June of 1984. The fire killed the majority of the ponderosa on the site, but many of the large mature trees survived. A salvage operation by the Forest Service removed some trees and a nearby area was planted with ponderosa seedlings. This area is near the upper limits of normal winter range at an elevation of 7,900 feet. The transect angles up the side of a hill with a slope of 10% to 15% and an eastern aspect. Pellet group data from the trend study site estimated 11 deer, 15 cow and only 1 elk day use/acre (27 ddu/ha, 37 cdu/ha, and 3 edu/ha) in 1998. Some of the cattle sign appeared several months old and the rest looked to be from the previous summer (1997). Deer use appears to be year-long, yet the most prominent use is during the winter and spring. Pellet group data from 2003 estimated 61 deer and 5 elk days use/acre (151 ddu/ha and 12 edu/ha). Most deer pellet groups appeared to be from late spring and early summer use. Cattle had been on the site just prior to the 2003 reading and use was estimated at 14 days use/acre (35 cdu/ha). Cattle use was heavy at the bottom of the hill near the 0 foot stake.

Soil at the site is moderately deep with an estimated effective rooting depth of about 12 inches. The ground is very rocky with scattered large rocks accounting for about 25% of the ground cover. Rock is also common in the soil profile with most concentrated in the top 8 inches. Soil texture is a sandy loam which is neutral in reaction (pH 6.5). Organic matter is relatively high at 3.3%. Percent cover of bare soil has steadily declined from 37% in 1985 to 9% by 2003. Burned wood, downed trees, and pine needles comprise the bulk of the litter. Bare spots show some signs of erosion as do the roads and other disturbed areas, but overall erosion is not a problem on this site.

Ponderosa pine is still a prominent part of the community. Tree density, using the point-quarter method, was estimated at 25 pine trees/acre with an average basal diameter of 6.75 inches in 1994. By 1998, tree density had increased to 140 trees/acre with an average basal diameter of 4.7 inches. Density remained stable in 2003 at 140 trees/acre but average diameter increased to 5.8 inches. Half of the trees sampled in 2003 were greater than 12 feet in height while 42% were young trees in the 1' to 4' range. Line-intercept canopy cover varies on the site, but averaged 13.5% in 2003. There are also a few scattered juniper, pinyon, and Douglas fir trees on the site.

The understory is currently dominated by a variety of browse species including antelope bitterbrush, several species of rabbitbrush, broom snakeweed, and Harriman yucca. There are several other species which occur in limited numbers. Only bitterbrush occurs in sufficient numbers and is palatable enough to be considered a key species. Fire damage to the low-spreading ecotype of bitterbrush appears to be variable as there was an estimated 1,666 plants/acre estimated in 1985. Most of these were young (88%) but 200 mature plants/acre were estimated. Density of bitterbrush was estimated at 1,100 plants/acre in 2003, and it appears to be slowly increasing. Cover of bitterbrush increased slightly between 1994 and 1998, then nearly doubled by 2003 to 9%. Strip frequency has also increased with each reading. Utilization of bitterbrush has been moderate to heavy over the years with heavier use reported in 1991, 1998, and 2003. Vigor has been good during all readings and percent decadence has remained very low. A few additional preferred shrubs occur on the site. These include small numbers of mountain big sagebrush, mountain mahogany, and elderberry.

Several increaser species, including three species of rabbitbrush, gray horsebrush, and broom snakeweed, are found in the disturbed area. Broom snakeweed increased dramatically from 866 plants/acre in 1985 to 7,280 by 1994. Its density declined 49% to 3,700 plants/acre in 1998 and 3,340 plants/acre in 2003. Age class composition indicates a stable population. Rubber rabbitbrush, Parry rabbitbrush, dwarf rabbitbrush, and narrowleaf low rabbitbrush are found on the site in low to moderate numbers. Use of these shrubs was moderate to heavy in 2003.

Perennial grasses are diverse and provided 40% of the total vegetative cover and 68% of the herbaceous cover in 1998. Common species include the following: bottlebrush squirreltail, mutton bluegrass, blue grama, Indian ricegrass and a sedge. Most grasses showed little use, although the sedge (*Carex* spp) did show some moderate use. Cattle use was not noted in 1985, but spring use was evident in 1991 and cattle had heavily utilized many grasses in 2003. Forbs also show good diversity. Diversity of all herbaceous species is lower up the hill where the ponderosa pine trees are more dominant. Most forbs occur only occasionally and most of the forb cover is provided by redroot eriogonum and Louisiana sagebrush.

1985 APPARENT TREND ASSESSMENT

The soil has been disturbed by fire and subsequent planting and salvaging operations, but the protective ground cover is increasing and the soil appears stable. As the vegetation cover continues to increase and disturbance is kept to a minimum, the soil should improve. Opening up the tree canopy has stimulated growth of herbaceous species. Bitterbrush (a key species) is increasing and vigorous, although heavily hedged. One downward indicator is the presence of several species of undesirable increaser browse which also includes yucca. However, as the site recovers from the fire, the trend appears to be upward.

1991 TREND ASSESSMENT

Percent bare ground has decreased since the last reading, while rock cover has increased. Litter cover has increased by 33%. This site is considered stable, but should be monitored closely for any unusual impacts or changes. A violent ecological event has opened up the once almost closed community to many invader species, which include the following: rabbitbrush, gray horsebrush, broom snakeweed, and yucca. These have all increased since the fire with the exception of bitterbrush. Bitterbrush has declined slightly because most ecotypes do not re-sprout after fire and it will take time for it to fully recover. The herbaceous understory is quite variable with many species of grasses and forbs. Overall, the trend would be up slightly, with an increase in the sum of nested frequency of perennial grasses and forbs.

TREND ASSESSMENT

soil - stable (3)

browse - slightly downward for the key species bitterbrush (2)

herbaceous understory - up slightly (4)

1994 TREND ASSESSMENT

Ground cover characteristics are still improving on this site. Bare ground has declined by 35% since 1991 to 13% cover. Litter cover has declined but the downward pattern is consistent with the drought conditions which have effected the area this spring. Erosion is not a problem on this site. The only abundant and desirable browse species is antelope bitterbrush. The new shrub density estimation procedure, which takes a much larger sample size, estimated 940 mostly mature plants/acre. This lower estimate is due to a reduction in the number of young plants sampled. Density of mature plants actually increased from 466 to 900 plants/acre. No seedlings were encountered and only 2% of the population consists of young plants. On the positive side, percent decadence is low and the proportion of plants heavily hedged declined from 45% in 1991 to only 11% in 1994. The site is still dominated by broom snakeweed and rabbitbrush. Trend for browse is still down slightly with the dominance of increaser species. Sum of nested frequencies for perennial grasses have increased slightly since 1991 while sum of nested frequencies for perennial forbs declined by 48%. Some of this change in composition can be explained by the very dry spring and summer of 1994. Combined nested frequencies of grasses and forbs have declined by 20% since 1991. Trend for the herbaceous understory is down slightly but the decline is likely a combination of the dry conditions and natural post fire succession.

TREND ASSESSMENT

soil - up slightly (4)

browse - slightly down (2)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent bare ground is low and protective ground cover is abundant and well dispersed. Trend for the key browse species, bitterbrush, is stable. Density declined but strip frequency and average cover increased slightly. It appears that there was some difficulty in differentiating individual bitterbrush plants. Use was more intense with heavy use reported on 37% of the bitterbrush. On the positive side, vigor was normal and there were no decadent plants sampled. Young recruitment also improved as 8% of the population now consists of young plants. Another positive sign is the reduction in the population density of broom snakeweed and various rabbitbrush species. Several new browse species were identified on the site in small numbers including mountain big sagebrush, true mountain mahogany, dwarf rabbitbrush, wax currant and elderberry. Trend for the herbaceous understory is up with an increase in the sum of nested frequency of grasses and forbs. Production is also up with increased herbaceous cover.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up (5)

2003 TREND ASSESSMENT

Trend for soil is up slightly. Relative percent cover of vegetation has remained stable while litter cover has increased slightly. Average cover of bare ground has declined from 12% to 9%. In addition, the ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground has increased. Erosion is not a problem on this site. Trend for the key browse, bitterbrush, is up. Density has increased 31% while average cover increased nearly 2 fold. Strip frequency also increased. Average vigor is normal on most plants and there are few decadent plants. Bitterbrush were not producing many flowers but annual leader growth was fair in 2003 averaging 2.9 inches. Use was extremely heavy however, with 80% of the plants sampled displaying heavy use. Increaser shrubs, rubber rabbitbrush, Parry rabbitbrush, dwarf rabbitbrush, narrowleaf low rabbitbrush, broom snakeweed, and yucca, have remained similar in total cover and strip frequency since 1998. Overstory cover of ponderosa pine has also remained stable. Overall, the browse trend is slightly up. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses declined slightly. Most of the dominant grasses remained stable or increased with the exception of Indian ricegrass and bottlebrush squirreltail. Composition is changing as the warm season grass, blue grama, now provides a larger portion of the total grass cover compared to 1998 (27% to 47%). Nested frequency of cool season species, Indian ricegrass and bottlebrush squirreltail, have declined significantly. Sum of nested frequency of perennial forbs has also declined slightly. Due to the dry conditions of the past 4 spring periods, herbaceous production is down. Total cover of perennial grasses declined 25% while cover of perennial forbs declined 45%. A return to normal precipitation patterns should reverse this trend.

TREND ASSESSMENT

soil - slightly up (4)

browse - slightly up (4)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	Agropyron cristatum	a-	a-	ab5	b15	ab12	.21	.42	.19
G	Agropyron intermedium	-	3	6	5	8	.04	.03	.02
G	Bouteloua gracilis	a51	ab66	ab61	bc97	c119	2.81	4.43	5.84
G	Bromus tectorum (a)	-	-	1	14	1	.00	.33	.01
G	Carex spp.	a23	ab67	b64	b69	b62	.96	1.41	.83
G	Oryzopsis hymenoides	a3	ab18	bc29	c43	ab17	2.22	1.81	.22
G	Poa fendleriana	a48	a85	b98	c147	c155	2.85	5.17	4.18
G	Sitanion hystrix	a62	ab90	a62	b108	a56	.57	2.12	.42
G	Sporobolus cryptandrus	42	27	29	19	33	.77	.42	.58
G	Stipa comata	a5	a3	b36	a15	a9	.87	.55	.05
Total for Annual Grasses		0	0	1	14	1	0.00	0.33	0.00
Total for Perennial Grasses		234	359	390	518	471	11.33	16.38	12.36
Total for Grasses		234	359	391	532	472	11.33	16.72	12.38
F	Alyssum alyssoides (a)	-	-	-	-	2	-	-	.03
F	Allium spp.	a-	a-	ab1	bc10	c12	.00	.10	.05
F	Antennaria parvifolia	11	5	3	3	4	.15	.04	.06
F	Arabis demissa	a1	b42	a-	a3	a-	-	.00	-
F	Artemisia dracunculus	-	-	-	-	1	-	-	.00
F	Artemisia ludoviciana	a81	ab121	ab110	b144	ab108	3.82	4.50	2.04
F	Astragalus convallarius	b13	a-	a-	a-	a-	-	-	-
F	Astragalus spp.	-	-	7	-	1	.09	-	.03
F	Chenopodium album (a)	-	-	5	-	9	.01	-	.04
F	Chaenactis douglasii	2	-	-	-	-	-	-	-
F	Cirsium spp.	-	-	-	3	-	-	.00	-
F	Cryptantha spp.	a-	b105	a6	a-	a2	.02	-	.00
F	Cymopterus spp.	-	-	-	2	-	-	.03	-
F	Descurainia pinnata (a)	-	-	-	5	2	-	.04	.01
F	Eriogonum alatum	3	1	3	6	1	.03	.03	.00
F	Eriogonum cernuum (a)	-	-	2	-	-	.00	-	-
F	Erigeron eatonii	10	7	6	6	1	.01	.04	.00
F	Erigeron flagellaris	-	-	-	-	5	-	-	.15
F	Erigeron pumilus	-	2	3	8	2	.00	.01	.03
F	Eriogonum racemosum	a65	b118	a63	ab85	ab75	.35	1.52	.68
F	Gilia spp. (a)	-	-	-	3	-	-	.03	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
F	Hedysarum boreale	-	-	3	5	1	.06	.33	.03
F	Hymenoxys acaulis	-	3	-	1	-	-	.03	-
F	Hymenoxys richardsonii	_a 8	_b 32	_{ab} 18	_a 9	_a 11	.67	.25	.27
F	Lappula occidentalis (a)	-	-	_a 7	_b 18	_{ab} 9	.01	.04	.07
F	Lepidium spp. (a)	-	-	_a -	_b 13	_a -	-	.03	-
F	Lithospermum spp.	-	-	-	-	1	-	-	.00
F	Lotus utahensis	-	-	-	2	-	-	.00	-
F	Lupinus argenteus	5	-	7	2	-	.04	.03	-
F	Lygodesmia spinosa	5	6	10	5	15	.48	.16	.66
F	Machaeranthera grindelioides	-	-	-	2	-	-	.15	-
F	Penstemon comarrhenus	2	-	-	-	2	-	-	.01
F	Penstemon spp.	_a 1	_b 20	_a -	_a -	_a -	-	-	-
F	Phlox longifolia	-	-	-	3	2	-	.00	.00
F	Polygonum douglasii (a)	-	-	-	3	1	-	.01	.00
F	Potentilla gracilis	_a -	_{ab} 6	_{ab} 5	_{ab} 2	_b 11	.01	.03	.05
F	Senecio spp.	_b 17	_a -	_a -	_a -	_a -	-	-	-
F	Sphaeralcea coccinea	10	12	7	15	4	.02	.29	.04
F	Tragopogon dubius	-	-	-	1	-	-	.00	-
F	Unknown forb-perennial	2	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	14	42	23	0.03	0.16	0.15
Total for Perennial Forbs		236	480	252	317	259	5.80	7.60	4.17
Total for Forbs		236	480	266	359	282	5.83	7.76	4.33

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

BROWSE TRENDS --

Management unit 25C, Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia nova	4	2	4	.03	.00	.18
B	Artemisia tridentata vaseyana	0	0	0	-	.15	-
B	Cercocarpus montanus	0	1	0	-	.03	-
B	Chrysothamnus depressus	0	7	4	-	.34	.06
B	Chrysothamnus nauseosus	28	20	13	.73	.82	2.72
B	Chrysothamnus parryi	5	9	12	.15	.21	.24
B	Chrysothamnus viscidiflorus stenophyllus	17	17	18	1.57	2.08	.64
B	Gutierrezia sarothrae	70	56	59	1.87	1.45	.70
B	Opuntia spp.	4	1	1	.00	.03	-
B	Pediocactus simpsonii	0	0	1	-	-	.00
B	Pinus edulis	0	0	0	.01	-	-
B	Pinus ponderosa	0	10	10	1.48	3.84	3.73
B	Purshia tridentata	22	28	37	4.10	4.51	8.85
B	Ribes spp.	0	0	0	-	.03	-
B	Sambucus racemosa	3	1	2	-	.03	-
B	Tetradymia canescens	6	9	12	.15	.33	.38
B	Yucca harrimaniae	15	19	20	2.90	2.58	3.66
Total for Browse		174	180	193	13.01	16.46	21.19

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 3

Species	Percent Cover	
	'98	'03
Artemisia nova	-	.21
Chrysothamnus nauseosus	-	2.33
Chrysothamnus parryi	-	.05
Chrysothamnus viscidiflorus stenophyllus	-	.36
Gutierrezia sarothrae	-	1.85
Pinus ponderosa	6.19	13.48
Purshia tridentata	-	7.19
Sambucus racemosa	-	.25
Tetradymia canescens	-	.06
Yucca harrimaniae	-	3.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 3

Species	Average leader growth (in)
	'03
Purshia tridentata	2.9

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 3

Species	Trees per Acre	
	'98	'03
Juniper osteosperma	20	N/A
Pinus ponderosa	140	140

Average diameter (in)	
'98	'03
1.4	N/A
4.7	5.8

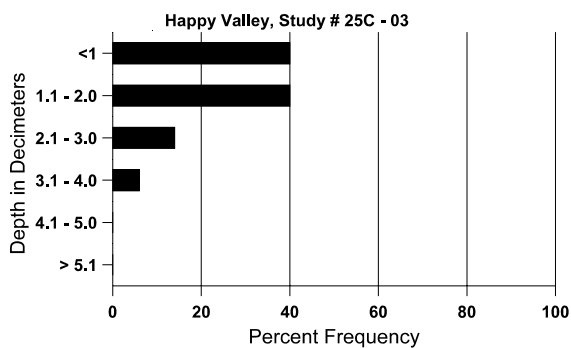
BASIC COVER --
Management unit 25C, Study no: 3

Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	7.00	7.50	25.82	39.38	35.17
Rock	18.50	27.75	23.07	30.28	26.31
Pavement	11.25	4.75	1.36	8.40	5.92
Litter	26.75	40.00	30.78	39.38	39.93
Cryptogams	0	0	0	.29	0
Bare Ground	36.50	20.00	13.10	15.55	8.84

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 3, Study Name: Happy Valley

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.7	61.3 (12.2)	6.5	56.0	21.4	22.6	3.3	21.4	153.6	0.7

Stoniness Index



PELLET GROUP DATA --
 Management unit 25C, Study no: 3

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	4	4	9
Elk	2	4	1
Deer	14	16	37
Cattle	-	4	6

Days use per acre (ha)	
'98	'03
-	-
1 (2)	5 (12)
11 (27)	61 (150)
15 (37)	14 (34)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	80	-	-	80	-	20	0	0	-	0	11/18
98	60	-	-	60	-	-	0	0	-	0	15/22
03	160	-	20	140	-	-	0	0	-	0	8/25
<i>Artemisia tridentata vaseyana</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	8/8
98	0	-	-	-	-	-	0	0	-	0	11/9
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Cercocarpus montanus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	12/15
98	20	-	-	20	-	-	100	0	-	0	13/24
03	0	-	-	-	-	-	0	0	-	0	10/17
<i>Chrysothamnus depressus</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	140	-	20	120	-	-	57	0	-	0	7/14
03	100	-	-	100	-	-	40	60	-	0	2/7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	2732	5333	2600	66	66	-	12	10	2	0	8/6
94	860	20	40	800	20	-	0	0	2	0	16/17
98	600	-	40	540	20	-	0	0	3	3	29/31
03	300	-	-	200	100	20	13	7	33	0	25/25
Chrysothamnus parryi											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	66	-	66	-	-	-	0	0	0	0	-/-
94	180	-	-	180	-	-	44	44	0	0	4/11
98	220	-	40	180	-	-	0	0	0	0	9/15
03	440	-	20	300	120	-	68	14	27	0	8/11
Chrysothamnus viscidiflorus stenophyllus											
85	466	66	200	266	-	-	0	0	0	0	9/7
91	199	133	133	-	66	-	0	0	33	33	-/-
94	940	-	20	880	40	-	13	0	4	0	12/27
98	360	-	-	340	20	-	22	11	6	0	7/22
03	800	20	120	640	40	-	38	18	5	0	12/17
Gutierrezia sarothrae											
85	866	800	266	600	-	-	0	0	0	0	9/7
91	5532	1066	666	4600	266	-	2	0	5	2	10/12
94	7280	460	1980	5040	260	1320	0	0	4	1	6/6
98	3700	440	220	3480	-	20	0	0	0	0	9/8
03	3340	-	200	3100	40	-	0	0	1	0	7/7
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	320	-	20	300	-	-	0	0	-	0	2/7
98	20	-	-	20	-	-	0	0	-	0	2/4
03	20	-	-	20	-	-	0	0	-	0	2/7
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	2/2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pinus ponderosa											
85	133	66	-	133	-	-	0	0	0	100	69/79
91	399	66	200	133	66	-	0	17	17	17	234/89
94	0	-	-	-	-	-	0	0	0	0	-/-
98	200	40	180	20	-	40	0	0	0	0	-/-
03	200	-	140	60	-	-	0	0	0	0	-/-
Purshia tridentata											
85	1666	466	1466	200	-	-	12	8	0	4	10/19
91	1465	-	866	466	133	-	36	45	9	5	5/15
94	940	-	20	900	20	20	32	11	2	2	14/41
98	760	40	60	700	-	-	45	37	0	0	17/49
03	1100	-	40	980	80	-	20	80	7	2	17/47
Quercus gambelii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	40/75
03	0	-	-	-	-	-	0	0	-	0	27/15
Ribes spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Sambucus racemosa											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	140	-	-	140	-	-	0	0	-	0	23/22
98	20	-	-	20	-	-	0	0	-	0	25/32
03	40	-	20	20	-	-	0	50	-	0	20/30
Tetradymia canescens											
85	66	-	66	-	-	-	0	0	0	0	-/-
91	132	-	66	66	-	-	50	0	0	0	6/9
94	120	-	20	100	-	-	33	0	0	0	7/13
98	200	20	20	180	-	-	30	0	0	0	9/14
03	260	-	40	180	40	-	38	38	15	8	7/11

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Yucca harrimaniae</i>											
85	1333	400	1133	200	-	-	0	0	0	0	8/9
91	2333	333	2000	333	-	-	0	0	0	0	9/15
94	1580	-	40	1540	-	-	0	0	0	0	13/22
98	1520	-	240	1240	40	-	0	0	3	1	14/23
03	1400	-	620	760	20	40	0	0	1	1	14/20

Trend Study 25C-4-03

Study site name: North Slope.

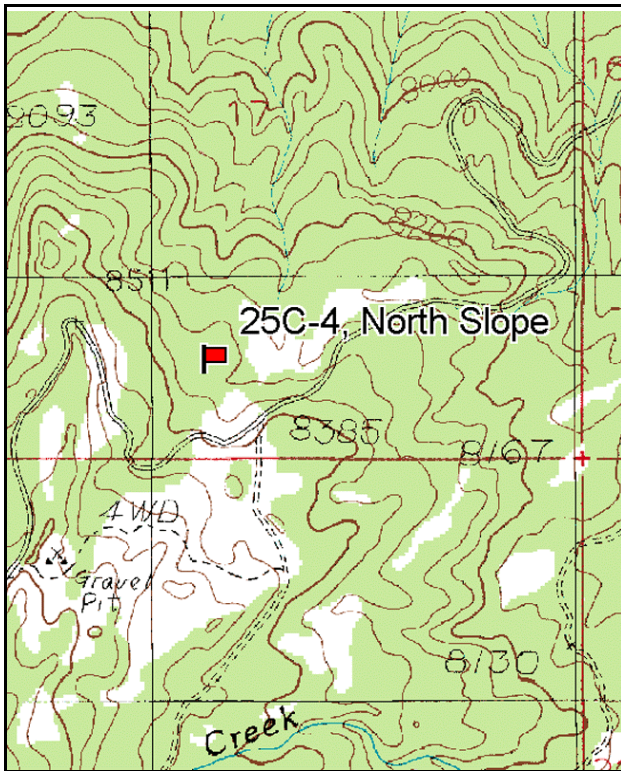
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 167 degrees magnetic. Lines 3-4, 270°M.

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

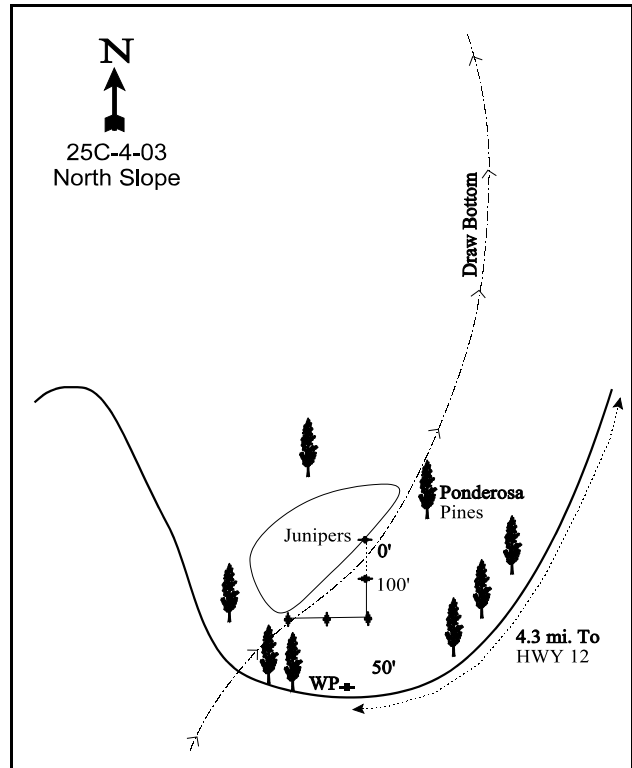
LOCATION DESCRIPTION

From Grover, Utah, go 1.5 miles northwest on SR12 to the North Slope Road. Turn up this road staying left on the main road and continue for 4.3 miles. Stop before you get to a bend in the road near the head of a draw. Look for a witness post at the base of a Ponderosa Pine 10 feet below the road. The witness post is a 2½ foot steel rebar tagged #7181. The 200-foot stake is a full-high post 50 feet from the witness post. The 0-foot baseline stake is marked by browse tag #7077.



Map Name: Grover

Township 30S, Range 5E, Section 18



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4277713 N, 466205 E

DISCUSSION

North Slope - Trend Study No. 25C-4

This study is located on the north slope of Boulder Mountain above Fish Creek. The general exposure is north. The slope varies from 10% to 15% with an elevation of 8,300 feet. During the 1998 reading, the old frequency baseline was moved to better sample the site. It was originally established entirely within a thick juniper stand with little herbaceous understory while the density plots sampled the more open area across a wash. The new baseline is located entirely within the more open area where the key browse and herbaceous understory are more numerous. The area is used by deer primarily as transitional and summer range. Pellet group data taken along the study site baseline show an increasing amount of deer use since 1991. Data from 1991 estimated 40 deer days use/acre (99 ddu/ha) increasing to 50 deer days use/acre in 1998 and 66 in 2003 (124 ddu/ha and 164 ddu/ha). Elk use has remained low at only 3 elk days use/acre in 1998 and 1 day use/acre in 2003. Cattle use was heavy in 1998 at 36 days use/acre (89 cdu/ha) and more moderate at 15 cow days use/acre in 2003 (36 cdu/ha).

Soil at the site is very rocky on the surface and throughout the profile. Effective rooting depth was estimated at 10 inches. Rooting restrictions are evident in some places where black sagebrush occurs. Soil texture is a sandy loam which is moderately acidic in reaction (pH 5.9). There is a very small amount of bare soil exposed on the site. Some soil movement was noticeable in 1985, but erosion is currently not a problem due to the high percentage of litter and thick vegetation.

The vegetative community is composed of pinyon and juniper and some ponderosa pine with an understory of antelope bitterbrush, rabbitbrush, and perennial grass. Point-center quarter data from 2003 estimated 42 pinyon and 30 rocky mountain and Utah juniper trees/acre. A few ponderosa pine trees also occur on the site. The pinyon and juniper provide good escape and thermal cover. Nearby Forest Service chainings provide excellent deer winter range, and more pinyon-juniper chainings have been proposed by DWR for the North Slope area.

A variety of browse species are present, but only bitterbrush is available and palatable enough to be considered a key species. Bitterbrush makes up approximately 50% of the browse cover and density has changed little since 1985 when 1,598 plants/acre were estimated. Many of the older plants, which are above the snow cover in the winter, have been heavily hedged in the past. Utilization has been moderate to heavy in most years but vigor has remained normal and percent decadence low.

Black sagebrush and a few mountain big sagebrush are mixed in with the bitterbrush. Both species showed an increase in density between 1991 and 1998, but the larger sample used in 1998 is the major reason for the difference. Black sagebrush has shown mostly light use with moderate use on mountain big sagebrush in 1991 and 2003. Three species of rabbitbrush are found on the site including dwarf rabbitbrush, Parry rabbitbrush, and mountain low rabbitbrush. Of these, mountain low rabbitbrush is the most abundant with a density that has ranged between about 3,000 and 4,000 plants/acre since 1985. Most of these are unutilized. The increaser broom snakeweed is also found on the site in moderate numbers.

Several perennial grasses are found on the site with blue grama, a sedge, mutton bluegrass, and bottlebrush squirreltail being most numerous. All grasses combined to produce 23% cover in 1998, declining to only 13% in 2003. The large decline in grass cover comes primarily from a 53% decline in mutton bluegrass cover. Grasses were heavily utilized in 2003 and most of the larger preferred grasses were found only within the protection of shrub canopies. Shrub interspaces consist mostly of low growing mutton bluegrass and blue grama. There are a large variety of forbs on the site, although Louisiana sage, silvery lupine, and pussytoes are the most abundant and provide the majority of the forb cover. Average forb cover was estimated at 14% in 1998, declining to only 5% in 2003 due to drought conditions.

1985 APPARENT TREND ASSESSMENT

Good litter and vegetative cover provides protection for the soil and buildup appears to exceed any loss. Vegetative trend also appears stable. Some increasers are present, but appear to have stable populations. The bitterbrush is heavily hedged, but mostly protected by snow during the season of heaviest use and has good reproduction.

1991 TREND ASSESSMENT

This site continues to have excellent basic cover characteristics. Bare ground is only 6% with litter cover at 62%. Soil condition is stable. The key browse, antelope bitterbrush, is fairly stable at around 1,500 plants per acre. The number of decadent plants has increased from 4 to 17 percent. This level of decadence is still low, but of real concern is that the increaser species have expanded during this same period. The browse trend is considered stable. The herbaceous understory is stable at this time with about as many species increasing as decreasing.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

The original frequency baseline was moved out of a thick juniper stand in order to sample the more important bitterbrush-grass vegetation. For this reason direct comparisons should not be made between 1991 and 1998 with regard to soil trends and herbaceous trends. The original baseline had a much higher pinyon and juniper density with considerable litter cover around these trees. Herbaceous vegetation was lacking. With this in mind, the soil trend on the expanded baseline appears stable with little bare ground exposed. Protective cover is abundant and well dispersed and no erosion is evident. Trend for bitterbrush is stable. There were less young plants sampled in 1998, but density of mature plants is similar to 1985 estimates. Utilization is more moderate, vigor normal, and percent decadence is low at only 3%. Density of increasers, including broom snakeweed and three species of rabbitbrush, are up for rabbitbrush, although down for snakeweed. More sagebrush, black sagebrush and mountain big sagebrush, was sampled in the larger sample of 1998. Trend for browse is considered stable. The herbaceous understory is diverse and abundant. Sum of nested frequency has increased dramatically, but much of the improvement is due to the relocation of the original frequency baseline. Trend is considered stable until data is available for direct comparison.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil remains stable with good protective ground cover to prevent erosion. Trend for the key browse species, bitterbrush, is also stable. Density has remained stable since 1985 but young recruitment has declined since 1991. Use was heavy in 2003 and the number of decadent plants increased to 12% of the population. This is still low however. Annual leader growth was fair averaging nearly 3 inches. Increasers, parry and mountain low rabbitbrush and broom snakeweed have remained relatively stable in density and average cover. Trend for the herbaceous understory is down slightly for perennial grasses but more sharply down for perennial forbs. Sum of nested frequency of perennial grasses declined 18% with a significant decline in

nested frequency of bottlebrush squirreltail and bluebunch wheatgrass. Mutton bluegrass declined slightly in nested frequency but average cover dropped 53%. Total grass cover declined 44% since 1998 due to drought conditions. The forb composition is dominated by Louisiana sage and silvery lupine. Sum of nested frequency of perennial forbs declined 43% since 1998 and average cover dropped from 13% to 4%. Overall the herbaceous trend is considered down.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 4

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron spicatum	a1	ab5	b16	a-	.35	-
G	Bouteloua gracilis	ab172	a139	b206	b203	8.07	6.58
G	Bromus anomalus	2	3	-	-	-	-
G	Carex spp.	28	29	51	31	1.17	.41
G	Oryzopsis hymenoides	3	3	-	1	-	.00
G	Poa fendleriana	a46	a48	b192	b173	11.08	5.25
G	Sitanion hystrix	a43	a56	b104	a56	2.24	.53
G	Stipa comata	a-	a-	b23	b19	.41	.40
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		295	283	592	483	23.33	13.19
Total for Grasses		295	283	592	483	23.33	13.19
F	Alyssum alyssoides (a)	-	-	a-	b15	-	.23
F	Allium spp.	-	-	1	-	.00	-
F	Antennaria parvifolia	a5	ab8	c31	bc26	1.68	.20
F	Androsace septentrionalis (a)	-	-	b95	a27	.93	.08
F	Arabis demissa	8	17	8	5	.07	.04
F	Artemisia dracunculus	c54	a-	b23	b10	.91	.14
F	Artemisia ludoviciana	b70	a2	c116	b52	3.14	.86
F	Castilleja linariaefolia	-	3	-	-	-	-
F	Chenopodium album (a)	-	-	a-	b53	-	.28
F	Chaenactis douglasii	-	-	6	-	.01	-
F	Chenopodium leptophyllum(a)	-	-	a-	b44	-	.16
F	Cirsium spp.	-	-	2	-	.00	-
F	Cryptantha spp.	3	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	8	3	.02	.03

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
F	Draba spp. (a)	-	-	-	1	-	.00
F	Eriogonum alatum	-	-	-	-	-	.00
F	Erigeron eatonii	_a 6	_a 3	_b 17	_a 4	.34	.06
F	Erigeron flagellaris	_a -	_a -	_b 10	_{ab} 9	.25	.06
F	Eriogonum spp.	-	-	2	-	.03	-
F	Erigeron pumilus	_a -	_a -	_b 10	_b 12	.24	.15
F	Eriogonum racemosum	_a 5	_a 1	_b 32	_b 26	.30	.22
F	Gayophytum ramosissimum(a)	-	-	-	6	-	.01
F	Gilia spp. (a)	-	-	2	-	.01	-
F	Holosteum umbellatum (a)	-	-	-	3	-	.00
F	Hymenoxys richardsonii	5	-	3	1	.03	.03
F	Lappula occidentalis (a)	-	-	9	8	.02	.07
F	Lepidium spp. (a)	-	-	31	8	.11	.02
F	Lupinus argenteus	_b 29	_a -	_c 82	_b 49	5.08	1.25
F	Lychnis drummondii	-	4	-	-	-	-
F	Lygodesmia spp.	_a -	_a -	_c 17	_b 6	.44	.25
F	Penstemon comarrhenus	-	2	8	3	.18	.03
F	Petradoria pumila	2	1	1	4	.15	.15
F	Potentilla concinna	-	-	-	1	-	.03
F	Polygonum douglasii (a)	-	-	5	-	.01	-
F	Potentilla gracilis	_a -	_b 18	_b 14	_b 6	.12	.05
F	Pteridium aquilinum	-	1	-	-	-	-
F	Sphaeralcea coccinea	4	10	10	6	.07	.21
F	Taraxacum officinale	-	-	1	-	.00	-
F	Tragopogon dubius	-	-	3	-	.01	-
F	Unknown forb-perennial	-	3	1	7	.00	.15
Total for Annual Forbs		0	0	150	168	1.11	0.91
Total for Perennial Forbs		191	73	398	227	13.12	3.94
Total for Forbs		191	73	548	395	14.24	4.85

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

BROWSE TRENDS --

Management unit 25C, Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	15	11	1.84	1.52
B	Artemisia tridentata vaseyana	4	7	.30	.33
B	Chrysothamnus depressus	7	0	.19	-
B	Chrysothamnus parryi	22	25	.81	.82
B	Chrysothamnus viscidiflorus lanceolatus	80	80	7.83	8.01
B	Gutierrezia sarothrae	29	17	.80	.36
B	Juniperus scopulorum	0	0	1.48	1.48
B	Pediocactus simpsonii	3	4	.09	.06
B	Pinus edulis	2	1	.78	1.75
B	Pinus ponderosa	0	0	.00	-
B	Potentilla fruticosa	0	0	-	.00
B	Purshia tridentata	51	48	14.16	15.80
B	Tetradymia canescens	4	5	.15	.03
Total for Browse		217	198	28.46	30.18

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 4

Species	Percent Cover	
	'98	'03
Artemisia nova	-	1.79
Artemisia tridentata vaseyana	-	.18
Chrysothamnus parryi	-	.75
Chrysothamnus viscidiflorus lanceolatus	-	6.03
Gutierrezia sarothrae	-	.40
Juniperus scopulorum	2.59	2.11
Pinus edulis	2.20	1.93
Purshia tridentata	-	17.85
Tetradymia canescens	-	.05

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 4

Species	Average leader growth (in)
	'03
Purshia tridentata	2.9

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 4

Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniperus scopulorum/osteosperma	10	30	4.6	6.6
Pinus edulis	17	42	4.4	4.2
Pinus ponderosa	8	N/A	15.1	N/A

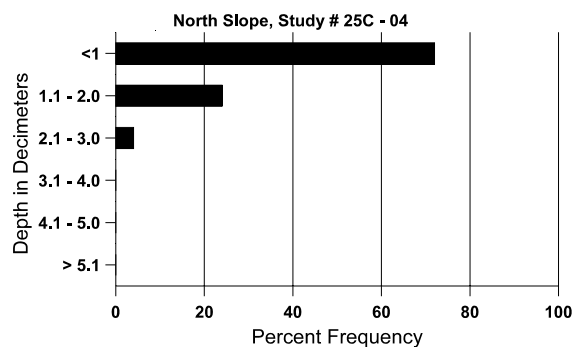
BASIC COVER --
Management unit 25C, Study no: 4

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	4.00	3.25	54.93	45.06
Rock	21.00	22.25	14.30	17.25
Pavement	9.00	5.25	8.15	7.00
Litter	60.00	62.00	49.14	39.52
Cryptogams	1.75	1.50	4.07	.19
Bare Ground	4.25	5.75	9.61	10.79

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 4, Study Name: North Slope

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.0	56.3 (10.4)	5.9	64.0	19.4	16.6	2.8	12.0	137.6	0.5

Stoniness Index



PELLET GROUP DATA --
Management unit 25C, Study no: 4

Type	Quadrat Frequency		Days use per acre (ha)		
	'98	'03	'91	'98	'03
Rabbit	25	24	-	-	-
Elk	4	4	9 (22)	3 (7)	1 (2)
Deer	30	37	40 (99)	50 (124)	66 (164)
Cattle	12	5	-	36 (89)	15 (36)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia nova											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	266	-	66	200	-	-	0	0	0	0	7/8
98	1000	40	500	480	20	40	2	0	2	2	12/19
03	820	-	-	620	200	120	17	0	24	20	10/14
Artemisia tridentata vaseyana											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	100	0	-	0	-/-
98	220	-	60	160	-	60	0	0	-	0	19/27
03	300	-	20	280	-	20	47	7	-	0	22/25
Chrysothamnus depressus											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	332	-	-	266	66	-	0	60	20	0	4/7
98	260	-	-	240	20	-	0	0	8	0	8/11
03	0	-	-	-	-	-	0	0	0	0	-/-
Chrysothamnus parryi											
85	2400	-	400	2000	-	-	3	0	0	0	8/7
91	466	-	-	466	-	-	0	0	0	0	6/9
98	940	-	60	720	160	-	0	0	17	0	10/10
03	820	-	80	740	-	-	49	7	0	0	8/10
Chrysothamnus viscidiflorus lanceolatus											
85	3866	600	666	3000	200	-	10	0	5	2	19/13
91	2866	-	533	1800	533	-	19	7	19	2	13/16
98	4060	-	300	3300	460	20	2	0	11	.98	18/20
03	4300	40	320	3500	480	20	7	0	11	.46	16/20

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
85	666	-	66	600	-	-	0	0	0	0	9/7
91	3065	66	1066	1733	266	-	2	0	9	0	6/5
98	1400	-	60	1260	80	-	0	0	6	3	9/11
03	900	-	140	760	-	-	0	0	0	0	7/6
<i>Juniperus scopulorum</i>											
85	66	-	-	66	-	-	0	0	-	0	69/89
91	66	-	-	66	-	-	0	0	-	0	109/125
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Pediocactus simpsonii</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	80	20	-	80	-	-	0	0	-	0	1/4
03	80	-	-	80	-	-	0	0	-	0	1/4
<i>Pinus edulis</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	133	-	-	-	-	0	0	-	0	-/-
98	40	20	20	20	-	-	0	0	-	0	-/-
03	20	20	20	-	-	-	0	0	-	0	-/-
<i>Potentilla fruticosa</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	20	-	-	-	-	0	0	-	0	-/-
<i>Purshia tridentata</i>											
85	1598	266	266	1266	66	-	50	33	4	0	24/35
91	1532	-	400	866	266	-	48	30	17	4	14/28
98	2000	120	180	1760	60	80	77	1	3	0	21/45
03	1540	-	60	1300	180	20	31	62	12	0	25/52
<i>Tetradymia canescens</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	80	-	-	60	20	-	0	0	25	0	12/15
03	120	-	-	80	40	-	0	17	33	17	8/12

Trend Study 25C-5-03

Study site name: Giles Hollow.

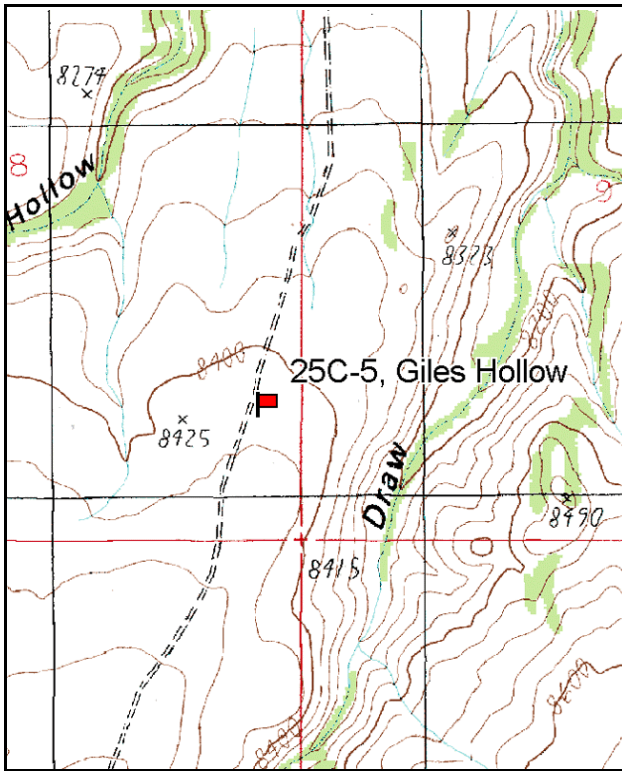
Vegetation type: Mountain brush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

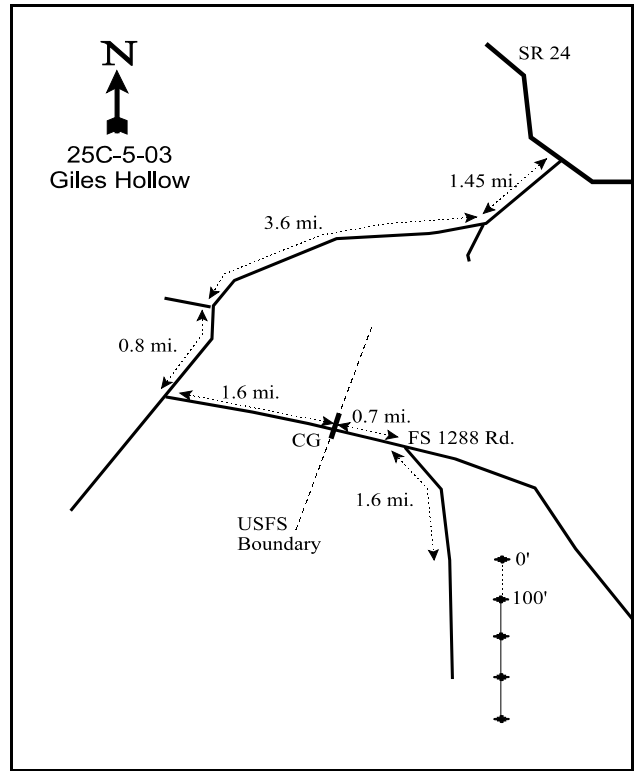
LOCATION DESCRIPTION

From the Egan Fish Hatchery south of Bicknell, travel southwest 1.45 miles on a paved road to a gravel road forking to the right (the left fork goes to King Ranch). Follow the right fork for 3.6 miles to where the road forks again. Turn left and go 0.8 miles where you take another left fork onto the Aquarius Ranger Station Road (F.S. Rd. 1288) and go 1.6 miles to a cattleguard at the USFS boundary. Continue for 0.7 miles, then turn right and go 1.6 miles south to a green fencepost 100 feet off the road to the left. The fencepost has a browse tag #7180 attached, and is the 0-foot baseline stake. The 100-foot end is also marked by a fencepost. The other three stakes are marked by rebar.



Map Name: Government Point

Township 30S, Range 3E, Section 8



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4229207 N, 447555 E

DISCUSSION

Giles Hollow - Trend Study No. 25C-5

The Giles Hollow study is located on Forest Service land on the northwest slope of the Aquarius Plateau. The area is an open windswept expanse of low-growing vegetation. It has a 5% slope to the north and an elevation of approximately 8,400 feet. The range type is low rabbitbrush-grass. Heavy cattle and sheep grazing have had a major impact on the vegetation here. A deferred rotation system of grazing is used on the allotment, with cattle grazing scheduled for a period between mid-June and mid-October on 4 pastures. Pronghorn antelope use the range year-round. A pellet group transect read along the study baseline in 1998 estimated 14 deer/antelope, 4 elk, and 10 cow days use/acre (35 ddu/ha, 10 edu/ha and 25 cdu/ha). Cattle were on the site during the 1998 reading (7/22/98). Pellet group data from 2003 estimated much lighter use at only 1 deer/antelope, 1 elk and 4 cow days use/acre (3 ddu/ha, 3 edu/ha and 10 cdu/ha). A few sheep pellet groups were also encountered.

The soil is shallow, compact, and rocky below the surface. Effective rooting depth is estimated at just over 8 inches. Soil texture is a loam which is neutral in reaction (pH 6.7). Rock and pavement account for more than 1/3 of the ground surface. The soil infiltration capacity appears to be good, and with adequate vegetation and litter cover, erosion is not a problem on this site.

The browse composition is dominated by the increasers, narrowleaf low rabbitbrush and broom snakeweed. Narrowleaf low rabbitbrush accounted for 84% of the browse cover in 1994 and 76% in 2003. Density of the more desirable species, black sagebrush, fourwing saltbush, and winterfat, are low due in part to a long history of heavy livestock use. These shrubs have displayed moderate to heavy hedging and are preferred by both livestock and big game. Winterfat is a very low growing form, averaging only 4 to 5 inches in height due to continued hedging. Rabbitbrush and broom snakeweed show little indication of any utilization with good numbers of seedlings and young. Rabbitbrush nearly doubled in density between 1985 and 1991 from 6,333 to 11,132 plants/acre. The population appears to have stabilized at around 10,000 plants/acre. Broom snakeweed declined 67% in density between 1985 and 1991. It's density has remained relatively stable since 1991, averaging 3,900 plants/acre. There may have been some problems in identification between these two similar looking plants during the 1985 reading.

The total cover for grasses is high compared to the cover contributed by forbs and browse, due largely to an abundance of blue grama. Blue grama provided 82% of the total grass cover in 1994 and 98% in 2003. This warm season grass, an increaser with livestock grazing, produces high quality forage, but in small amounts. These plants are very short (about 1 inch tall) and often escape grazing. The most desirable grass, Indian ricegrass, is present in very low numbers. Bottlebrush squirreltail is also common but has significantly decreased in frequency since the 1985 reading. Frequency and diversity of forbs is very low with only two species encountered in 1985, 1991 and 1994. Six additional forbs were encountered in 1998 but in very low numbers. Total forb cover averaged less the 1/2 of 1% in 1994 and 1998. Low fleabane and globemallow may provide limited forage to antelope in spring and summer. The rather abundant lichens may also provide some forage, especially after rain (Smith and Beale 1980).

1985 APPARENT TREND ASSESSMENT

The soil trend appears to be stable with little exposed bare ground subject to erosion. The vegetative community is poor. The desirable browse species, black sagebrush and winterfat, may be replaced by low-value increasers. Composition of the herbaceous component is also poor. Reduced livestock grazing and time are required for this plant community to heal naturally.

1991 TREND ASSESSMENT

The soil trend is stable. Percent rock and pavement cover have increased, probably because of some minor erosion and loss of litter cover. Vegetation basal cover has increased from 13% to 15%, with cryptogamic cover also slightly increasing. Litter cover loss, as it has been reported on most other sites throughout the state, appears to be more of a function of drought. The fringed sagebrush population is about the same as it was in 1985. Black sagebrush and winterfat numbers have both decreased by 36% and 6% respectively. Black sagebrush's decadency rate has gone from zero to 57% in 1991. The increaser, stickyleaf low rabbitbrush, has increased 43% in density. Even with the dramatic decrease in broom snakeweed population (67%), the browse trend would still be considered down slightly. The overall trend for the herbaceous understory is also slightly down. Nested frequency of bottlebrush squirreltail has declined significantly.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - down slightly (2)

1994 TREND ASSESSMENT

Ground cover characteristics are slightly down since 1991. Bare ground has increased slightly, while litter and cryptogam cover have declined somewhat. Erosion is not a problem, but the soil trend is still down slightly due to the dry conditions. The site is still dominated by undesirable increaser shrubs. However, the trend for black sagebrush is up due to declining rates of decadence and better vigor. Winter fat density has slightly increased. Overall browse trend is stable for the key species. Over 80% of the herbaceous understory cover is made up of one species, blue grama, which will act as an increaser with moderate to heavy grazing. Forbs are almost nonexistent. Trend is stable for the herbaceous understory and should be considered in poor condition because of the poor composition with increaser species.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up slightly. Percent bare ground declined from 17% to 13% and litter cover increased from 18% to 26%. Vegetation and cryptogamic cover also increased. On the negative side, rock and pavement cover increased from 28% to 41%, perhaps due to some soil loss. Trend for browse appears stable with similar population densities for key species, black sagebrush and winterfat, since 1994. Utilization of black sagebrush is currently light with normal vigor and no decadent plants sampled. Recruitment has improved slightly since 1994 with seedlings accounting for 30% of the population and young plants making up 4% of the population. Winterfat is still low growing, averaging only 4 inches in height. Utilization has remained moderate to heavy since 1994, but the population has remained stable at about 1,500 plants/acre. Both increasers, narrowleaf low rabbitbrush and broom snakeweed, have declined slightly in density. However, reproduction of rabbitbrush remains high with abundant seedlings and young. Trend for the herbaceous understory is up slightly. Blue grama still dominates the understory by providing 85% of the total herbaceous cover. Both blue grama and bottlebrush squirreltail have increased slightly in nested frequency. Forbs are still severely depleted although more species were picked up in 1998 and sum of nested frequency of forbs nearly doubled from 46 to 80.

TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is stable. Relative percent cover of vegetation has increased slightly while litter cover has declined from 20% to 10%. Cover of cryptogams increased 41% and cover of bare ground declined slightly. There is adequate protective ground cover to prevent most erosion. Trend for browse is stable but poor with narrowleaf low rabbitbrush providing 76% of the browse cover. Preferred browse, black sagebrush and winterfat, have both increased slightly in density. Use remains light on black sagebrush and heavy on winterfat. Vigor is good for both species. Narrowleaf low rabbitbrush has increased slightly in density to 11,340 plants/acre. Broom snakeweed, another increaser, has remained stable in density at 3,780 plants/acre. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses has declined due to a significant and dramatic drop in the nested frequency of bottlebrush squirreltail. The dominant grass, blue grama, has remained stable. Because blue grama is so much more abundant than all the other herbaceous species, the decline in bottlebrush squirreltail is mitigated somewhat. Sum of nested frequency of perennial forbs has decreased slightly and forbs are still rare.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	<i>Bouteloua gracilis</i>	317	337	307	329	329	21.54	25.74	28.25
G	<i>Oryzopsis hymenoides</i>	_b 13	_{ab} 4	_a 1	_{ab} 6	_a -	.00	.06	.00
G	<i>Sitanion hystrix</i>	_c 315	_b 207	_b 221	_b 226	_a 35	4.83	4.11	.62
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		645	548	529	561	364	26.38	29.92	28.88
Total for Grasses		645	548	529	561	364	26.38	29.92	28.88
F	<i>Arabis</i> spp.	-	-	-	2	1	-	.00	.00
F	<i>Astragalus</i> spp.	-	-	-	1	-	-	.00	-
F	<i>Chenopodium fremontii</i> (a)	-	-	-	-	6	-	-	.04
F	<i>Chenopodium leptophyllum</i> (a)	-	-	_a -	_a -	_b 57	-	-	.70
F	<i>Draba</i> spp. (a)	-	-	-	4	-	-	.00	-
F	<i>Erigeron pumilus</i>	7	3	7	7	2	.02	.02	.03
F	<i>Lappula occidentalis</i> (a)	-	-	-	3	-	-	.00	-
F	<i>Penstemon</i> spp.	-	-	-	1	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
F	<i>Polygonum douglasii</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Sphaeralcea coccinea</i>	38	45	39	61	52	.09	.36	.30
F	Unknown forb-perennial	1	-	-	-	3	-	-	.01
Total for Annual Forbs		0	0	0	8	63	0	0.01	0.75
Total for Perennial Forbs		46	48	46	72	58	0.10	0.39	0.34
Total for Forbs		46	48	46	80	121	0.10	0.40	1.09

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

BROWSE TRENDS --

Management unit 25C, Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	<i>Artemisia frigida</i>	5	0	1	.00	-	.03
B	<i>Artemisia nova</i>	10	11	15	.36	1.21	1.21
B	<i>Atriplex canescens</i>	3	1	2	.00	-	-
B	<i>Ceratoides lanata</i>	37	34	38	.19	.47	.83
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	88	85	91	4.82	7.94	9.74
B	<i>Gutierrezia sarothrae</i>	73	69	77	.32	1.57	.95
B	<i>Opuntia</i> spp.	0	3	4	-	-	.00
B	<i>Pediocactus simpsonii</i>	0	3	3	-	.02	.00
B	<i>Tetradymia canescens</i>	0	1	0	-	-	-
B	<i>Yucca harrimaniae</i>	1	0	3	.00	-	.03
Total for Browse		217	207	234	5.71	11.22	12.81

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 5

Species	Percent Cover
	'03
<i>Artemisia nova</i>	.65
<i>Ceratoides lanata</i>	.66
<i>Chrysothamnus viscidiflorus stenophyllus</i>	8.94
<i>Gutierrezia sarothrae</i>	.58

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 5

Species	Average leader growth (in)
	'03
Ceratoides lanata	1.9

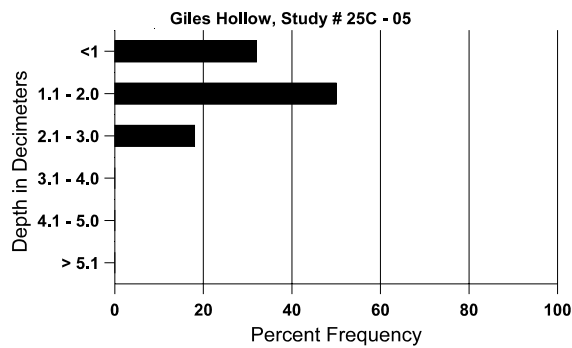
BASIC COVER --
Management unit 25C, Study no: 5

Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	12.75	15.25	31.80	46.57	43.48
Rock	6.00	10.75	19.31	10.92	20.56
Pavement	23.25	28.00	8.79	30.21	17.64
Litter	34.00	26.00	18.34	26.23	10.65
Cryptogams	3.75	5.00	2.25	4.61	6.47
Bare Ground	20.25	15.00	16.75	13.10	9.64

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 5, Study Name: Giles Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
8.3	66.0 (8.0)	6.7	44.0	33.4	12.6	2.6	19.3	89.6	0.5

Stoniness Index



PELLET GROUP DATA --
Management unit 25C, Study no: 5

Type	Quadrat Frequency		
	'94	'98	'03
Sheep	-	-	4
Rabbit	58	16	4
Elk	-	4	1
Deer	15	11	7
Cattle	-	-	3
Antelope	3	-	1

Days use per acre (ha)	
'98	'03
-	2 (5)
-	-
4 (10)	1 (2)
9 (22)	1 (3)
10 (25)	4 (11)
-	-

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 5

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>											
85	3800	-	1400	2400	-	-	0	0	0	0	2/4
91	3999	200	1800	1466	733	-	20	5	18	2	3/4
94	180	-	20	140	20	-	0	11	11	0	2/4
98	0	-	-	-	-	-	0	0	0	0	-/-
03	20	-	20	-	-	-	0	0	0	0	-/-
<i>Artemisia nova</i>											
85	732	-	466	266	-	-	18	0	0	0	5/11
91	466	-	200	-	266	-	29	29	57	29	-/-
94	400	-	-	380	20	20	5	5	5	0	5/9
98	460	200	20	440	-	-	0	0	0	0	6/12
03	740	-	240	500	-	40	8	0	0	0	6/16
<i>Atriplex canescens</i>											
85	66	-	-	-	66	-	100	0	100	0	-/-
91	199	-	133	-	66	-	67	0	33	0	-/-
94	60	-	-	60	-	-	33	0	0	0	9/13
98	20	-	-	20	-	-	0	0	0	0	11/11
03	40	-	-	40	-	-	0	100	0	0	11/17
<i>Ceratoides lanata</i>											
85	1199	-	133	1066	-	-	44	22	-	0	4/5
91	1133	-	333	800	-	-	35	12	-	0	4/5
94	1520	-	100	1420	-	-	30	21	-	0	2/4
98	1540	20	100	1440	-	-	42	25	-	0	4/7
03	1640	-	-	1640	-	-	28	56	-	0	5/7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
85	6333	1066	2800	2933	600	-	2	0	9	1	8/10
91	11132	66	6466	3733	933	-	14	2	8	0	6/9
94	10640	60	1240	8980	420	20	.18	0	4	2	5/11
98	9220	2400	1140	8000	80	40	0	0	1	.21	7/12
03	11340	-	800	10040	500	180	0	0	4	2	7/14
<i>Gutierrezia sarothrae</i>											
85	10266	1133	2200	8066	-	-	0	0	0	0	7/7
91	3400	133	1200	2200	-	-	0	0	0	0	4/4
94	4920	100	1940	2740	240	360	.40	0	5	1	3/4
98	3500	840	280	3220	-	-	0	0	0	0	7/8
03	3780	160	280	3500	-	40	0	0	0	0	4/5
<i>Opuntia spp.</i>											
85	398	-	66	266	66	-	0	0	17	0	4/8
91	333	66	333	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	-/-
98	60	-	40	20	-	20	0	0	0	0	2/9
03	80	-	20	60	-	-	0	0	0	0	4/14
<i>Pediocactus simpsonii</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	-	60	-	-	0	0	-	0	1/2
03	100	-	-	100	-	-	0	0	-	0	1/3
<i>Tetradymia canescens</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	100	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Yucca harrimaniae</i>											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	40	-	40	-	-	-	0	0	-	0	3/5
98	0	-	-	-	-	-	0	0	-	0	-/-
03	100	-	100	-	-	-	0	0	-	0	-/-

Trend Study 25C-6-03

Study site name: Terza Flat.

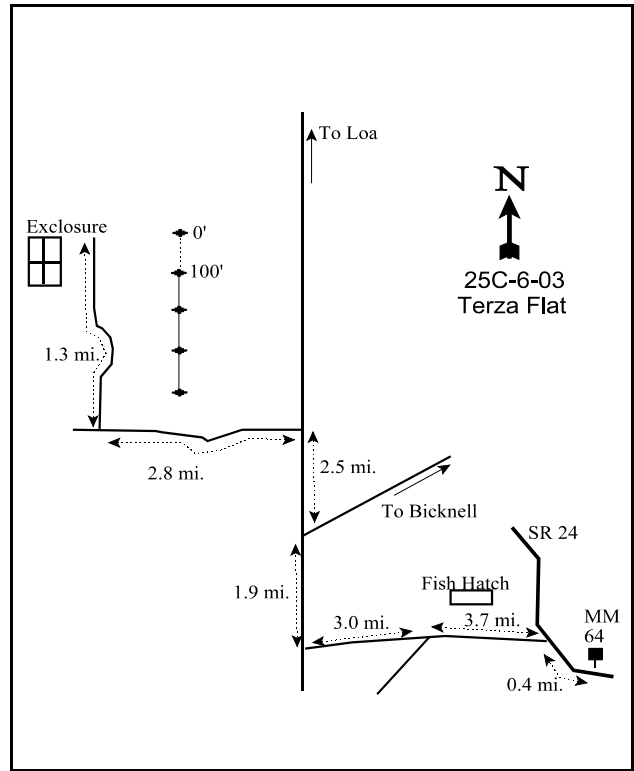
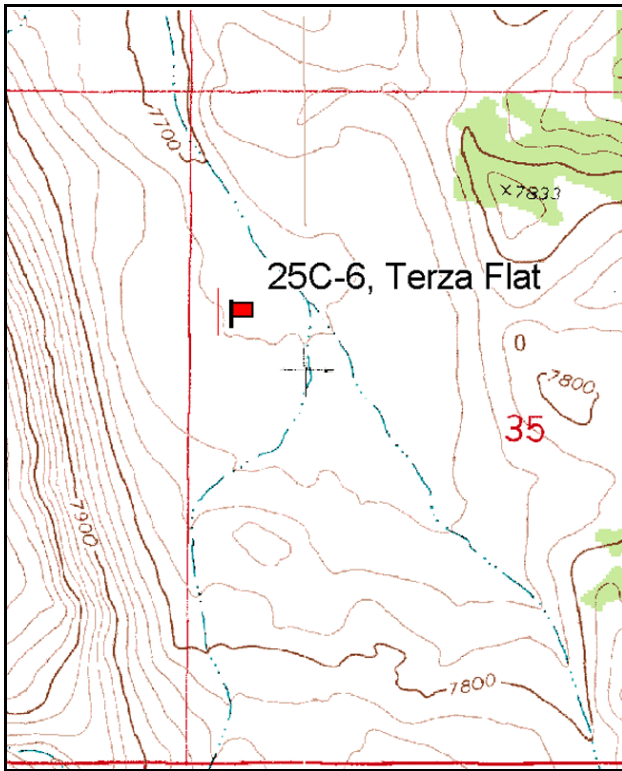
Vegetation type: Wyoming big sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

South of Bicknell, turn on the road (east) towards Bicknell Fish Hactery. This road is 0.4 miles north of mile marker 64. Travel east for 3.7 miles to a fork, stay right at fork (sign says left is toward King's Ranch). Continue 3.0 miles to an intersection. Turn right (north) and go 1.9 miles to a fork, stay left (straight) for another 2.5 miles to a road going left (west). Drive 2.8 miles to a road going left (north). Take this road for 1.3 miles to an enclosure. Drive to the northeast corner of the enclosure. The 0-foot end of the baseline is 200 feet east of the corner in line with the fence. The 0-foot stake is a fencepost marked by browse tag #7178. The other stakes are marked by rebar.



Map Name: Moroni Peak

Diagrammatic Sketch

Township 29S, Range 2E, Section 35

GPS: NAD 27, UTM 12S 4242907 N, 441561 E

DISCUSSION

Terza Flat - Trend Study No. 25C-6

The Terza Flat study is on BLM land which was reportedly the most abused site encountered during the 1985 field season. An experimental exclosure located near the transect contains vigorous stands of winterfat and sagebrush where livestock have been excluded. In contrast, Russian thistle, snakeweed, halogeton, and narrowleaf low rabbitbrush are dominant outside the exclosure. Sheep are allowed to graze the allotment each winter, followed by cattle each spring. Antelope are present in the area year-round. Pellet group data from the site in 1998 estimated 56 antelope/deer, 9 elk and 3 cow days use/acre (138 adu/ha, 22 edu/ha, 7 cdu/ha). Sheep sign was also noted in small numbers. It was difficult to differentiate between antelope, deer, and sheep sign on this site. Rabbits were also present in high numbers. Pellet group data from 2003 estimated 11 antelope/deer days use/acre (26 adu/ha). Only 1 elk pellet group and 1 cattle pat were encountered. A colony of Utah prairie dogs was reported to be present 1/4 mile southeast of the Terza Flat study site in 1985.

The soil is moderately deep with an effective rooting depth of 14 inches. There may be a hardpan between 12 to 18 inches below the surface. Soil texture is a sandy clay loam which is neutral in reaction (pH 7.2). Phosphorus is low at 7.7 ppm, when 10 ppm is considered to be the minimum value for normal plant growth and development. There are a few large rocks on the surface, and erosion pavement is abundant providing 37% cover in 1998 and 35% in 2003. Cover of bare ground is also high, increasing from 29% in 1985 to 44% in 1998. Perennial herbaceous cover is lacking and erosion is ongoing. The erosion condition class was determined to be moderate in 2003. Even with the slight slope, high intensity rain just prior to the 2003 reading caused considerable rills, flow patterns, and soil movement.

This site is dominated by invaders and increasers. Together, the increaser forbs and shrubs made up 88% of the total vegetative cover in 1994 and 77% in 1998. The dominant browse include narrowleaf low rabbitbrush and Wyoming big sagebrush. Winterfat is also an important browse species on the site but plants are small, measuring only 3 to 6 inches in height. Total cover of winterfat has averaged 1/2 of 1% since 1994. Judging from scattered stumps found throughout the area, Wyoming big sagebrush was once the dominant species, but has declined to only 640 plants/acre by 2003. Its patchy distribution has partially contributed to the changes in population between 1991 and 1994 when a larger sample was used to give a better estimate of population density. The Wyoming big sagebrush plants were moderately to heavily hedged in 1991 but more lightly used since. The larger sample used in 1994 also picked up some black sagebrush.

The winterfat population numbered around 1,200 plants/acre in 1994 and 1998. Utilization was heavy in 1991 but more moderate in 1994 and 1998. Use was extremely heavy in 2003, and the short stature of the plants (6 inches) is due to continued heavy use. Density declined to only 460 plants/acre in 2003. Vigor has remained normal on most plants during all readings and percent decadence has been low since 1998. Winterfat is as dense in the livestock exclosure as rabbitbrush is on the outside. Plants are large and vigorous measuring about 12 inches in height. Another preferred browse species, fourwing saltbush, is declining. In 1991, 100% of the fourwing were heavily hedged and all were considered decadent. Density declined by 57% from 932 plants/acre to 400 between 1985 and 1991. Density continued to decline in 1994 and 1998. By 2003 no fourwing was sampled. Fringed sagebrush has followed the same trend. Density has declined from 4,260 plants/acre in 1994 to only 140 plants/acre in 2003.

Narrowleaf low rabbitbrush and broom snakeweed are increasers of little value. Both increased substantially in 1991. Density of rabbitbrush increased to 11,140 plants/acre in 1994 and has remained relatively stable since. Broom snakeweed has fluctuated in density over the years and there may have been some identification problems with narrowleaf low rabbitbrush in 1991.

Composition of the herbaceous vegetation is extremely poor. Halogeton dominates the herbaceous understory. It was noted growing only along the road and was not encountered on the frequency belts in 1985. By 1994, halogeton had spread throughout the site and had a quadrat frequency of 32%. Nested frequency declined significantly by 1998, but halogeton was still the most numerous herbaceous plant on the site. Nested frequency increased significantly in 2003 and cover increased to 7%. Locoweed (*Astragalus* spp.) and one low fleabane were the only other perennial forbs found on the transect. Grasses are rare and only two species were encountered in 1998, bottlebrush squirreltail and Indian ricegrass. Grasses provided less than ½ of 1% cover on the site in 1998. No grasses were sampled in 2003.

1985 APPARENT TREND ASSESSMENT

Although there is a lot of bare soil and pavement exposed, the soil trend is basically stable because of the levelness of the terrain. Vegetative trend is downward. Desirable herbaceous perennials have been almost totally replaced by Russian thistle, an annual. The desirable browse species are being replaced by low-value invaders and increasers. This site should be rested from livestock grazing to allow the vegetative community to heal while there is still seed within the native seed bank for desirable browse species.

1991 TREND ASSESSMENT

The soil trend would have to be considered slightly downward because percent cover for pavement and bare ground have both increased, while litter cover decreased from 35 to only 13%. The more desirable species, Wyoming big sagebrush and winterfat, have contradicting trends. The Wyoming big sagebrush has increased by 39%, up to 3,732 plants per acre, while winterfat has decreased by 36%, now down to only 466 plants per acre. Twenty-nine percent of the winterfat is decadent and is not reproducing. Overall, there was a gain in browse, but low rabbitbrush and broom snakeweed both increased by a remarkably large 62% and 93% respectively. The trend for browse is going down with the large increases for weedy increaser species. There is only one perennial grass, bottlebrush squirreltail, which is quite small and only has a quadrat frequency of 21%. Forbs are mostly weedy invaders. Russian thistle has decreased significantly in nested frequency, which would have to be considered an improvement. However, halogeton has invaded the site and now has a quadrat frequency of 32%. The trend for the herbaceous understory is considered downward and extremely poor.

TREND ASSESSMENT

soil - slightly downward (2)

browse - downward (1)

herbaceous understory - downward (1)

1994 TREND ASSESSMENT

The soil trend now appears to be slightly improving with decreasing values for bare ground and rock cover and a slight increase in litter cover. Density of the key browse, Wyoming big sagebrush, declined from 3,732 plants/acre to 440, while winterfat density increased 58%, from 466 to 1,120 plants/acre. Fourwing saltbush also declined in density from 400 to 200 plants/acre. The larger sample used in 1994 is responsible for most of the changes in density. Shrubs on this site, especially sagebrush, occur in scattered clumps. The new, larger sample better estimates shrub populations which have this type of distribution. With this in mind, the key browse species appear to have stable populations. Wyoming big sagebrush displays lighter use and no decadence. Fourwing and winterfat also show lighter use and improved decadency rates. Increasers, narrowleaf low rabbitbrush and broom snakeweed, appear to have been misidentified during past readings. Combined, these species had a density of 25,264 plants/acre. This high density has declined to 13,760 plants/acre by 1994. These species are widespread over the whole site and density estimates between the old and new, larger sample should be comparable. With all of this in mind, trend for browse is stable. Trend for

the herbaceous understory is stable but with continued dominance by weedy species. Grasses are rare and produced less than ½ of 1% cover. Forbs are also lacking and dominated by halogeton and Russian thistle which provide 99% of the forb cover.

TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is down slightly with an increase in percent bare ground and pavement cover combined with a slight decline in litter cover. Erosion is not a problem however, due to the level terrain. Trend for the key browse species, black sagebrush, Wyoming big sagebrush, and winterfat appears stable. Use of these species is moderate, vigor is good, and decadence low. Fourwing saltbush does appear to be declining however. One positive trend indicator is the decline in abundance of narrowleaf low rabbitbrush and broom snakeweed. Rabbitbrush still has a high number of seedlings and young however. Trend for the herbaceous understory is stable even with a decline in the sum of nested frequency of forbs. Nested frequency of halogeton and Russian thistle have both declined significantly which is an improvement, but there are no forbs or grasses to replace them.

TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - stable, but poor (3)

2003 TREND ASSESSMENT

Trend for soil is down slightly and in very poor condition. Cover of bare ground has declined slightly but litter cover has also declined by 43% and vegetation cover has dropped slightly. Pavement cover is high and has remained similar to 1998 estimates. There is little protective ground cover on the site and recent rain has caused considerable erosion. The erosion condition class was determined to be moderate in 2003. Trend for browse is down. Density of black and Wyoming big sagebrush combined has declined slightly while percent decadence of both sagebrush species has increased. Fourwing saltbush was not sampled in 2003 and winterfat declined 67% to only 460 plants/acre. Use of winterfat was extremely heavy but vigor remained good. Recruitment was nonexistent however. Narrowleaf low rabbitbrush continues to dominate the site. Trend for the herbaceous understory is also down. No grasses were sampled in 2003 and halogeton increased significantly. It currently accounts for 98% of the total herbaceous cover. Only a few annual forbs were sampled. The nearby enclosure contains a high density of winterfat and little halogeton illustrating that the changes in trend are due primarily to past and present grazing pressure.

TREND ASSESSMENT

soil - down slightly (2)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 6

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	<i>Oryzopsis hymenoides</i>	-	-	-	2	-	-	.00	-
G	<i>Sitanion hystrix</i>	_b 17	_c 50	_{bc} 41	_{bc} 36	_a -	.44	.39	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		17	50	41	38	0	0.43	0.39	0
Total for Grasses		17	50	41	38	0	0.43	0.39	0
F	<i>Astragalus</i> spp.	8	5	4	-	-	.01	-	-
F	<i>Chenopodium fremontii</i> (a)	-	-	7	-	9	.02	-	.09
F	<i>Chenopodium leptophyllum</i> (a)	-	-	-	-	2	-	-	.01
F	<i>Descurainia</i> spp. (a)	-	-	-	1	-	-	.01	-
F	<i>Draba</i> spp. (a)	-	-	4	-	-	.01	-	-
F	<i>Eriogonum cernuum</i> (a)	-	-	-	-	-	-	-	.00
F	<i>Erigeron pumilus</i>	2	2	-	-	-	-	-	-
F	<i>Halogeton glomeratus</i> (a)	-	_a 74	_{bc} 97	_a 69	_b 120	2.83	1.65	7.03
F	<i>Lappula occidentalis</i> (a)	-	-	-	7	-	-	.01	-
F	<i>Polygonum douglasii</i> (a)	-	-	4	-	-	.00	-	-
F	<i>Salsola iberica</i> (a)	_c 216	_b 41	_b 55	_a -	_a -	1.01	-	-
Total for Annual Forbs		216	115	167	77	131	3.88	1.67	7.14
Total for Perennial Forbs		10	7	4	0	0	0.00	0	0
Total for Forbs		226	122	171	77	131	3.89	1.67	7.14

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

BROWSE TRENDS --

Management unit 25C, Study no: 6

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	<i>Artemisia frigida</i>	50	27	6	.56	.78	.06
B	<i>Artemisia nova</i>	7	8	3	.36	.96	.03
B	<i>Artemisia tridentata wyomingensis</i>	13	15	19	1.05	2.27	2.37
B	<i>Atriplex canescens</i>	9	4	0	-	-	-
B	<i>Ceratoides lanata</i>	29	30	18	.15	.37	.22
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	78	79	69	7.21	10.93	6.34
B	<i>Gutierrezia sarothrae</i>	25	5	26	.23	.09	.33
Total for Browse		211	168	141	9.56	15.42	9.36

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 6

Species	Percent Cover '03
<i>Artemisia nova</i>	.03
<i>Artemisia tridentata wyomingensis</i>	2.61
<i>Ceratoides lanata</i>	.28
<i>Chrysothamnus viscidiflorus stenophyllus</i>	8.75
<i>Gutierrezia sarothrae</i>	.23

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 6

Species	Average leader growth (in) '03
<i>Artemisia tridentata wyomingensis</i>	1.1

BASIC COVER --

Management unit 25C, Study no: 6

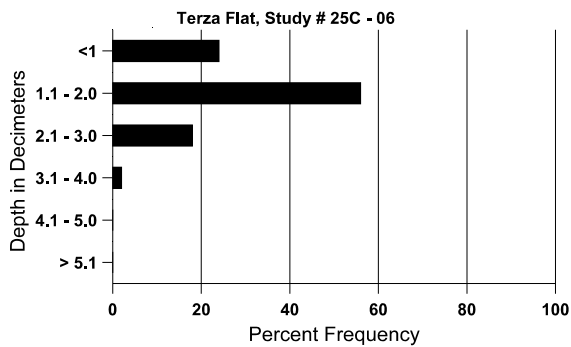
Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	2.50	6.50	13.80	17.43	16.77
Rock	2.50	3.75	6.61	6.38	9.92
Pavement	30.50	38.25	25.40	30.49	34.85
Litter	35.25	13.25	16.29	12.10	6.94
Cryptogams	0	0	.01	.20	.04
Bare Ground	29.25	38.25	33.95	43.59	38.86

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 6, Study Name: Terza Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.7	59.0 (15.0)	7.2	50.0	25.4	24.6	1.4	7.7	128.0	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 6

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'98	'03	'98	'03
Rabbit	74	64	39	-	-
Elk	4	6	-	9 (22)	1 (2)
Deer/Antelope	20	51	6	56 (138)	11 (26)
Cattle	-	1	-	3 (7)	1 (2)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 6

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>											
85	5933	466	600	5333	-	-	0	0	0	0	11/12
91	35799	1200	10133	25400	266	-	5	1	1	.18	4/6
94	4260	-	160	2980	1120	980	0	0	26	18	2/4
98	1320	4240	300	1000	20	-	20	5	2	0	4/6
03	140	-	-	140	-	-	0	14	0	0	4/5
<i>Artemisia nova</i>											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	460	-	-	460	-	120	0	0	0	0	12/21
98	360	-	40	300	20	20	39	0	6	0	11/18
03	60	-	-	20	40	-	33	0	67	0	15/24
<i>Artemisia tridentata wyomingensis</i>											
85	2265	2400	1866	333	66	-	0	0	3	0	15/17
91	3732	-	266	3200	266	-	45	16	7	4	9/15
94	440	-	-	440	-	160	9	0	0	0	11/20
98	520	-	60	380	80	20	19	4	15	0	17/29
03	640	-	20	420	200	40	9	3	31	19	21/36
<i>Atriplex canescens</i>											
85	932	-	133	733	66	-	14	7	7	0	12/12
91	400	-	-	-	400	-	0	100	100	100	-/-
94	200	-	-	200	-	-	10	40	0	0	6/6
98	80	-	80	-	-	-	25	0	0	0	-/-
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Ceratoides lanata</i>											
85	732	-	66	666	-	-	0	0	0	0	5/4
91	466	-	-	333	133	-	29	43	29	14	4/4
94	1120	-	-	860	260	80	36	0	23	9	4/5
98	1380	60	160	1200	20	-	48	20	1	1	3/5
03	460	-	-	440	20	-	0	91	4	4	6/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus stenophyllus											
85	1733	533	1000	733	-	-	0	0	0	0	7/11
91	4598	-	1666	2466	466	-	23	4	10	1	8/13
94	11140	660	1480	8920	740	960	0	0	7	3	6/14
98	10920	720	2800	6680	1440	420	.73	0	13	3	8/14
03	9200	-	240	8240	720	240	0	1	8	4	8/13
Gutierrezia sarothrae											
85	1999	-	533	1466	-	-	0	0	0	0	9/11
91	30666	200	4800	25533	333	-	0	0	1	.86	7/10
94	1300	40	20	1060	220	2020	0	0	17	8	5/6
98	120	580	-	120	-	20	0	0	0	0	5/6
03	720	-	-	720	-	-	0	0	0	0	6/9
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	6/12
03	0	-	-	-	-	-	0	0	-	0	-/-
Rosa woodsii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	6/16
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 25C-7-03

Study site name: Cedar Grove.

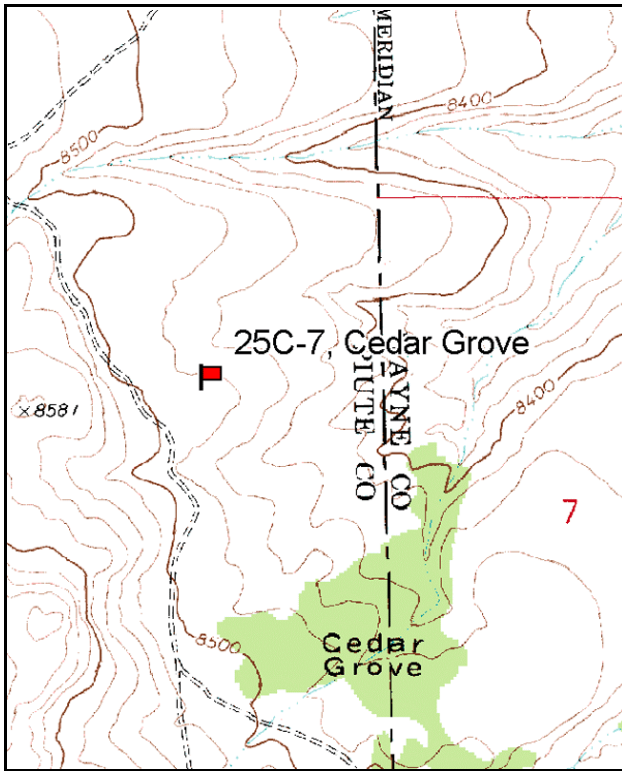
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

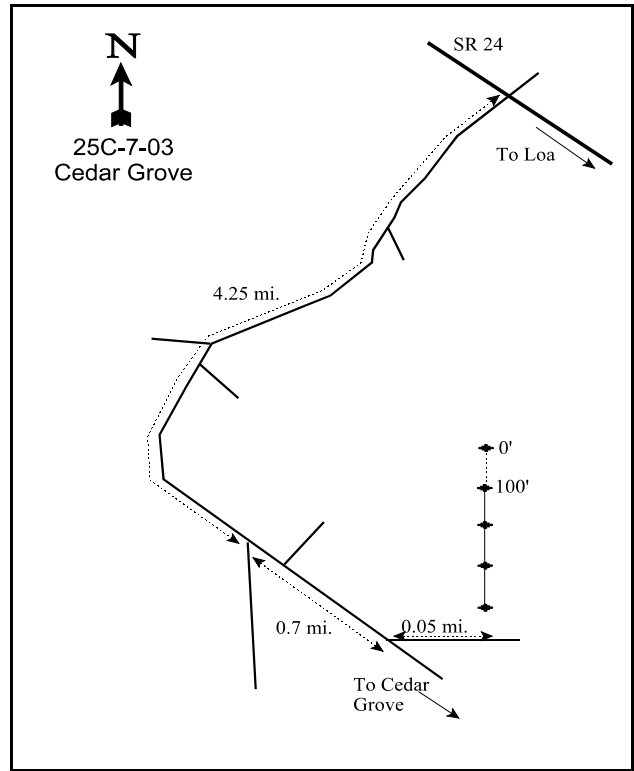
LOCATION DESCRIPTION

Head northwest out of Loa on SR24 for about 11 miles to the summit (marked by a sign, "elevation 8410 ft"). Turn left on a gravel road (Cedar Grove Road) and go 4.25 miles to a fork (West Cedar Grove Road). Turn left and continue 0.75 miles to a faint road to the left. Turn onto this road and go down 0.05 miles (about 55 paces) to a rebar 50 feet to the north of the road. This rebar is tagged #7179 and marks the 400-foot stake. The other stakes are marked by short (1-foot) rebar. The 0-foot baseline stake is 390 feet true north of the 400-foot stake. The 100-foot stake has a red browse tag #7178 attached.



Map Name: Abes Knoll

Township 28S, Range 1W, Section 1



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4249577 N, 425524 E

DISCUSSION

Cedar Grove - Trend Study No. 25C-7

The Cedar Grove trend study is located on the east side of Parker Mountain at an elevation of 8,500 feet on a slight southeast facing slope. The range type is sagebrush-grass. The area is good antelope habitat, and is also used by elk and deer in winter. There is little thermal or escape cover in the immediate area, but a stand of junipers 1/3 mile away provides some cover. The land was managed by the BLM in the past, but is now administered by State Lands and Forestry. Cattle were present in 1985 during study site establishment in mid-June and September of 1991. Sheep may have grazed through the section during the spring in years past. Pellet group data from the site in 1998 estimated 2 deer, 25 elk and 4 cow days use/acre (5 ddu/ha, 62 edu/ha, and 10 cdu/ha). A few antelope pellet groups were also encountered. Rabbit sign was very abundant. Pellet group data from 2003 estimated 8 deer/antelope, 25 elk, and 8 cow days use/acre (20 ddu/ha, 61 edu/ha, and 20 cdu/ha). Most of the deer and elk pellet groups were from winter use and cow use appeared to be from the previous summer ('02).

The soil is very rocky, both above and below the surface. It is fairly shallow with an estimated effective rooting depth of just 8 inches. There is a hardpan at about 7 to 8 inches in depth. This must not be a very restrictive rooting barrier over the whole site due to the presence of mountain big sagebrush mixed in with the black sagebrush. Soil texture is a loam which is slightly acidic in reaction (pH 6.1). Parent material is basalt. Bare soil is exposed in the shrub interspaces as litter is found only under the vegetation. Rock and pavement cover is high accounting for more than 1/3 of the ground cover. Erosion is not a problem due to adequate protective ground cover and the gentle terrain.

The key and dominant browse are black sagebrush and mountain big sagebrush which appear to be hybridizing. The black sagebrush is the most abundant species, numbering around 4,000 plants/acre in 1998 and 2003. Mature plants average 1 foot in height and received moderate to heavy use in 1991 and 1998. Use was mostly light in 2003. Mountain big sagebrush is about one-half as abundant with a density of 2,440 plants/acre in 1998 and 2,780 in 2003. It also has shown moderate to heavy hedging during past readings. Both sagebrush species have fairly high numbers of decadent plants with mountain big sagebrush maintaining a higher level of decadence. Over half of the population was classified as decadent in 2003 and 51% of those were rated as dying (>50% crown death). Black sagebrush is also apparently feeling the effects of several years of drought. Over 1/3 of the population was decadent in 2003 and 56% of those were classified as dying. Other browse species include narrowleaf low rabbitbrush, slenderbush eriogonum, broom snakeweed, bitterbrush, snowberry, and gray horsebrush. These are found in small numbers and do not appear to be increasing.

Grasses on the site do not produce much forage, but mutton bluegrass (*Poa fendleriana*) is very common with a quadrat frequency of 82% in 1998 and 2003. Bottlebrush squirreltail and blue grama are also fairly common and had been grazed by cattle in the past. Forbs are diverse but low in numbers. None are abundant enough to be an important forage source.

1985 APPARENT TREND ASSESSMENT

Soil trend appears relatively stable. Vegetative trend appears stable, but there is potential for the range condition to deteriorate unless the reproduction of big sage improves. Grazing should be closely monitored each year and terminated when livestock begin to take significant and excessive amounts of key browse.

1991 TREND ASSESSMENT

Most basic cover parameters are fairly stable, with a slight increase in bare ground and rock cover, and a

decrease in vegetative cover. Soil trend would be considered stable. The key browse, black sagebrush and Wyoming sagebrush, show increases in population density and in the proportion of heavily hedged plants. Trend for browse would be stable. Trend for herbaceous understory would be slightly upward as 10 of the 20 species indicate upward increases in abundance.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

1998 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground from 24% to 16%. Rock and pavement cover has also declined from 53% to 33% and litter cover increased slightly. Trend for browse is mixed. Black sagebrush appears to have a stable trend. Density estimates are lower compared to 1991, but some of the difference is due to the larger sample used in 1998. There were only 240 dead plants sampled in 1998 which does not completely account for the nearly 3,000 plants/acre decline in density. Utilization is lighter, vigor improved and percent decadence lower at 16%. Mountain big sagebrush appears to be declining with a 20% decrease since 1991. The number of dead plants (460) appear to support the actual decline in density. Utilization and percent decadence are similar to 1991 levels, but vigor is poor on 15% of the population compared to 2% in 1991. In addition, 27% of the decadent plants sampled were classified as dying. Recruitment is poor and not enough to maintain the population. This is probably a marginal site for mountain big sagebrush. Overall, the browse trend is considered slightly down. Trend for the herbaceous understory is down slightly since the sum of nested frequency of perennial grasses and forbs has declined slightly. Nested frequency of blue grama and bottlebrush squirreltail have decreased significantly while frequency of mutton bluegrass has remained similar.

TREND ASSESSMENT

soil - up slightly (4)

browse - down slightly (2)

herbaceous understory - down slightly (2)

2003 TREND ASSESSMENT

Trend for soil is down slightly. Cover of vegetation and litter have declined slightly while cover of bare ground increased 40%. Erosion is not a problem however due to the level terrain and adequate protective ground cover. Trend for the key browse species, black and mountain big sagebrush, is down slightly. Densities of both species are similar to 1998 estimates but poor vigor has increased and the number of decadent plants has risen. Just over 1/3 of the black sagebrush were classified as decadent and 56% of those were rated as dying (>50% crown death). Recruitment is nonexistent. Mountain big sagebrush has a decadence rate of 53% with 51% classified as dying. Young recruitment is currently poor indicating a possible decline in the future. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses has declined slightly with a significant decline in Carex. Mutton bluegrass is still dominant and contributes 88% of the total grass cover. It has remained stable in frequency. Sum of nested frequency of perennial forbs has declined with several species declining significantly. Overall forbs are insignificant and contribute less than 2% cover. The most abundant forbs are low value species.

TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 7

Type	Species	Nested Frequency			Average Cover %	
		'91	'98	'03	'98	'03
G	Agropyron smithii	-	1	2	.03	.00
G	Agropyron spicatum	14	5	4	.05	.18
G	Bouteloua gracilis	_b 41	_a 14	_a 15	.28	.52
G	Carex spp.	_A -	_b 31	_a 10	.18	.01
G	Poa fendleriana	213	225	216	9.03	7.77
G	Sitanion hystrix	_b 139	_a 47	_a 35	.44	.32
G	Stipa lettermani	-	-	3	-	.04
Total for Annual Grasses		0	0	0	0	0
Total for Perennial Grasses		407	323	285	10.02	8.85
Total for Grasses		407	323	285	10.02	8.85
F	Antennaria rosea	-	2	1	.00	.00
F	Androsace septentrionalis (a)	-	_b 57	_a 20	.39	.07
F	Arabis demissa	_c 44	_b 11	_a -	.03	-
F	Astragalus convallarius	-	-	1	-	.03
F	Astragalus spp.	_{ab} 8	_b 15	_a 3	.09	.00
F	Calochortus nuttallii	5	-	2	-	.00
F	Chaenactis douglasii	-	3	-	.00	-
F	Cruciferae	-	-	7	-	.01
F	Cryptantha spp.	_b 15	_a 4	_a -	.01	-
F	Cymopterus spp.	4	1	-	.00	-
F	Descurainia pinnata (a)	-	-	3	-	.00
F	Erigeron eatonii	_b 39	_b 33	_a 1	.14	.00
F	Erigeron pumilus	_a 16	_b 28	_a 8	.25	.01
F	Holosteum umbellatum (a)	-	-	2	-	.00
F	Hymenoxys richardsonii	_b 15	_a -	_a -	-	-
F	Lappula occidentalis (a)	-	-	3	-	.00
F	Lomatium triternatum	_c 60	_a -	_b 9	-	.02
F	Lotus utahensis	-	1	-	.00	-
F	Lygodesmia spinosa	22	19	19	.36	.50
F	Microsteris gracilis (a)	-	-	3	-	.03
F	Phlox austromontana	_a 2	_b 20	_{ab} 14	.42	.23
F	Phlox longifolia	_a 13	_b 50	_a 19	.16	.08
F	Polygonum douglasii (a)	-	1	-	.00	-
F	Senecio multilobatus	1	3	-	.01	-

Type	Species	Nested Frequency			Average Cover %	
		'91	'98	'03	'98	'03
F	Trifolium spp.	b ⁹	a ⁻	ab ³	.00	.01
Total for Annual Forbs		0	58	31	0.39	0.12
Total for Perennial Forbs		253	190	87	1.50	0.93
Total for Forbs		253	248	118	1.90	1.05

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

BROWSE TRENDS --

Management unit 25C, Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	81	70	7.40	11.75
B	Artemisia tridentata vaseyana	73	71	7.71	9.65
B	Chrysothamnus viscidiflorus stenophyllus	3	10	-	.07
B	Eriogonum microthecum	8	9	.01	.01
B	Gutierrezia sarothrae	8	7	.04	.00
B	Leptodactylon pungens	0	1	-	-
B	Pediocactus simpsonii	0	3	-	.00
B	Tetradymia canescens	1	0	-	-
Total for Browse		174	171	15.17	21.50

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 7

Species	Percent Cover
	'03
Artemisia nova	13.19
Artemisia tridentata vaseyana	7.36
Eriogonum microthecum	.01

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 7

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	1.3

BASIC COVER --

Management unit 25C, Study no: 7

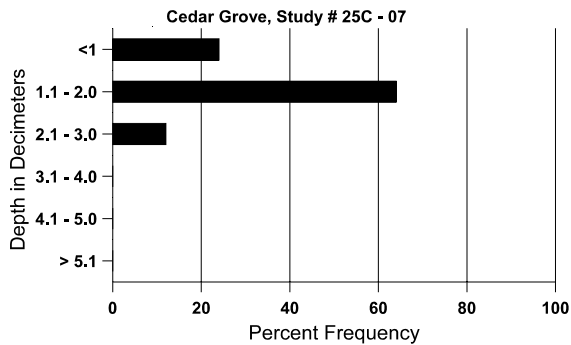
Cover Type	Average Cover %		
	'91	'98	'03
Vegetation	6.25	32.63	28.45
Rock	19.50	9.01	12.55
Pavement	24.50	24.20	23.00
Litter	24.00	27.92	21.27
Cryptogams	2.00	.39	.93
Bare Ground	23.75	16.36	22.84

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 7, Study Name: Cedar Grove

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
7.9	60.0 (9.8)	6.1	48.0	29.4	22.6	2.4	16.9	195.2	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 7

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	31	58	-	-
Elk	9	11	25 (62)	25 (61)
Deer/antelope	7	8	2 (5)	8 (20)
Cattle	-	1	4 (10)	8 (20)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 7

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
91	7066	133	1333	3133	2600	-	42	20	37	16	12/15
98	4120	80	240	3240	640	240	12	12	16	5	12/22
03	4000	-	-	2740	1260	580	6	.50	32	18	12/23
<i>Artemisia tridentata vaseyana</i>											
91	3065	466	733	866	1466	-	33	17	48	2	18/25
98	2440	40	40	1360	1040	460	37	20	43	15	17/26
03	2780	-	40	1260	1480	400	13	4	53	27	20/30
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
91	198	-	66	66	66	-	0	0	33	0	4/4
98	60	-	-	60	-	-	0	0	0	0	8/9
03	440	20	80	360	-	-	0	0	0	0	6/5
<i>Eriogonum microthecum</i>											
91	133	-	-	133	-	-	100	0	-	0	1/3
98	260	-	40	220	-	-	0	0	-	0	6/8
03	280	-	-	280	-	-	50	36	-	0	5/6
<i>Gutierrezia sarothrae</i>											
91	133	66	133	-	-	-	0	0	-	0	-/-
98	220	-	-	220	-	-	0	0	-	0	9/8
03	240	-	60	180	-	-	0	0	-	0	4/5
<i>Leptodactylon pungens</i>											
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	6/4
<i>Pediocactus simpsonii</i>											
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	-	0	1/1
<i>Purshia tridentata</i>											
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	30/89
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus											
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	19/49
03	0	-	-	-	-	-	0	0	-	0	-/-
Tetradymia canescens											
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	100	0	-	0	4/5
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 25C-8-03

Study site name: South Narrows .

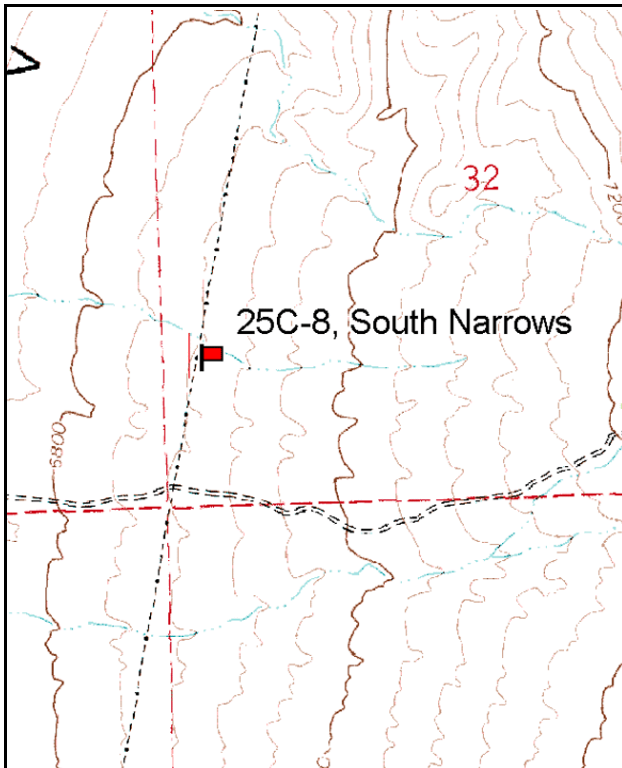
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 180 degrees magnetic.

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

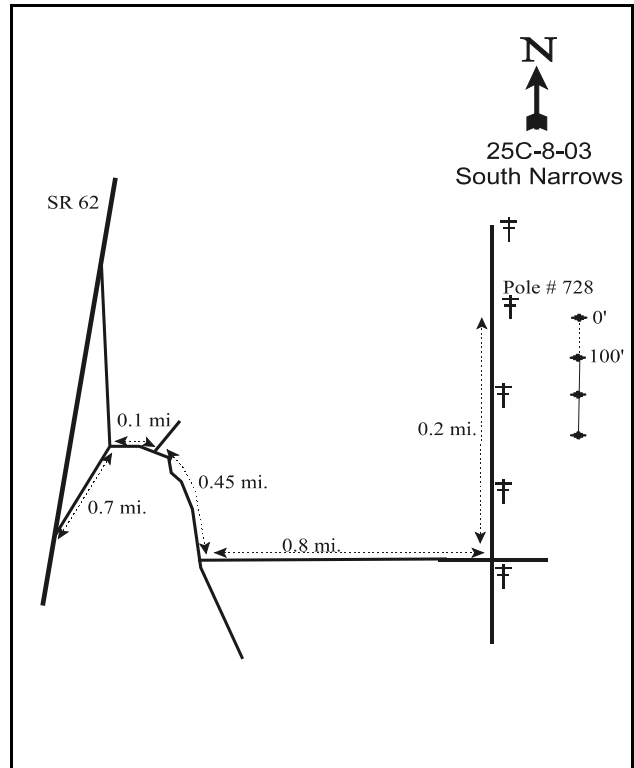
LOCATION DESCRIPTION

Proceed south of Koosharem on SR62. Turn left (east) 0.5 miles south of mile marker 24. Go northeast 0.7 miles and turn right. Go east 0.1 miles to another fork and turn right. Go 0.45 miles and turn left just across the creek (Otter Creek). Go 0.8 miles east and turn left. Drive parallel to the powerline (north) for 0.2 miles to pole #728. The frequency baseline begins 100 feet east of this powerpole. The 0-foot baseline stake is tagged #7120. All stakes are rebar.



Map Name: Parker Knoll

Township 28S, Range 1W, Section 32



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4242347 N, 418231 E

DISCUSSION

South Narrows - Trend Study No. 25C-8

The South Narrows trend study is located west of Parker Mountain in Grass Valley at an elevation of 6,900 feet. The foothills slope gently west-southwest toward Otter Creek about ½ mile away. The range type is Wyoming big sagebrush-grass in association with scattered pinyon-juniper. Mule deer and elk use the area for winter range. The level of browsing and number of pellet groups indicate a low level of use with 13 deer and 14 elk days use/acre estimated in 1991 (32 ddu/ha and 35 edu/ha). Pellet group data from the site in 1998 estimated a higher level of deer use at 30 days use/acre (74 ddu/ha), but elk use was similar to 1991 at 16 days use/acre (40 edu/ha). Pellet group data from 2003 show very similar deer and elk use compared to 1998 estimates at 29 deer and 17 elk days use/acre (73 ddu/ha and 41 edu/ha). Security and thermal cover are lacking except for a few pinyon-junipers along the washes. Livestock have grazed here heavily in the past, yet use levels were estimated at only 3 cow days use/acre in 1998 and 9 days use/acre in 2003 (7 cdu/ha and 22 edu/ha).

Soil is very rocky and relatively shallow with an effective rooting depth estimated at only 9 inches. Parent material is basalt and the dark colored rocks and pavement are common on the surface providing 41% cover in 1998 and 2003. Rock ranges in size from small gravel to large boulders, and is found throughout the soil profile. Stoniness index data show rock to be concentrated from the surface down to about 4 inches. Due to the high rock content, average soil temperature is high at nearly 70°F at an average depth of 8.5 inches in 1998. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.3). Litter cover is clustered under sagebrush plants. There is some evidence of soil movement, although erosion is not severe on the site. Two washes run through the transect area which channel water into Otter Creek during heavy runoff events.

The key species is Wyoming big sagebrush, which provides nearly all of the browse cover on the site. Density has ranged between 3,665 plants/acre in 1985 to 4,440 in 2003. Utilization has been moderate to heavy over the years with the heaviest use reported in 1985. Percent decadence has remained fairly steady averaging 35% between 1985 and 1998. Drought conditions have caused the number of decadent plants to increase to 56% in 2003. Plants displaying poor vigor was relatively high at 20% in 1991 and 31% in 2003, both drought years. An average of 42% of the decadent plants sampled between 1991 and 2003 were classified as dying but the population has remained stable due to adequate young recruitment. Young recruitment was poor in 2003 suggesting that the population may decline in the future. The only other shrubs found on the site include low numbers of broom snakeweed, winterfat, and 2 species of cactus.

As with the browse, species diversity of herbaceous plants is low. The only common perennial grasses found on the site include blue grama and needle-and-thread. These 2 species provided 97% of the grass cover in 2003. Indian ricegrass and bottlebrush squirreltail are found in small numbers. Forbs are lacking. Total forb cover has totaled less than ½ of 1% since 1994.

1985 APPARENT TREND ASSESSMENT

Soil trend appears stable. Vegetative trend also appears stable, but could be improving under reduced livestock grazing. An increase in grass density, especially needle-and-thread and Indian ricegrass, is desirable to improve early spring forage, but the rockiness of the soil may be limiting to the site potential.

1991 TREND ASSESSMENT

Soil trend would be slightly down, regardless of the changes in the rock and pavement values which negate one another. There were substantial losses in litter cover and increases in percent bare ground. There are not many browse species on this site, but the key species, Wyoming big sagebrush, has increased its density by

26% with a slight increase in rate of decadency. This would be expected with the drought. The browse trend is considered slightly improving. The herbaceous understory is stable with a slight increase in the nested frequency of perennial grasses. One problem on this site is that there are no forbs.

TREND ASSESSMENT

soil - down slightly (2)

browse - up slightly (4)

herbaceous understory - stable but poor (3)

1994 TREND ASSESSMENT

The soil trend would be considered stable since the percent of rock-pavement cover has decreased and percent bare ground has also decreased from 23% to 16%. Litter cover has declined slightly. The browse trend is regarded as stable even with the slight decrease in the Wyoming big sagebrush population (12%). Use remains mostly light to moderate and vigor normal on most plants. Young recruitment is marginal. Trend for the herbaceous understory is up slightly. Sum of nested frequency of grasses continues to increase including a significant increase in the nested frequency of Indian ricegrass. Some forbs were picked up this year but they are still lacking with a cover value of less than 1%.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

1998 TREND ASSESSMENT

Trend for soil appears stable with an increase in litter cover and a slight increase in percent bare ground. Trend for the key Wyoming big sagebrush is slightly down with a lower density, percent decadence still above 30%, and the percentage of decadent plants classified as dying increasing to 44%. Reproduction has improved. Trend for the herbaceous understory is stable. Sum of nested frequency of grasses has increased slightly while frequency of forbs has declined. Most of the drop in frequency of forbs is the result of a lack of annual forbs in 1998 compared to 1994.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - stable, but still lacking forbs (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Relative percent cover of vegetation, litter, and bare ground have remained similar to 1998 estimates. Trend for the key browse, Wyoming big sagebrush, is down. Even though the population has remained relatively stable since 1991, and has actually increased 12% since 1998, the sagebrush on this site is showing the effects of drought. Young recruitment is low, vigor is poor on 1/3 of the population, and percent decadence has increased to 56%. In addition, nearly half (46%) or 1,140 sagebrush per acre were rated as dying (>50% crown death). All data points to a decline in the sagebrush population in the future. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses has declined slightly (15%) but the dominant grasses, blue grama and needle-and-thread, remained stable. Nested frequency of bottlebrush squirreltail declined significantly. Total grass cover has remained nearly identical to 1998 estimates at about 13.5%. Forbs are still lacking.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 8

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	<i>Bouteloua gracilis</i>	284	296	289	274	266	12.30	9.30	10.01
G	<i>Bromus tectorum</i> (a)	-	-	_a 1	_b 14	_a -	.00	.06	-
G	<i>Oryzopsis hymenoides</i>	_a 6	_{ab} 16	_c 49	_{bc} 24	_{ab} 8	1.80	.36	.21
G	<i>Sitanion hystrix</i>	_{ab} 43	_b 52	_b 58	_b 58	_a 21	.88	.36	.12
G	<i>Sporobolus cryptandrus</i>	_a -	_a -	_b 8	_a 3	_a 1	.10	.03	.03
G	<i>Stipa comata</i>	_a 75	_a 95	_a 102	_b 165	_b 165	2.96	3.48	3.16
Total for Annual Grasses		0	0	1	14	0	0.00	0.06	0
Total for Perennial Grasses		408	459	506	524	461	18.05	13.55	13.54
Total for Grasses		408	459	507	538	461	18.05	13.61	13.54
F	<i>Astragalus</i> spp.	-	-	6	3	-	.04	.04	-
F	<i>Descurainia pinnata</i> (a)	-	-	_b 20	_a 2	_b 16	.05	.00	.15
F	<i>Draba</i> spp. (a)	-	-	_b 12	_{ab} 8	_a -	.03	.01	-
F	<i>Erigeron pumilus</i>	_a -	_a -	_b 10	_{ab} 9	_a -	.07	.06	-
F	<i>Lappula occidentalis</i> (a)	-	-	_c 62	_a 3	_b 27	.15	.01	.18
F	<i>Lepidium</i> spp. (a)	-	-	_b 20	_a -	_a -	.05	-	-
F	<i>Phlox hoodii</i>	-	-	-	-	1	-	-	.00
F	<i>Phlox longifolia</i>	-	-	3	-	-	.00	-	-
F	<i>Sphaeralcea coccinea</i>	-	-	-	-	3	-	-	.00
Total for Annual Forbs		0	0	114	13	43	0.28	0.02	0.33
Total for Perennial Forbs		0	0	19	12	4	0.12	0.10	0.00
Total for Forbs		0	0	133	25	47	0.40	0.13	0.34

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

BROWSE TRENDS --

Management unit 25C, Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia tridentata wyomingensis	88	84	91	11.14	10.00	14.18
B	Ceratoides lanata	0	1	1	-	-	-
B	Chrysothamnus nauseosus	0	1	0	-	-	-
B	Echinocereus spp.	0	0	0	.00	-	-
B	Gutierrezia sarothrae	0	0	1	-	-	.03
B	Juniperus osteosperma	0	1	0	.15	.03	-
B	Opuntia spp.	3	5	12	.00	.00	.36
B	Pediocactus simpsonii	0	6	2	-	.07	.01
Total for Browse		91	98	107	11.30	10.10	14.58

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 8

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	12.88
Opuntia spp.	.01

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 8

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.5

BASIC COVER --

Management unit 25C, Study no: 8

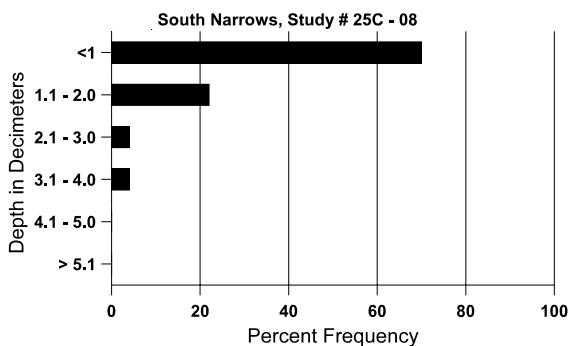
Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	11.00	13.25	27.00	27.67	28.39
Rock	17.50	25.50	25.76	25.90	25.40
Pavement	20.75	15.25	3.57	15.20	15.48
Litter	34.50	22.50	17.28	26.57	20.55
Cryptogams	2.25	.75	.33	.92	.51
Bare Ground	14.00	22.75	16.27	20.51	17.73

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 8, Study Name: South Narrows

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
8.5	69.6 (9.2)	6.3	54.0	31.4	14.6	1.5	13.5	105.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 8

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	17	18	23
Elk	7	11	5
Deer	24	37	23
Cattle	3	1	2

Days use per acre (ha)	
'98	'03
-	-
16 (40)	17 (41)
30 (74)	29 (73)
3 (7)	9 (23)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
85	3665	133	333	2466	866	-	67	20	24	5	12/19
91	4932	-	1133	1866	1933	-	47	9	39	20	15/21
94	4340	40	160	2660	1520	880	34	2	35	17	17/29
98	3900	20	540	2100	1260	840	38	10	32	14	18/30
03	4440	-	40	1920	2480	960	17	0	56	31	18/29

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Ceratoides lanata											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	9/6
03	20	-	-	20	-	-	0	0	-	0	6/10
Chrysothamnus nauseosus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	100	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Gutierrezia sarothrae											
85	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	-	0	0	0	0	7/11
03	20	-	-	-	20	-	0	0	100	0	-/-
Juniperus osteosperma											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Opuntia spp.											
85	200	-	-	200	-	-	0	0	-	0	2/2
91	199	-	133	66	-	-	0	0	-	0	2/4
94	60	20	-	60	-	-	0	0	-	0	2/3
98	100	-	40	60	-	-	0	0	-	0	4/6
03	260	-	-	260	-	-	0	0	-	8	4/10
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	140	20	40	100	-	-	0	0	-	0	1/2
03	40	-	-	40	-	-	0	0	-	0	2/3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pinus edulis											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	20	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Tetradymia canescens											
85	533	-	-	533	-	-	0	0	-	0	9/4
91	333	-	-	333	-	-	40	20	-	0	6/4
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

Trend Study 25C-9-03

Study site name: Dry Wash.

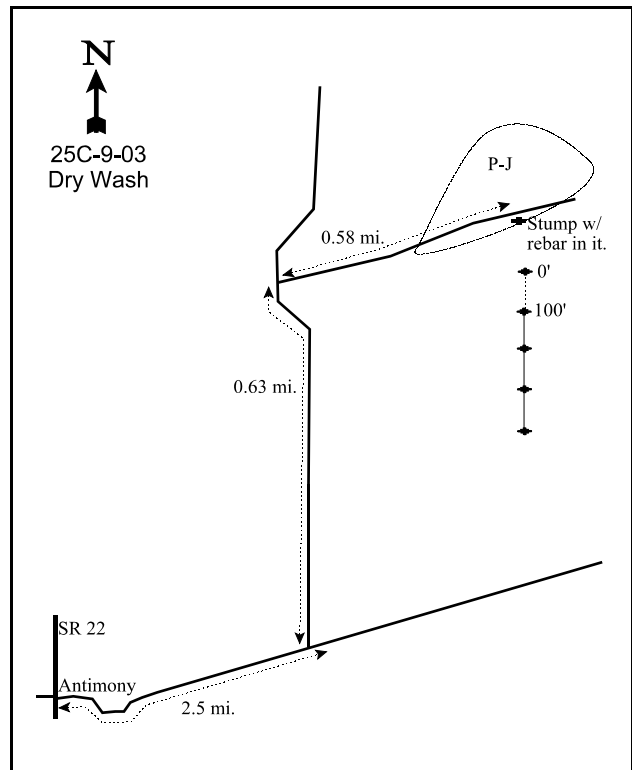
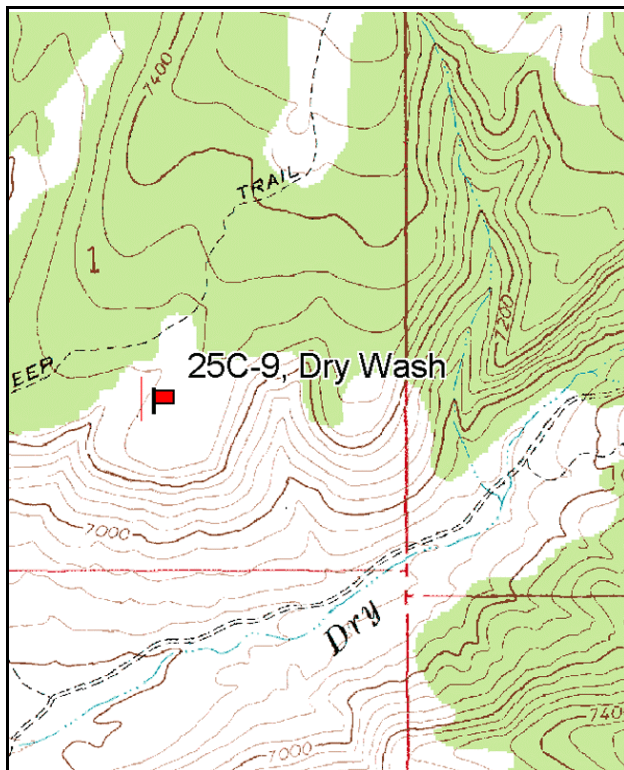
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the town of Antimony, go east on the dump road (off Main between the Antimony school and Antimony mercantile) 2.5 miles up Dry Wash Canyon then turn left. Go up the hill 0.63 miles to the top of the ridge and turn right. Go 0.58 miles to a small stump on the right side with tagged rebar #7176 on it. The baseline stake is 688 feet away at 165 degrees magnetic. Measure with a tape to make it easier to find the short rebar that marks the baseline. The 0-foot baseline stake is tagged #7177. The 100-foot end of the baseline is marked by a rebar that is actually 101 feet away because of rocks.



Map Name: Angle

Diagrammatic Sketch

Township 31S, Range 2W, Section 1

GPS: NAD 27, UTM 12S 4221048 N, 416184 E

DISCUSSION

Dry Wash - Trend Study No. 25C-9

The Dry Wash trend study is located on a rocky knoll east of the town of Antimony at an elevation of 7,300 feet. The transect runs up a 10% north facing slope which drops off at a steep, boulder-strewn cliff. The range type is Wyoming big sagebrush-grass. The trend study samples an island of Wyoming big sagebrush which receives concentrated use. Surrounding areas are dominated by increaser species including rabbitbrush, broom snakeweed, and pinyon-juniper. Grazing pressure from livestock has been very heavy on this BLM administered land in the past. There is also considerable use from deer, with an estimated 22 deer days use/acre estimated in 1991 (54 ddu/ha). Elk use was lower at only 5 elk days use/acre. Pellet group data from 1998 estimated a higher amount of big game use at 40 deer and 54 elk days use/acre (99 ddu/ha and 133 edu/ha). Cow use was estimated at only 4 days use/acre. Big game use increased in 2003 to 66 deer and 78 elk days use/acre (164 ddu/ha and 193 edu/ha). Cattle use remained low at 3 days use/acre (7 cdu/ha).

The site is very rocky but soils have fair depth with an effective rooting depth of 12 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.3). Parent material is basalt and these dark colored rocks cover half of the ground surface. Rocks are also common within the profile. Due to the high amounts of rock on the surface and within the profile, average soil temperature is fairly high, estimated at 70.8°F at a depth of almost 14 inches in 1998 and 64°F at 12 inches in 2003. Erosion is slight with low amounts of bare ground. There are no active gullies on the site.

The dominant browse species is Wyoming big sagebrush which provided 58% of the total shrub cover in 2003. There is also some black sagebrush on the site and hybridizing between the two species is taking place. However, all sagebrush has been classified as Wyoming big sagebrush. Population density was estimated at 4,660 plants/acre in 2003. The population is dynamic with excellent young recruitment during most readings. Utilization has been moderate to heavy with good vigor on most plants. The number of decadent plants has remained acceptable at around 15% with higher levels of 31% and 37% during the drought years of 1991 and 2003.

Other important browse species found on the site include winterfat and fourwing saltbush. Individual winterfat plants are small, averaging only 4 to 5 inches in height. It appears that much of the annual growth is utilized each year. Population density was fairly stable from 1985 - 1998, but declined substantially in 2003. Utilization was heavy in 1985 and 2003, moderate in 1991 and 1994, and moderate to heavy in 1998. Vigor has remained good and few decadent plants have been found on the site. Fourwing saltbush occurs in low numbers of about 350 plants/acre. It has showed continued heavy use, yet shows mostly normal vigor and low to moderate decadence.

The site also supports fairly large populations of broom snakeweed and narrowleaf low rabbitbrush. Pinyon and juniper trees are found scattered on the site at an estimated density of 33 pinyon and 18 juniper trees/acre in 1998. Average trunk diameter was 3.5 inches for both species.

The herbaceous understory is not very productive. Perennial grasses combined to produce only 6% cover in 1994, 7% in 1998, and 5% in 2003. The most common perennial grasses are blue grama and needle-and-thread grass. Indian ricegrass is also fairly abundant. Cheatgrass, an undesirable annual, was found in small numbers in 1994. It increased nearly 10 fold in nested frequency by 1998. It provided only 1.2% cover in 1998, increasing to 4% in 2003. Cheatgrass will likely increase unless there is significant competition from perennial grasses. Forbs are lacking and produced less than ½ of 1% cover in 1994 and 1998.

1985 APPARENT TREND ASSESSMENT

The soil trend appears stable. An increase in vegetative cover, especially growing between and around rocks

is desirable, but difficult to establish unless the site is rested. The key species, Wyoming big sagebrush, has a stable population and appears able to sustain it's current level of utilization. Winterfat is also a very important species here, but the heavy hedging and resulting poor vigor may reduce it's ability to maintain itself in the stand. A reduction in grazing and rest every third year should increase production of the winterfat and fourwing saltbush, as well as benefit the entire vegetative community.

1991 TREND ASSESSMENT

It appears that percent bare ground has decreased since 1985, but percent rock cover is increasing. Other soil parameters are similar to 1985 estimates so the trend is considered stable, but still in poor condition. The Wyoming big sagebrush population has declined by 18%, fourwing saltbush has declined by 34%, winterfat has declined by 33%, all indicating a slightly downward trend for browse. In addition, percent decadence increased to 31% for Wyoming big sagebrush. Broom snakeweed has decreased by a remarkable 94%, which is the only decrease that would be welcome on this site. Low rabbitbrush was the only browse species that increased in density since 1985 (42%). Overall trend for browse is considered slightly down. There are 10 herbaceous understory species, and only 3 species showed any increase. Dominant grasses, blue grama and needle-and-thread, declined but only needle-and-thread showed a significant decline in nested frequency. The herbaceous trend is considered downward.

TREND ASSESSMENT

soil - stable (3)

browse - slightly down (2)

herbaceous understory - down (1)

1994 TREND ASSESSMENT

Trend for soil is still stable, but in poor condition. Percent cover of bare ground is consistent with what it was estimated in 1985. Litter cover has continued to slowly decrease through time. The browse trend is mixed with broom snakeweed having an overall declining trend from 1985 and narrowleaf low rabbitbrush having remained fairly steady since 1991. Winterfat has had an interesting up and down change in it's density since 1985. Overall, it has increased by 8% since 1985. The key species with the highest relative cover value is Wyoming big sagebrush. It shows a slight decrease in it's density. Percent decadence has decreased to only 14% and the percentage of plants being moderately to heavily hedged has also decreased. Trend for browse is considered stable with the losses of sagebrush counterbalanced by the increase in winterfat and fourwing saltbush. The herbaceous understory trend is slightly up, considering the increase in sum of nested frequency for the grasses and forbs. Nested frequency of blue grama increased significantly. Forbs are still rare.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

1998 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics are similar to 1994 estimates. Cover of bare ground is low and erosion is minimal. The browse trend appears stable for the key species, Wyoming big sagebrush and winterfat. Density of Wyoming big sagebrush declined from 4,440 plants/acre in 1994 to 2,660 by 1998. Some of the change is due to a decline in young plants. Utilization was mostly light to moderate but heavier than 1994 estimates. Percent decadence is still low at only 15%, however 63% of those decadent plants were classified as dying (>50% crown death). Recruitment is good, with enough young plants present to replace the decadent/dying individuals. Winterfat density has declined 26% from the extremely high number of 18,520 plants/acre estimated in 1994. However, strip frequency and cover of winterfat increased suggesting

that density estimates in 1994 may have been overestimated. Utilization is heavier but vigor is good and there are no decadent plants. In addition, reproduction is good with 23% of the population consisting of young plants. Fourwing saltbush also shows heavier use compared to 1994 estimates and a slight decline in density. Overall, trend for browse is considered stable. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has remained similar to 1994 estimates while nested frequency of perennial forbs has increased slightly. One negative factor is the significant 10 fold increase in frequency of cheatgrass. It still only produces just over 1% cover, however a continued increase would be detrimental.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is up slightly. Average cover of vegetation and litter increased slightly while cover of bare ground declined to only 4%. Rock and pavement cover increased. Trend for browse is stable for Wyoming big sagebrush but down for winterfat. Density of sagebrush is similar to 1994 estimates. Utilization is moderate to heavy but vigor is normal on most plants. The number of decadent plants increased to 37% of the population and 34% of the decadent sagebrush were classified as dying. Recruitment is fair with 6% of the population consisting of young plants. However, this is not enough to replace all of the decadent & dying plants. Winterfat has declined 60% since 1998 from nearly 12,000 plants/acre to 4,760 plants/acre. Use was extremely heavy in 2003, but vigor remained good and decadence low. Another preferred shrub, fourwing saltbush, shows a stable trend. Taking all of these factors into consideration, trend for browse is considered slightly down. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses declined slightly with a significant decline in the frequency of Indian ricegrass and bottlebrush squirreltail. The most abundant perennial grasses, blue grama and needle-and-thread increased slightly. Perennial forbs are rare and have declined in nested frequency. Only 1 perennial forb was found on the site in 2003.

TREND ASSESSMENT

soil - up slightly (4)

browse - down slightly (2)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 9

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
G	<i>Bouteloua gracilis</i>	ab66	a54	b100	a53	ab91	3.13	2.19	2.37
G	<i>Bromus tectorum</i> (a)	-	-	a16	b154	b151	.06	1.20	3.86
G	<i>Oryzopsis hymenoides</i>	b116	b98	b109	b99	a46	1.21	1.02	.74
G	<i>Sitanion hystrix</i>	b76	b74	b79	b95	a32	.85	1.06	.31
G	<i>Sporobolus cryptandrus</i>	c31	b12	ab3	ab5	a-	.03	.18	-
G	<i>Stipa comata</i>	b100	a59	ab75	ab97	b111	.85	2.24	1.75

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'94	'98	'03	'94	'98	'03
	Total for Annual Grasses	0	0	16	154	151	0.06	1.20	3.86
	Total for Perennial Grasses	389	297	366	349	280	6.08	6.72	5.19
	Total for Grasses	389	297	382	503	431	6.15	7.92	9.05
F	Arabis demissa	3	-	-	-	-	-	-	-
F	Astragalus spp.	-	1	3	4	-	.03	.01	-
F	Castilleja spp.	-	-	-	1	-	-	.00	-
F	Chenopodium album (a)	-	c58	b20	a-	a-	.08	-	-
F	Cryptantha spp.	-	-	4	5	-	.01	.02	-
F	Descurainia pinnata (a)	-	-	b82	a-	b94	.17	-	.60
F	Erigeron pumilus	9	2	12	17	1	.05	.06	.03
F	Lappula occidentalis (a)	-	-	b61	a15	b61	.11	.03	.30
F	Salsola iberica (a)	a3	b59	a-	a-	a-	-	-	-
	Total for Annual Forbs	3	117	163	15	155	0.36	0.03	0.90
	Total for Perennial Forbs	12	3	19	27	1	0.09	0.10	0.03
	Total for Forbs	15	120	182	42	156	0.45	0.13	0.93

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

BROWSE TRENDS --

Management unit 25C, Study no: 9

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia tridentata wyomingensis	71	57	83	8.25	5.23	9.92
B	Atriplex canescens	15	12	13	2.01	.98	1.58
B	Ceratoides lanata	52	56	47	2.40	4.69	.78
B	Chrysothamnus nauseosus	0	1	2	-	-	-
B	Chrysothamnus viscidiflorus stenophyllus	24	34	31	1.63	2.69	.67
B	Gutierrezia sarothrae	33	38	59	.51	.97	1.05
B	Juniperus osteosperma	0	0	0	-	.15	-
B	Opuntia spp.	3	2	3	-	-	-
B	Pediocactus simpsonii	0	1	0	-	.03	-
B	Pinus edulis	0	1	8	1.00	2.11	3.06
	Total for Browse	198	202	246	15.82	16.87	17.09

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 9

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	7.58
Atriplex canescens	-	.96
Ceratoides lanata	-	.41
Chrysothamnus viscidiflorus stenophyllus	-	1.70
Gutierrezia sarothrae	-	.40
Opuntia spp.	-	.08
Pinus edulis	4.59	6.94

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 9

Species	Average leader growth (in)
	'03
Ceratoides lanata	3.6
Artemisia tridentata wyomingensis	1.7

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 9

Species	Trees per Acre	
	'98	'03
Pinus edulis	40	N/A

Average diameter (in)	
'98	'03
3.5	N/A

BASIC COVER --

Management unit 25C, Study no: 9

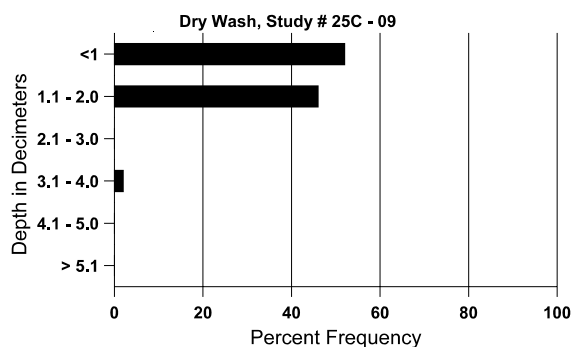
Cover Type	Average Cover %				
	'85	'91	'94	'98	'03
Vegetation	4.00	4.50	23.49	25.56	27.10
Rock	24.75	36.75	29.15	29.29	35.18
Pavement	24.75	20.75	11.21	20.95	21.31
Litter	34.50	30.50	27.61	23.70	24.66
Cryptogams	.75	0	.00	0	.66
Bare Ground	11.25	7.50	11.68	17.37	4.47

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 9, Study Name: Dry Wash

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.9	64.0 (11.7)	7.2	48.0	29.4	22.6	3.5	9.7	179.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 9

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	33	38	8
Horse	-	1	-
Elk	30	37	26
Deer	33	37	23
Cattle	-	4	1

Days use per acre (ha)	
'98	'03
-	-
-	-
54 (133)	78 (193)
40 (99)	66 (164)
4 (10)	3 (7)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 9

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	6598	5666	3666	1866	1066	-	46	19	16	8	14/18
91	5399	-	1600	2133	1666	-	48	15	31	9	13/20
94	4440	240	1080	2820	540	760	10	11	12	7	16/27
98	2660	240	700	1580	380	440	32	.75	14	9	13/21
03	4660	-	280	2660	1720	720	35	22	37	12	13/22

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Atriplex canescens											
85	199	-	-	133	66	-	33	67	33	0	13/14
91	132	-	66	66	-	-	0	50	0	0	23/9
94	460	-	40	360	60	-	22	4	13	9	22/28
98	340	-	60	240	40	-	65	12	12	6	20/27
03	360	-	20	240	100	-	44	33	28	6	22/27
Ceratoides lanata											
85	17066	3733	9200	7800	66	-	41	51	0	11	2/3
91	11399	-	3733	7666	-	-	68	0	0	0	8/5
94	18520	-	2040	16480	-	-	17	11	0	0	5/6
98	11900	-	2740	9160	-	-	62	29	0	0	4/5
03	4760	-	60	4680	20	120	21	71	0	0	5/5
Chrysothamnus nauseosus											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	60	-	-	-	0	0	-	0	-/-
03	60	-	40	20	-	-	67	0	-	0	-/-
Chrysothamnus viscidiflorus stenophyllus											
85	732	66	133	533	66	-	9	0	9	0	8/13
91	1266	-	333	533	400	-	21	0	32	5	7/11
94	1260	60	560	700	-	-	5	5	0	0	9/16
98	2820	-	480	2340	-	20	0	0	0	0	9/13
03	1480	-	-	1360	120	80	0	0	8	0	7/12
Gutierrezia sarothrae											
85	7798	4066	2866	4866	66	-	0	0	1	2	7/7
91	466	333	200	266	-	-	0	0	0	0	6/5
94	1360	-	300	1040	20	-	0	0	1	0	7/9
98	1320	20	260	1040	20	60	0	0	2	2	9/10
03	4040	160	1840	2080	120	160	2	0	3	1	6/7
Opuntia spp.											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	60	-	-	60	-	-	0	0	-	0	4/11
98	40	-	-	40	-	-	0	0	-	0	5/11
03	60	-	-	60	-	-	0	0	-	0	3/11

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii											
85	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	1/4
03	0	-	-	-	-	-	0	0	-	0	-/-
Pinus edulis											
85	133	-	133	-	-	-	0	0	-	0	-/-
91	133	-	133	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	160	-	20	140	-	-	0	0	-	0	-/-

Trend Study 25C-12-03

Study site name: Nazer Draw.

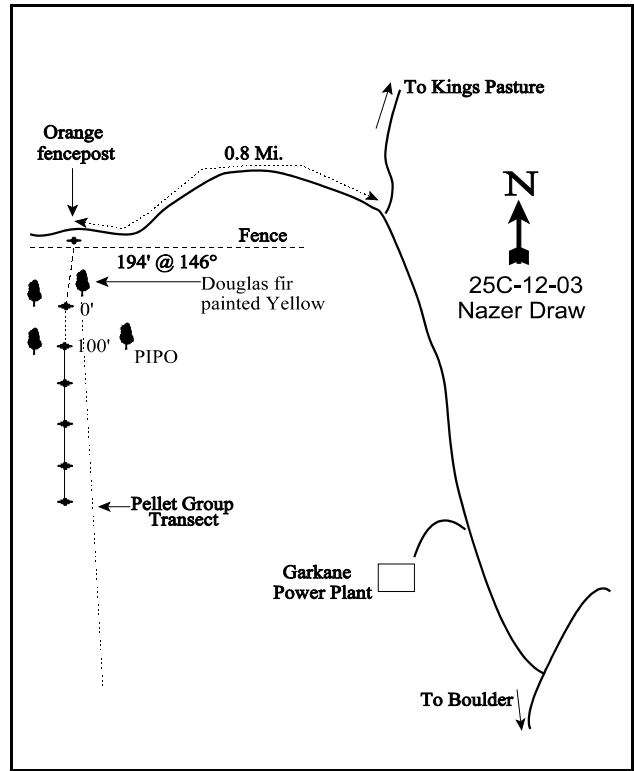
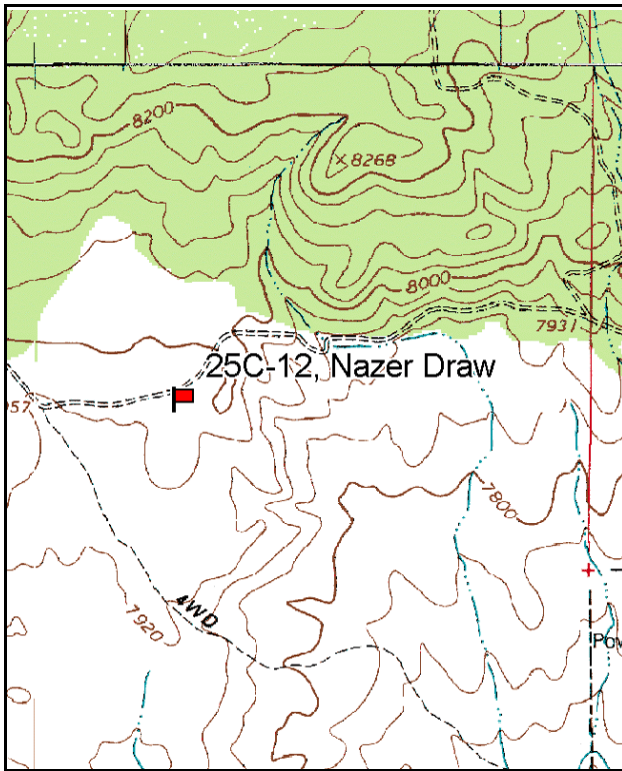
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 161 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). No rebar.

LOCATION DESCRIPTION

Travel north from Boulder on SR12 for approximately 5.0 miles to the Garkane Power Plant Road. Turn left (west) onto this road. Go 0.95 miles to a cattleguard. Continue 0.2 miles to a minor fork. Bear left onto a rough road and go 0.8 miles. This road is now closed so you now have to walk the 0.8 miles to the site. Stop along the fence by an orange fence post, which serves as a witness post for the range trend study and adjacent pellet group transect. The transect starts 195 feet south of the fence. The 0-foot baseline stake is a 1 1/2-foot tall fence post marked with browse tag #7131.



Map Name: Boulder Town

Diagrammatic Sketch

Township 32S, Range 4E, Section 27

GPS: NAD 27, UTM 12S 4204780 N, 460128 E

DISCUSSION

Nazer Draw - Trend Study No. 25C-12

The Nazer Draw study samples an open bench with a mixture of low-growing shrubs, mountain brush and grass. The study site is part of a 1,200 acre seeding project completed in 1955. It is surrounded by ponderosa pine, scattered clumps of oak, and slopes dominated by mountain brush. The site is used by big game year-round, but less so in the winter. Data from the nearby DWR pellet group transect shows moderate use at 32 days use/acre from 1990-91 to 1993-94 (79 ddu/ha) (Evans et al. 1995). Pellet group data taken along the study site baseline in 1998 estimated 27 deer, 9 elk, and 6 cow days use/acre (67 ddu/ha, 22 edu/ha and 15 cdu/ha). Cattle sign from 1998 appeared to be from previous summer. Rabbits also utilize the site in moderate numbers. Pellet group data from 2003 estimated similar use at 63 deer, 11 elk, and 5 cow days use/acre (155 ddu/ha, 26 edu/ha, and 13 cdu/ha). Most of the pellet groups appeared to be from spring/fall and summer use.

The almost level bench drains to the south to Boulder Creek and Nazer Draw. At the study site, the elevation is about 8,000 feet. Due to the level terrain, erosion potential is minimal. There has been some soil loss in the past as evidenced by the amount of pavement and rock on the soil surface. The soil is shallow with an effective rooting depth estimated at just over 10 inches. Texture is a sandy loam which is moderately acidic (pH 5.6) and contains a high percentage of coarse fragments in the profile. Parent material is basalt.

A variety of browse occur on the site including several preferred species. The most numerous shrub is black sagebrush which had a very high density of 19,540 plants/acre in 2003. The population is dynamic with abundant young recruitment and large numbers of seedlings encountered in most years. Plants are vigorous and have displayed mostly light to moderate use between 1987 and 1998. Very little use was observed during the 2003 reading. Percent decadence has steadily declined from 34% in 1987, to 22% in 1994 and 18% by 1998 and 2003.

Another key browse species is a low, spreading form of bitterbrush. Density was estimated at about 1,500 plants/acre in 1994 and 2003. These plants have received continual heavy use, especially in 1987 and 2003. Vigor was normal on most plants from 1987 to 1998, but drought conditions combined with extremely heavy use in 2003 have caused a decline in average vigor for 32% of the population. The number of decadent plants also increased from 4% in 1998 to 46% in 2003. Young recruitment has been variable through the years but is currently poor. These shrubs may also reproduce by layering. Annual leader growth was good in 2003 averaging 3.5 inches.

Scattered around the site but more abundant on the surrounding slopes are true mountain mahogany and serviceberry. Both species have been moderately to heavily hedged. Most of the mature serviceberry on the site are small averaging less than 2 feet in height, due in part to continual heavy use.

The oak clones are present around the site and were picked up with the larger sample used in 1994. The population appears relatively stable and provides good escape and thermal cover. Little use of oak has been noted during any reading. Other shrub species found on the site include dwarf rabbitbrush, stickyleaf low rabbitbrush, slenderbush eriogonum, and broom snakeweed. The site also supports some pinyon and Ponderosa pine trees. These appear to be moving into the site. The ponderosa pine population is still young with point-quarter data estimating approximately 33 trees/acre in 1998 and 32 in 2003. Pinyon pine numbered about 20 trees/acre during both readings. Average basal diameter of ponderosa pine was estimated at 6 inches in 1998 and 8 inches in 2003. Pinyon basal diameter averaged 3.5 inches during both readings. Drought conditions for the past few years caused several young ponderosa trees to display poor vigor in the form of brown needles in 2003.

Herbaceous plants are fairly abundant and diverse. Grasses provided 8% cover in 1994 while forbs produced only 3%. Production doubled in 1998 due to good precipitation. Grass cover nearly doubled to 14%, while

forb cover more than doubled to 8%. Drought conditions caused a 3 fold decrease in herbaceous cover in 2003. The most common species include crested wheatgrass, intermediate wheatgrass, blue grama, and bottlebrush squirreltail. Neither wheatgrass was on the Forest Service seed list which included smooth brome, orchardgrass, timothy, alfalfa, and clover. Crested wheatgrass showed moderate use in 2003. Nearly 30 species of forbs were present on the study site in 1994. Many of the more common species like the buckwheats, penstemon, and Indian paintbrush had shown signs of utilization by deer in 1991. Currently, the most abundant forb species include Carruth sage, redroot eriogonum, sulfur eriogonum, Utah deervetch, and owl clover.

1987 APPARENT TREND ASSESSMENT

Soil conditions appear stable. Protective ground cover is abundant leaving little exposed bare ground. The key browse species, black sagebrush has a high population density with good seedling and young recruitment. Use is light to moderate and vigor good on most plants. Percent decadence is relatively high but young plants are numerous enough to maintain the population. Serviceberry and bitterbrush are the most preferred shrubs on the site. They occur in small numbers and are heavily browsed. The herbaceous understory is abundant and diverse with a good mix of perennial grasses and forbs.

1991 TREND ASSESSMENT

Basic cover for rock, pavement, and bare ground have all slightly increased since 1987, while percent cover for litter and vegetation have both decreased. All principal parameters indicate a slightly downward trend for the soil. The key browse species, black sagebrush, antelope bitterbrush, and serviceberry, have all increased or stayed the same since 1987. The browse trend is up. The herbaceous understory has many species, but the few species that increased since the last inventory are in such low quadrat frequencies they would not effect the overall condition very much. The major decrease was with crested wheatgrass. Except for a small handful of forbs, most declined during the extended drought. Trend for the herbaceous understory would be slightly downward.

TREND ASSESSMENT

soil - slightly downward (2)

browse - up (5)

herbaceous understory - slightly downward (2)

1994 TREND ASSESSMENT

Soil conditions are similar to those of 1991 indicating a fairly stable soil trend. However, percent bare ground is still higher than that of 1987 and litter cover has steadily decreased. Soil trend is considered stable. The browse trend appears stable with healthy populations of black sagebrush and antelope bitterbrush. The 1994 data shows some differences in population estimates for the browse species due to the larger sample taken in 1994. This new sample is a better representation of the actual populations than the samples taken in 1987 and 1991, so changes don't necessarily represent actual changes in population densities. Sum of nested frequencies of herbaceous vegetation have remained stable since 1991, but they are still 21% lower than those of 1987. On the down side, the warm season increaser, blue grama is now the most abundant grass. Crested and intermediate wheatgrass declined slightly. Sum nested frequencies of forbs increased slightly. Trend for herbaceous understory is stable since 1991.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up with a decline in percent bare ground and an increase in litter cover from 35% to 55%. Vegetation cover also increased due to excellent herbaceous production this year. Trend for browse is stable. Black sagebrush appears to be increasing slightly while bitterbrush density has declined. Both species display good vigor and low decadence. Bitterbrush has excellent leader growth this year. Trend for the herbaceous understory is up slightly. Sum of nested frequency of grasses increased slightly with the biggest change being the significant decline of crested wheatgrass, an increase in frequency on intermediate wheatgrass and blue grama, and a significant increase in bottlebrush squirreltail. Sum of nested frequency of forbs also increased.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is stable with similar relative percent cover for vegetation, litter, and bare ground. Protective ground cover is abundant and erosion is not a problem on this site. Trend for browse is mixed. Trend for black sagebrush is up with an increase in density, excellent young recruitment, light use, and good vigor. Bitterbrush has remained stable in density compared to 1994 estimates, but use is extremely heavy and vigor poor on 32% of the population. Use combined with drought conditions have caused an increase in the number of decadent plants, up to 46% of the population. In addition, 58% of the decadent bitterbrush sampled were classified as dying (>50% of stems dead). Young recruitment is poor and the population will probably decline slightly in the future. Low numbers of serviceberry also occur on the site. These preferred shrubs also show heavy use and reduced vigor. Trend for browse is considered down slightly since the most preferred shrubs, bitterbrush and serviceberry, are showing signs of decline. An increase in the already thick population of black sagebrush would be considered detrimental at this site considering the elevation is nearly 8,000 feet. Perennial grasses and forbs along with highly preferred serviceberry and bitterbrush should be the key components of this site. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses has declined slightly but sum of nested frequency for perennial forbs has declined by 58%. Eleven of the 19 forbs sampled in 2003 declined significantly in nested frequency. Herbaceous production declined with perennial grass cover dropping by 56% while average forb cover fell 3 fold from 8% to 3%. These trends are caused by drought conditions which have effected the area for the past few years. Especially critical for herbaceous plants is spring precipitation (April to June) which has been below normal for the past 4 years.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 12

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	Agropyron cristatum	c190	b114	b110	a46	ab74	1.55	.98	.86
G	Agropyron intermedium	24	31	18	48	27	.25	1.27	.42
G	Bouteloua gracilis	a107	a104	ab152	b183	b168	5.54	9.67	4.21
G	Bromus inermis	10	7	4	4	-	.03	.15	-
G	Bromus tectorum (a)	-	-	-	-	1	-	-	.03
G	Carex spp.	-	-	1	6	-	.00	.44	-
G	Oryzopsis hymenoides	-	-	2	-	-	.03	-	-
G	Sitanion hystrix	b100	b90	a15	b79	b62	.88	1.44	.55
G	Stipa comata	3	4	-	-	3	-	-	.03
Total for Annual Grasses		0	0	0	0	1	0	0	0.03
Total for Perennial Grasses		434	350	302	366	334	8.30	13.95	6.08
Total for Grasses		434	350	302	366	335	8.30	13.95	6.11
F	Agoseris glauca	-	-	-	3	-	-	.00	-
F	Antennaria parvifolia	6	4	-	4	-	-	.15	-
F	Arabis spp.	a-	b12	a-	ab5	a-	-	.01	-
F	Artemesia carruthii	a17	a8	ab22	b36	a9	.20	.91	.25
F	Arabis demissa	-	5	-	-	-	-	-	-
F	Astragalus newberryi	6	2	-	6	-	-	.06	-
F	Castilleja chromosa	ab7	a-	ab4	b18	a1	.01	.37	.00
F	Castilleja linariaefolia	c37	ab4	ab3	b14	a-	.01	.21	-
F	Calochortus nuttallii	3	1	-	-	3	-	-	.03
F	Comandra pallida	c19	a5	ab8	bc21	a-	.04	.49	.00
F	Crepis acuminata	9	-	1	3	5	.03	.09	.01
F	Cryptantha spp.	ab5	bc13	c24	ab9	a-	.09	.09	-
F	Descurainia pinnata (a)	-	-	-	-	6	-	-	.01
F	Draba spp. (a)	-	-	-	-	1	-	-	.00
F	Eriogonum alatum	a5	ab9	ab18	b26	a5	.15	.35	.06
F	Erigeron divergens	a2	a5	a3	b38	a-	.01	.35	-
F	Eriogonum racemosum	87	83	83	98	62	.72	.96	.60
F	Eriogonum umbellatum	68	56	55	50	37	.82	.88	.57
F	Gayophytum ramosissimum(a)	-	-	b13	a-	a-	.03	-	-
F	Hymenoxys acaulis	1	-	3	11	-	.03	.09	-
F	Hymenoxys cooperi	3	-	1	2	-	.00	.15	-
F	Hymenopappus filifolius	-	4	-	-	-	-	-	-
F	Lepidium densiflorum (a)	b16	a-	a3	b39	a3	.00	.10	.03

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
F	<i>Linum lewisii</i>	-	3	5	6	7	.06	.05	.02
F	<i>Lomatium</i> spp.	3	-	-	3	5	-	.00	.01
F	<i>Lotus utahensis</i>	_b 32	_b 24	_c 57	_b 30	_a -	.43	.75	-
F	<i>Lupinus kingii</i> (a)	_b 7	_a -	_{ab} 1	_b 10	_a -	.00	.31	-
F	<i>Lychnis drummondii</i>	-	-	3	2	-	.00	.00	-
F	<i>Lygodesmia spinosa</i>	_a -	_a -	_b 13	_{ab} 8	_a 2	.20	.04	.03
F	<i>Oenothera pallida</i>	_b 16	_{ab} 5	_b 15	_{ab} 6	_a -	.05	.03	-
F	<i>Orthocarpus purpureo-albus</i> (a)	_b 7	_{ab} 7	_a -	_c 46	_c 35	-	1.12	.52
F	<i>Penstemon comarrhenus</i>	_b 73	_a 30	_a 13	_a 40	_a 6	.08	.34	.05
F	<i>Penstemon</i> spp.	_a 4	_a -	_b 15	_a -	_{ab} 6	.06	-	.01
F	<i>Phlox longifolia</i>	_{ab} 58	_b 61	_{ab} 49	_a 33	_{ab} 40	.14	.15	.24
F	<i>Polygonum douglasii</i> (a)	-	-	-	8	-	-	.07	-
F	<i>Sphaeralcea coccinea</i>	_b 10	_b 13	_b 10	_a -	_b 10	.19	-	.10
F	<i>Taraxacum officinale</i>	-	-	4	-	-	.03	-	-
F	<i>Townsendia incana</i>	-	-	1	3	-	.00	.00	-
F	<i>Tragopogon dubius</i>	1	-	-	-	-	-	-	-
F	Unknown forb-perennial	-	3	-	-	-	-	-	-
Total for Annual Forbs		30	7	17	103	45	0.03	1.60	0.57
Total for Perennial Forbs		472	350	410	475	198	3.39	6.59	2.01
Total for Forbs		502	357	427	578	243	3.43	8.20	2.59

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

BROWSE TRENDS --

Management unit 25C, Study no: 12

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Amelanchier utahensis	2	5	4	.30	.45	.53
B	Artemisia nova	95	90	97	17.12	17.40	25.88
B	Cercocarpus montanus	1	0	0	-	-	-
B	Chrysothamnus depressus	11	5	4	.06	.48	.09
B	Chrysothamnus viscidiflorus viscidiflorus	13	16	13	.36	1.11	.72
B	Eriogonum microthecum	16	26	22	.13	.80	.25
B	Gutierrezia sarothrae	2	17	8	.06	.42	.21
B	Opuntia spp.	2	0	0	-	-	-
B	Pediocactus simpsonii	0	10	9	-	.03	.03
B	Pinus edulis	0	1	0	-	-	-
B	Pinus ponderosa	0	4	2	.18	.31	.30
B	Purshia tridentata	35	15	34	7.43	5.48	7.10
B	Quercus gambelii	0	17	13	2.47	5.36	3.19
B	Sclerocactus	0	4	0	-	-	-
B	Tetradymia canescens	0	1	2	-	-	-
Total for Browse		177	211	208	28.14	31.87	38.32

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 12

Species	Percent Cover
	'03
Amelanchier utahensis	.18
Artemisia nova	25.63
Chrysothamnus viscidiflorus viscidiflorus	.68
Eriogonum microthecum	.16
Gutierrezia sarothrae	.15
Pediocactus simpsonii	.05
Pinus edulis	.03
Pinus ponderosa	.55
Purshia tridentata	6.06
Quercus gambelii	4.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 12

Species	Average leader growth (in)
	'03
Artemisia nova	1.2
Purshia tridentata	3.5

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 12

Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Pinus edulis	20	20	3.5	3.5
Pinus ponderosa	33	32	6.0	7.9

BASIC COVER --

Management unit 25C, Study no: 12

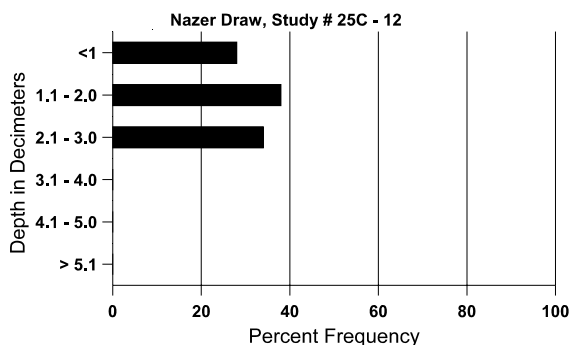
Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	10.75	7.75	33.47	49.48	42.52
Rock	7.00	8.00	14.85	15.41	14.18
Pavement	10.75	13.00	4.99	12.05	6.04
Litter	62.25	58.50	34.90	54.52	42.09
Cryptogams	0	0	.00	0	.38
Bare Ground	9.25	12.75	12.34	10.12	10.93

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 12, Study Name: Nazer Draw

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.4	53.4 (12.1)	5.6	60.0	21.8	18.2	2.4	10.3	112.0	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 12

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	23	10	12
Elk	5	12	6
Deer	35	24	38
Cattle	-	2	4

Days use per acre (ha)	
'98	'03
-	-
9 (22)	11 (26)
27 (67)	63 (155)
6 (15)	5 (13)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 12

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>											
87	133	-	133	-	-	-	50	50	0	50	-/-
91	132	-	66	-	66	-	0	100	50	0	-/-
94	40	-	-	40	-	-	0	50	0	0	18/20
98	100	-	40	60	-	-	20	0	0	0	22/30
03	80	-	20	40	20	-	25	50	25	25	20/19
<i>Artemisia nova</i>											
87	14599	466	1133	8466	5000	-	25	4	34	12	8/7
91	21866	2400	3600	12666	5600	-	44	12	26	15	12/14
94	8820	14640	1640	5200	1980	640	22	0	22	4	13/21
98	11080	2000	4640	4440	2000	820	15	.36	18	2	15/26
03	19540	180	4400	11720	3420	1140	0	0	18	9	12/18
<i>Cercocarpus montanus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	20	-	-	20	-	-	0	0	-	0	19/16
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	20/20
<i>Chrysothamnus depressus</i>											
87	866	-	200	666	-	-	23	15	0	0	4/4
91	1199	-	133	933	133	-	17	39	11	0	7/11
94	280	-	-	260	20	-	14	0	7	0	4/8
98	180	-	-	180	-	-	0	0	0	0	3/8
03	100	-	-	60	40	-	40	60	40	0	4/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	799	-	266	533	-	-	0	0	0	0	4/8
91	798	-	266	466	66	-	42	33	8	0	4/7
94	360	-	-	360	-	-	0	0	0	0	7/12
98	540	-	180	340	20	-	0	0	4	4	26/34
03	400	-	-	340	60	-	5	0	15	10	8/11
<i>Eriogonum microthecum</i>											
87	2799	333	533	1800	466	-	24	5	17	7	4/2
91	3466	-	1400	2000	66	-	37	8	2	2	5/5
94	640	-	120	520	-	-	6	0	0	0	4/5
98	800	60	280	520	-	-	3	0	0	0	6/7
03	840	-	60	780	-	-	43	7	0	0	6/6
<i>Gutierrezia sarothrae</i>											
87	866	-	133	733	-	-	0	0	0	0	8/4
91	466	-	66	400	-	-	0	0	0	0	8/6
94	60	-	-	40	20	-	0	0	33	0	8/6
98	660	100	80	580	-	40	0	0	0	0	9/8
03	220	-	-	220	-	-	0	0	0	9	8/7
<i>Opuntia spp.</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	40	-	-	40	-	20	0	0	-	0	2/3
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Pediocactus simpsonii</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	-/-
98	200	-	40	160	-	-	0	0	0	0	3/5
03	200	-	40	140	20	-	0	0	10	10	2/3
<i>Pinus edulis</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Pinus ponderosa											
87	66	-	66	-	-	-	0	0	0	0	-/-
91	66	-	-	-	66	-	0	0	100	0	-/-
94	0	-	-	-	-	-	0	0	0	0	-/-
98	80	-	80	-	-	-	0	0	0	0	-/-
03	40	-	40	-	-	20	0	0	0	0	-/-
Purshia tridentata											
87	66	266	-	66	-	-	0	100	0	0	22/67
91	798	600	266	466	66	-	42	42	8	8	7/10
94	1500	20	40	1300	160	20	60	16	11	0	12/37
98	540	-	120	400	20	-	19	26	4	0	21/52
03	1440	-	20	760	660	60	3	97	46	32	16/41
Quercus gambelii											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	-/-
98	1680	520	400	1240	40	180	0	0	2	1	52/47
03	1500	-	420	1000	80	140	0	0	5	5	29/17
Sclerocactus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	140	-	100	40	-	-	0	0	-	0	3/4
03	0	-	-	-	-	-	0	0	-	0	-/-
Tetradymia canescens											
87	66	-	66	-	-	-	0	0	0	0	-/-
91	66	-	66	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	6/7
98	20	-	-	20	-	-	0	0	0	0	6/7
03	40	-	20	-	20	-	0	0	50	0	7/6

Trend Study 25C-13-03

Study site name: Short Neck.

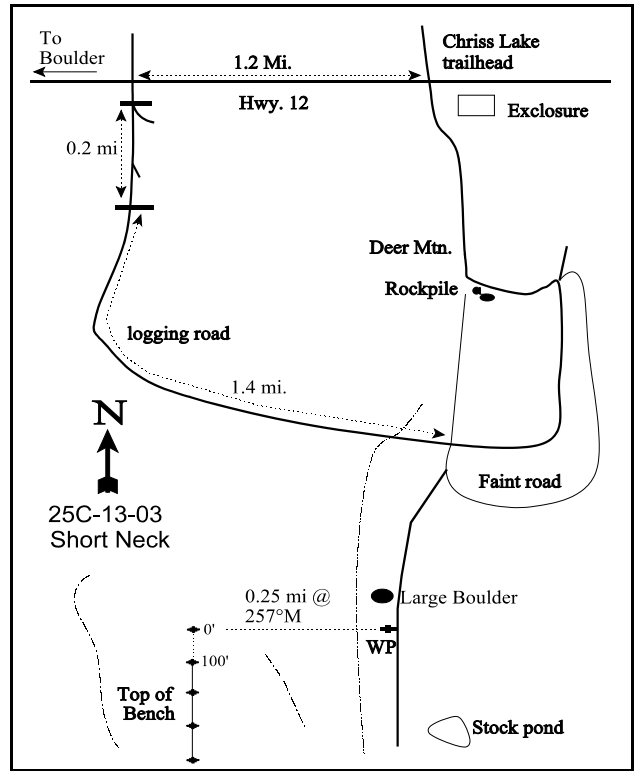
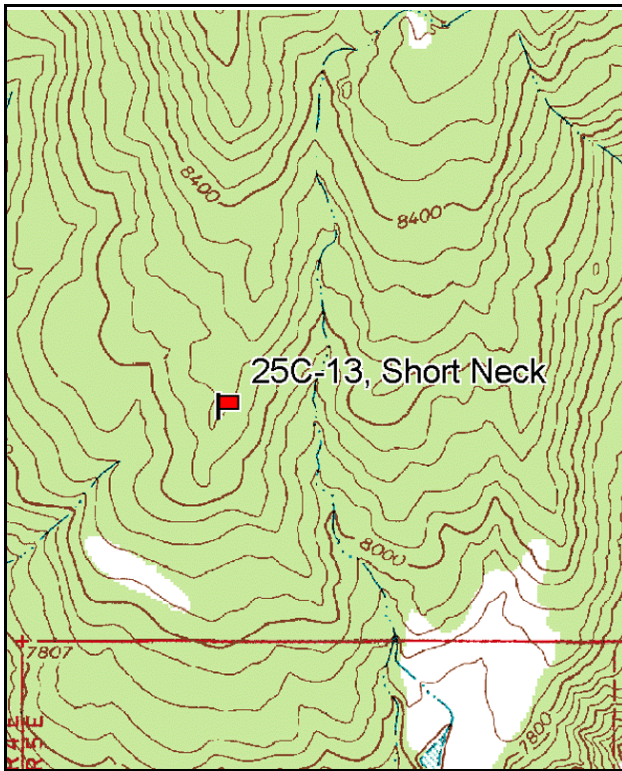
Vegetation type: Burn-Mountain Brush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft).

LOCATION DESCRIPTION

Go south (toward Boulder) from the Chris Lake trailhead (same place to turnoff to Deer Mountain) on SR 12 for 1.2 miles. Turn south onto a logging road. Proceed on main road 0.1 mile. Stay right. Go 0.1 mile to a fork, stay right. From here, stay on main road at all forks. Proceed 0.2 miles to a gate. Continue 1.4 miles to a faint road to the left (south) staying left at all forks. Assuming you can drive to this faint road, you will undoubtedly have to walk from here. Find an old faint road that goes down the ravine just west of the stock pond. Hike down this road one-half mile or so to a place where the plastic water pipeline makes a fork and is marked by an orange steel fencepost. Go west from here to the ridge top on the west side of the ravine. Then hike down the ridge about ~0.25 miles to the study site. The 0-foot baseline stake is by a boulder that is about 3 feet high by 4 feet wide. It is marked by browse tag #7171. There is a 95 foot separation between the 100-foot baseline stake and the 200-foot baseline stake.



Map Name: Boulder Town

Diagrammatic Sketch

Township 32S, Range 5E, Section Unsurveyed

GPS: NAD 27, UTM 12S 4203289 N, 464962 E

DISCUSSION

Short Neck - Trend Study No. 25C-13

The Short Neck trend study is located in an area burned by wildfire in 1971. It is now occupied by a mixed mountain brush community. The study site is located at 8,000 feet on the south aspect of a bench below Deer Mountain and 400 feet above Short Neck Mesa. The transect runs south across the slope, which varies from nearly level at the baseline to 10% at the last post. The area is considered winter range which is heavily used by elk, and to a lesser extent deer. Pellet group data taken on the site in 1998 estimated 52 elk, 14 deer, and 8 cow days use/acre (128 edu/ha, 35 ddu/ha, and 20 cdu/ha). Cattle pats appeared to be from the previous year. Some elk sign appeared to be only a few weeks old while the rest looked to be from winter use. Pellet group data from 2003 estimated 45 elk, 8 deer, and 3 cow days use/acre (111 edu/ha, 20 ddu/ha, and 7 cdu/ha).

Soil on the site is a cobbly, sandy loam which is moderately acidic in reaction (pH 5.7). Large rocks and boulders are commonly found on the surface and throughout the soil profile. Soil depth is variable with an estimated effective rooting depth of almost 10 inches. There is little if any erosion occurring. The rocky nature of the soil is demonstrated by the high percentage of rock and pavement cover which accounts for more than 1/3 of the ground cover. Little bare soil is exposed.

The key browse species include Gambel oak, serviceberry, and bitterbrush. These three species contribute more than 90% of the browse cover. Gambel oak is the least preferred key browse but the most abundant shrub which has provided around 60% of the browse cover since 1994. Cover of oak has averaged around 20% since 1994. Mature plants average between 3 and 4 feet in height. Oak sampled in 1987 had not been hedged, but 22% showed a loss of vigor due to insect damage. Other clumps not sampled did show signs of browsing. The oak was not as prevalent on the original frequency baseline as opposed to the density plots used in 1987 and 1991. Oak densities increased 38% between 1987 and 1991 and appeared to be light to moderately utilized. In 1994, density of oak was estimated with the new, larger sample size at 4,000 stems/acre. Most plants were moderately hedged and in good vigor. Density increased in 1998 and 2003. Most plants appeared only lightly utilized, in good vigor, with low decadence.

Thick patches of serviceberry were also sampled on the site. These clumps, as with the oak, are a mixture of both mature and young plants. Population density has remained relatively stable since 1987 at around 1,500 plants/acre. Serviceberry was heavily hedged in 1987, however, vigor was excellent. Use in 1991 was mostly moderate, but light to moderate in 1994, 1998 and 2003. Reproduction is limited, although the population appears healthy with low decadence and good vigor. Another preferred browse is bitterbrush which appears to have a stable population of 600 to 700 plants/acre. Utilization has been moderate since 1987, with heavier use reported in 1991 and 2003. Vigor has remained good on most plants and percent decadence is low. Several other shrub species are found on the site in small numbers.

Herbaceous vegetation is limited by the thick shrub canopy which made up 66% of the total vegetative cover in 1994, 57% in 1998, and 71% in 2003. The large amount of rock cover also limits herbaceous plants to some extent. An exception is the extremely abundant herbaceous Louisiana sage. This rhizomatous plant accounted for 52% of the total forb cover in 1998 and 37% in 2003. Other common species encountered were redroot eriogonum, penstemon, bastard toadflax, and longleaf phlox. Grasses are diverse with 6 species providing most of the cover. These include blue grama, smooth brome, cheatgrass, a Carex, bottlebrush squirreltail, and needle-and-thread grass. Crested wheatgrass is found in small numbers while intermediate wheatgrass, found on the site in 1991, was not encountered in 1994 or 1998. The annual, cheatgrass, was found on the site in small numbers in 1994 but has since increased significantly with each reading. It was the most abundant grass sampled in 2003, contributing 46% of the total grass cover.

1987 APPARENT TREND ASSESSMENT

Soil at the site is stable with abundant protective ground cover to prevent erosion. Key shrubs include serviceberry, bitterbrush, and Gambel oakbrush. Bitterbrush and serviceberry are highly preferred and showed moderate to heavy use. Both have good age class distributions indicative of a stable population. Gambel oak provides some additional forage, but is used primarily for cover. The herbaceous understory is fairly abundant and diverse. Several perennial grasses and forbs are abundant and provide good forage. Herbaceous production appears to be limited by the high shrub cover of the site.

1991 TREND ASSESSMENT

Ground cover characteristics are similar to 1987 estimates in several categories. However, litter cover decreased from 42% to 35%, and rock cover (rock and pavement) increased from 49% to 53%. There is little bare ground exposed and erosion is not a problem on this site. The trend for soil is considered stable. Looking at the three key browse species, Gambel oak, serviceberry, and antelope bitterbrush; serviceberry decreased in number by 19%, while oak and bitterbrush increased by 38% and 50% respectively. Serviceberry in 1987 made up 33% of the key browse population and in 1991 it only made up 19%. Overall, the trend for key browse would be considered slightly up. Looking at the grasses and forbs, sum of nested frequency is similar between 1987 and 1991 indicating a stable trend.

TREND ASSESSMENT

soil - stable (3)

browse - slightly upward (4)

herbaceous understory - stable (3)

1994 TREND ASSESSMENT

Basic ground cover characteristics are similar to those of 1991 and erosion is not a problem at this time. Trend for soil is stable. The browse trend is slightly up for the moment due to healthy populations, low decadence rates, and improved vigor of the key species since 1991. Some of the population density changes are the result of the larger sample taken in 1994. On the down side, there were few seedling and young plants of the key species encountered. This will likely change with better precipitation patterns. Trend for the herbaceous understory is down dramatically. Sum of nested frequency of perennial grasses and forbs has declined from 992 to only 682 between 1991 and 1994, a 31% decrease. Nested frequency of bottlebrush squirreltail, and needle-and-thread, declined significantly. This change is likely the result of the dry spring (April - June) of 1994 in which only 59% of the normal precipitation was recorded at Boulder (Utah Climate Summaries 2004). Lack of adequate precipitation during the spring severely limits growth of herbaceous vegetation, especially forbs. A return to normal precipitation patterns will reverse this trend.

TREND ASSESSMENT

soil - stable (3)

browse - slightly up (4)

herbaceous understory - down (1)

1998 TREND ASSESSMENT

Trend for soil is up due to an increase in vegetation and litter cover and a decline in rock and bare ground cover. Trend for the key browse species, serviceberry, bitterbrush, and Gambel oak is slightly up due to improved recruitment compared to 1994. Densities are similar and vigor remains good with low decadence. Trend for the herbaceous understory is up slightly. Sum of nested frequency of perennial grasses increased slightly with a significant increase in frequency of bottlebrush squirreltail. Unfortunately, cheatgrass also showed a significant increase in nested frequency, more than doubling from 44 to 99. Cover also increased

from 0.21% cover to 1.6% cover. Sum of nested frequency of forbs remained similar to 1994 estimates. Production of grasses has increased with cover rising from 8% in 1994 to 14% by 1998. Production of forbs has remained similar at 8%.

TREND ASSESSMENT

soil - up (5)

browse - up slightly (4)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is stable. Cover of vegetation and litter declined slightly but there is less than 2% cover of bare ground and erosion is not a problem. The decline in vegetation and litter cover is due to drought conditions which have suppressed herbaceous production. Trend for browse is stable for the key species, serviceberry, bitterbrush, and Gambel oakbrush. Both serviceberry and bitterbrush have relatively stable populations with good vigor, low decadence, and adequate young recruitment. Serviceberry has been mostly light to moderately browsed while bitterbrush shows mostly heavy use. Gambel oakbrush is the least preferred key browse species. It also appears stable in average cover and strip frequency while density of stems/acre has increased steadily since 1994. Oak is mostly unutilized with the exception of some moderate use along trails. Trend for the herbaceous understory is down due to the effects of drought. Sum of nested frequency of perennial grasses has declined 35% since 1998, with significant drops in the nested frequencies of bottlebrush squirreltail and *Carex*. Cover of perennial grasses declined 56% from 12% to 5%. Sum of nested frequency of perennial forbs declined 34% but only 3 species, Louisiana sage, Lewis flax, and stoneseed declined significantly. Perennial forb cover declined by 40% from 8% to 5%.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 13

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	Agropyron cristatum	5	5	10	8	15	.19	.10	.22
G	Agropyron intermedium	_b 13	_{ab} 11	_a -	_a -	_{ab} 3	-	.01	.03
G	Agropyron spicatum	-	-	-	-	4	-	-	.06
G	Bouteloua gracilis	_{ab} 61	_b 87	_{ab} 52	_a 44	_{ab} 51	1.44	2.10	1.42
G	Bromus inermis	_a 22	_{ab} 21	_{bc} 41	_c 50	_c 44	1.94	2.13	1.27
G	Bromus tectorum (a)	-	-	44	99	214	.21	1.58	4.48
G	Carex spp.	_{ab} 33	_{ab} 36	_b 46	_b 37	_a 12	1.78	1.64	.36
G	Poa fendleriana	7	23	19	16	10	.18	.26	.13
G	Sitanion hystrix	_b 120	_b 101	_a 63	_b 122	_a 40	.44	1.89	.39
G	Stipa comata	_b 183	_b 154	_a 75	_a 96	_a 62	1.62	4.06	1.43

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
	Total for Annual Grasses	0	0	44	99	214	0.20	1.58	4.48
	Total for Perennial Grasses	444	438	306	373	241	7.61	12.21	5.34
	Total for Grasses	444	438	350	472	455	7.82	13.79	9.82
F	<i>Alyssum alyssoides</i> (a)	-	-	a-	a3	b9	-	.00	.04
F	<i>Allium cernuum</i>	8	6	3	3	-	.03	.03	-
F	<i>Antennaria rosea</i>	-	-	-	-	2	-	-	.00
F	<i>Arabis</i> spp.	-	4	6	-	-	.02	-	-
F	<i>Artemisia ludoviciana</i>	c221	bc192	b149	b149	a63	3.98	4.15	1.74
F	<i>Aster chilensis</i>	-	-	-	-	4	-	-	.04
F	<i>Astragalus desperatus</i>	3	6	-	-	-	-	-	-
F	<i>Aster</i> spp.	-	-	-	3	-	-	.03	-
F	<i>Astragalus</i> spp.	-	1	-	4	-	-	.04	-
F	<i>Chaenactis douglasii</i>	-	1	3	5	1	.15	.18	.00
F	<i>Cirsium undulatum</i>	3	3	-	6	4	-	.01	.06
F	<i>Comandra pallida</i>	27	35	31	16	32	1.50	.80	1.03
F	<i>Crepis acuminata</i>	2	5	8	5	4	.05	.09	.03
F	Cruciferae	8	-	-	-	-	-	-	-
F	<i>Cryptantha</i> spp.	12	3	1	3	4	.00	.03	.15
F	<i>Dalea searlsiae</i>	2	2	-	-	-	-	-	-
F	<i>Draba</i> spp. (a)	-	8	-	-	-	-	-	-
F	<i>Eriogonum alatum</i>	3	1	2	-	-	.03	-	-
F	<i>Erigeron flagellaris</i>	-	-	-	-	-	-	.00	-
F	<i>Erigeron</i> spp.	a-	b8	b10	ab7	ab1	.57	.01	.00
F	<i>Eriogonum racemosum</i>	b196	b191	a56	a78	a66	.30	.62	.50
F	<i>Eriogonum umbellatum</i>	a-	ab4	b12	b12	b18	.05	.30	.25
F	<i>Gayophytum ramosissimum</i> (a)	-	-	b8	a-	a-	.40	-	-
F	<i>Hymenoxys acaulis</i>	2	2	1	3	3	.03	.03	.15
F	<i>Hymenopappus filifolius</i>	9	10	3	4	13	.03	.16	.11
F	<i>Lappula occidentalis</i> (a)	-	-	3	5	5	.00	.03	.15
F	<i>Linum lewisii</i>	b16	b19	ab15	ab7	a3	.05	.01	.01
F	<i>Lithospermum ruderales</i>	ab5	bc8	ab3	c26	a-	.18	.87	-
F	<i>Lotus utahensis</i>	3	3	-	-	-	-	.03	-
F	<i>Lygodesmia spinosa</i>	2	3	5	6	7	.30	.09	.21
F	<i>Oenothera caespitosa</i>	-	1	-	-	-	-	-	-
F	<i>Oenothera pallida</i>	-	-	-	5	-	-	.06	-
F	<i>Orthocarpus purpureo-albus</i> (a)	-	-	4	-	-	.03	-	-

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
F	Penstemon comarrhenus	c ₂₅	bc ₁₈	c ₂₉	a ₁	ab ₅	.32	.03	.01
F	Phlox longifolia	c ₅₉	ab ₂₃	abc ₃₃	bc ₄₂	a ₂₁	.15	.22	.17
F	Stellaria jamesiana	-	-	-	1	6	-	.00	.04
F	Tragopogon dubius	b ₁₄	a ₁	a ₋	a ₃	a ₋	-	.06	-
F	Unknown forb-perennial	12	-	6	-	-	.06	-	-
F	Viguiera multiflora	-	4	-	-	-	-	-	-
Total for Annual Forbs		0	8	15	8	14	0.43	0.03	0.20
Total for Perennial Forbs		632	554	376	389	257	7.84	7.90	4.55
Total for Forbs		632	562	391	397	271	8.28	7.94	4.75

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

BROWSE TRENDS --

Management unit 25C, Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Amelanchier utahensis	24	29	22	7.48	6.51	8.53
B	Artemisia nova	2	3	9	.04	.15	1.08
B	Artemisia tridentata vaseyana	0	0	0	.03	-	-
B	Chrysothamnus depressus	8	3	5	.19	.15	.33
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	2	-	.00	.15
B	Coryphantha vivipara arizonica	0	0	2	.00	-	.03
B	Eriogonum microthecum	3	6	6	-	.03	.24
B	Gutierrezia sarothrae	11	8	13	.03	.04	.18
B	Mahonia repens	2	2	3	.06	.06	.03
B	Opuntia spp.	4	6	8	.03	.06	.21
B	Pinus edulis	0	1	1	-	.85	.38
B	Purshia tridentata	17	21	24	2.30	3.29	3.72
B	Quercus gambelii	36	51	53	20.68	18.57	20.18
B	Symphoricarpos oreophilus	3	3	4	.38	.33	.33
B	Tetradymia canescens	0	2	4	-	.03	.06
Total for Browse		110	136	156	31.25	30.12	35.47

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 13

Species	Percent Cover '03
Amelanchier utahensis	9.53
Artemisia nova	.50
Eriogonum microthecum	.08
Gutierrezia sarothrae	.23
Opuntia spp.	.30
Pinus edulis	.56
Purshia tridentata	2.90
Quercus gambelii	28.41
Symphoricarpos oreophilus	.20

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 13

Species	Average leader growth (in) '03
Amelanchier utahensis	1.2
Purshia tridentata	2.5

BASIC COVER --

Management unit 25C, Study no: 13

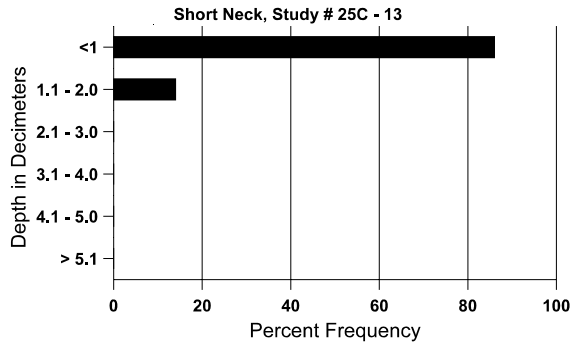
Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	4.75	8.25	43.62	55.77	47.02
Rock	40.50	45.75	35.59	27.93	31.74
Pavement	8.25	6.50	1.00	2.05	.67
Litter	42.25	35.25	47.81	54.97	49.41
Cryptogams	0	.25	.03	.08	0
Bare Ground	4.25	4.00	5.95	1.04	1.40

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 13, Study Name: Short Neck

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.5	67.3 (7.9)	5.7	54.0	28.2	17.8	4.5	18.4	137.6	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 13

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	12	1	2
Cow	-	-	-
Elk	13	16	14
Deer	6	3	5

Days use per acre (ha)	
'98	'03
-	-
6 (15)	3 (7)
52 (128)	45 (111)
14 (35)	3 (7)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 13

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
87	2133	66	1333	800	-	-	16	66	0	0	36/17
91	1733	-	133	1600	-	-	96	0	0	0	34/27
94	1140	-	20	1100	20	-	18	0	2	4	42/40
98	1440	40	260	1100	80	80	36	0	6	1	42/39
03	1020	-	180	800	40	20	37	4	4	0	50/58
Artemisia nova											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	60	-	-	60	-	-	0	0	-	0	9/22
98	160	-	40	120	-	80	25	0	-	0	13/21
03	360	-	20	340	-	-	0	0	-	0	13/21

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Ceanothus martinii											
87	66	-	-	66	-	-	0	0	-	0	14/31
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Chrysothamnus depressus											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	300	-	40	260	-	-	53	7	0	0	14/12
98	160	-	-	160	-	-	0	0	0	0	8/15
03	360	-	-	260	100	-	100	0	28	0	5/10
Chrysothamnus viscidiflorus viscidiflorus											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	-	20	-	0	0	100	0	8/6
03	80	-	20	60	-	-	0	0	0	0	8/10
Coryphantha vivipara arizonica											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	2/5
Eriogonum microthecum											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	199	-	-	66	133	-	0	0	67	67	9/10
94	140	-	-	140	-	-	100	0	0	0	9/11
98	280	-	20	260	-	-	14	0	0	0	7/11
03	260	-	-	260	-	-	38	54	0	0	6/10
Gutierrezia sarothrae											
87	332	-	66	266	-	-	0	0	-	0	11/7
91	200	-	-	200	-	-	33	0	-	0	6/4
94	220	-	20	200	-	-	0	0	-	0	7/7
98	300	80	100	200	-	-	0	0	-	0	6/7
03	440	-	-	440	-	-	0	0	-	0	7/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Mahonia repens											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	300	-	-	300	-	-	0	0	-	0	3/2
98	300	20	-	300	-	-	0	0	-	0	2/3
03	260	-	-	260	-	-	0	0	-	0	3/4
Opuntia spp.											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	120	-	-	120	-	-	0	0	-	0	2/5
98	440	40	-	440	-	40	0	0	-	0	3/6
03	520	20	20	500	-	-	0	0	-	0	4/12
Pinus edulis											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	66	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	20	20	20	-	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-
Pinus ponderosa											
87	66	-	-	66	-	-	0	0	-	0	393/236
91	66	-	-	66	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
87	466	-	200	266	-	-	43	0	0	0	16/22
91	932	66	466	333	133	-	43	36	14	0	15/35
94	620	-	60	520	40	-	65	0	6	6	29/63
98	660	20	120	480	60	-	27	0	9	0	18/39
03	720	-	80	500	140	-	42	53	19	6	16/37
Quercus gambelii											
87	3866	600	800	3066	-	-	0	0	0	22	45/28
91	6265	1733	4133	666	1466	-	54	2	23	15	48/22
94	4000	-	400	3440	160	40	80	0	4	0	40/32
98	7160	880	2560	4080	520	380	8	0	7	.83	45/27
03	9300	-	1600	7060	640	700	8	0	7	.21	36/26

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	0	100	-	0	-/-
94	120	-	20	100	-	-	0	0	-	17	10/25
98	100	-	-	100	-	-	40	0	-	0	13/33
03	100	-	-	100	-	-	0	0	-	0	16/30
Tetradymia canescens											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	8/14
98	60	-	20	40	-	-	33	0	-	0	10/18
03	80	-	60	20	-	-	0	0	-	0	8/13

Trend Study 25C-14-03

Study site name: New Home Bench.

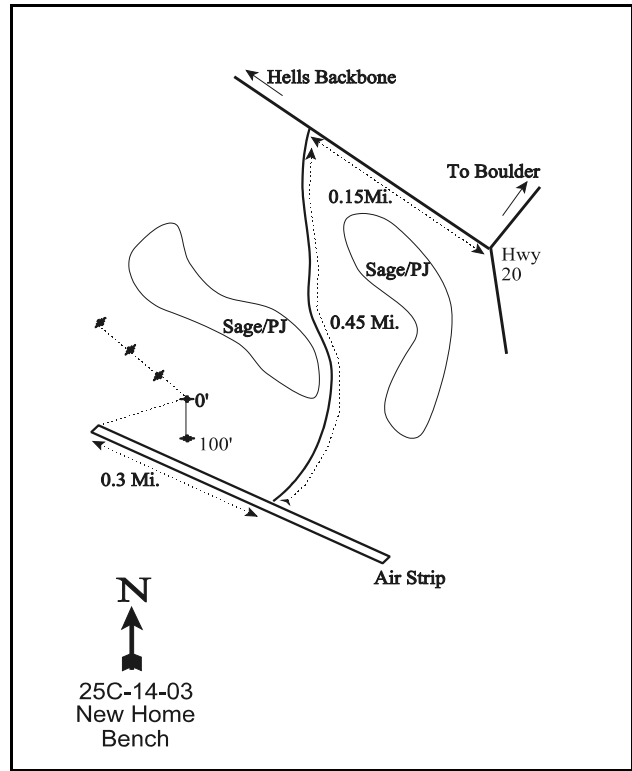
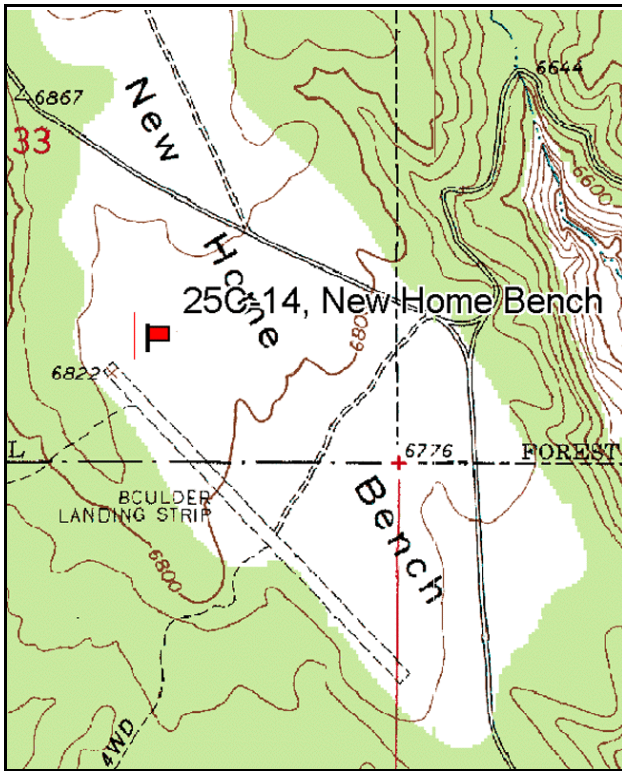
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic. Lines 2-4 346°M.

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

LOCATION DESCRIPTION

Take SR12 southwest out of Boulder for approximately 3 miles to the top of the bench above Dry Hollow. Turn onto the Hells Backbone-Salt Gulch Road. Travel 0.15 miles northwest to a road turning off to the left. Go 0.45 miles on this road to the Boulder airstrip. Turn right and drive down the airstrip 0.3 miles. The transect starts approximately 65 paces from the end of the airstrip, bearing 86 degrees magnetic. The 0-foot baseline stake is marked by browse tag #7145.



Map Name: Boulder Town

Diagrammatic Sketch

Township 33S, Range 4E, Section 33

GPS: NAD 27, UTM 12S 4193396 N, 459012 E

DISCUSSION

New Home Bench - Trend Study No. 25C-14

The New Home Bench study site is located just north of the Boulder airport on the south side of Boulder Mountain. The sagebrush range type occupies a relatively small area, and is usually found interspersed with pinyon-juniper woodland. These sage flats, such as the one on New Home Bench, are important as deer winter ranges. The large bench where the trend study is located is nearly level with a slope of 1-2% and an east to northeast aspect. Elevation is 6,800 feet. The small drainage east of the study site drains toward the south. Pellet group data from the site in 1998 estimated deer use at 66 days use/acre (163 ddu/ha). A couple of cow pats were also encountered. Pellet group data from 2003 estimated high deer use at 95 days use/acre (235 ddu/ha). Elk use was estimated at 7 days use/acre (17 edu/ha). No sign of cattle grazing was noted in 2003.

The soil is a sandy loam which is neutral in reaction (pH 6.8). Effective rooting depth is estimated at just over 13 inches with little rock on the surface or within the profile. Soil is loose and susceptible to both wind and water induced soil disturbance. Sparse vegetation, litter, and cryptogamic cover provide some soil protection, but bare soil is abundant averaging over 50% cover since 1987. The well developed cryptogams on this site are an important factor in soil stabilization. However, cryptogamic cover is concentrated only under sagebrush canopies. Erosion is not severe, however localized soil movement is occurring and soil pedestalling is evident around shrubs.

The dominant vegetation on the site is an old stand of Wyoming big sagebrush. Density was estimated at around 4,100 plants/acre in 1998 and 2003. The stand is overly mature and has had a high proportion of decadent plants since study site establishment. Percent decadence peaked at 63% in 1991 and 91% in 2003, both drought years. Young recruitment has been good in past years but was poor in 2003 with drought. Use was moderate to heavy in 1987 and 1991 but more moderate in 1998 and 2003. Drought conditions in 2003 have caused 70% of the sagebrush sampled to display poor vigor. Decadent plants accounted for 91% of the population in 2003 and 73% of those were classified as dying (>50% crown death). This suggests a pending decline in the population due to the lack of young recruitment.

There are a few other browse species which provide some additional forage including ephedra and a few slenderbush eriogonum. Broom snakeweed, an increaser, occurs in moderately high numbers. A few stickyleaf low rabbitbrush also occur on the site. Pinyon and juniper trees are scattered on the flat. Point-quarter data from 1998 and 2003 estimated a stable population of 28 pinyon and 27 to 28 juniper trees/acre. Average basal diameter was estimated at about 3.5 inches for both species. About 1/3 of the population was in the 1 to 4 foot height class in 2003, while another 1/3 occurred in the 8 to 12 foot height range.

Density and diversity of herbaceous plants is very low. Blue grama is the only common perennial grass species with a quadrat frequency of 59% in 1991, declining to about 35% in 1998 and 2003. Bottlebrush squirreltail and needle-and-thread were moderately abundant in 1987 and 1998. The annual, sixweeks fescue was abundant in 1998 but this very low growing species provides little useful forage. Forbs are depleted and nearly absent. With drought conditions, perennial grasses declined by 52% in sum of nested frequency and average cover showed nearly a 3-fold decline in 2003.

1987 APPARENT TREND ASSESSMENT

Soil conditions are poor with abundant exposed bare ground and marginal protective ground cover. Erosion is not a major problem however due to the gentle terrain. The key browse is mostly mature and decadent stand of Wyoming big sagebrush. It shows moderate to heavy use and high decadence. Young recruitment is good however with 24% of the population consisting of young plants. Trend for sagebrush appears stable at this time. The herbaceous understory is poor with only blue grama being abundant. A few other perennial grasses occur in limited numbers including Indian ricegrass, bottlebrush squirreltail, and needle-and-thread. Forbs are

rare in their occurrence.

1991 TREND ASSESSMENT

The soil trend is considered slightly down. Basal vegetative cover did increase to 6%, and the high proportion of bare ground also increased slightly. Percent litter cover has decreased from only 28% down to 21%. Recent soil movement was detectable on the site in 1991, and washes in the area are active. There appeared to be a great deal of soil pedestalling around the sagebrush. Wyoming big sagebrush, the key browse species, remained stable in density since 1987. However, percent decadence has gone up from 39% to 63%. Seedlings were rare in 1991 but young recruitment was good. Trend is considered stable. The herbaceous understory is poor with blue grama the only abundant species. Sum of nested frequency of perennial grasses remained similar to 1991. With the exception of scarlet globemallow, none of the forbs encountered in 1987 were still growing on the site in 1991. Forbs were never abundant however and the herbaceous trend is considered stable.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground and an increase in litter cover. Trend for Wyoming big sagebrush is up slightly. The increase in density is primarily due to the larger sample used in 1998, but vigor is improved and percent decadence has declined from 63% to 35%. Reproduction is also improved since 1991 with more seedlings counted in 1998. Trend for the herbaceous understory is stable but depleted. Sum of nested frequency of perennial grasses and forbs remained similar to 1991 estimates. Nested frequency of blue grama declined significantly but bottlebrush squirreltail and needle-and-thread increased significantly. The annual, sixweeks fescue, increased significantly in nested frequency and is now the most abundant grass on the site. Forbs are severely lacking.

TREND ASSESSMENT

soil - up slightly (4)

browse - up slightly (4)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable but poor with similar ground cover characteristics compared to 1998. The one negative aspect of the soil trend is the decline in nested frequency and cover of perennial grasses. Erosion is not a problem however due to the lack of slope. Trend for Wyoming big sagebrush is down. Population density is stable for the moment but 91% of the population is decadent and 73% of those plants were classified as dying in 2003. No seedlings were encountered and young plants were rare. Use remained moderate. All of this data suggests a significant die-off of sagebrush in the future. Trend for the herbaceous understory is also down. Sum of nested frequency of perennial grasses declined 52% with a significant decline in all species except for blue grama. One good aspect of the grass component is the disappearance of the annual, sixweeks fescue. Forbs remain rare.

TREND ASSESSMENT

soil - stable (3)

browse - down (1)

herbaceous understory - down (1)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 14

T y p e	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
G	<i>Bouteloua gracilis</i>	_b 149	_b 144	_a 91	_a 84	4.32	2.29
G	<i>Oryzopsis hymenoides</i>	_{ab} 1	_b 13	_{ab} 6	_a -	.05	-
G	<i>Sitanion hystrix</i>	_a 19	_a 19	_b 59	_a 10	1.23	.08
G	<i>Stipa comata</i>	_b 25	_{ab} 13	_c 47	_a 3	1.27	.15
G	<i>Vulpia octoflora</i> (a)	-	_b 18	_c 202	_a -	8.65	-
Total for Annual Grasses		0	18	202	0	8.65	0
Total for Perennial Grasses		194	189	203	97	6.89	2.52
Total for Grasses		194	207	405	97	15.55	2.52
F	<i>Cryptantha fulvocanescens</i>	2	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	_a 5	_b 18	.01	.11
F	<i>Eriogonum cernuum</i> (a)	-	-	-	3	-	.00
F	<i>Eriogonum</i> spp.	-	-	6	-	.06	-
F	<i>Erigeron pumilus</i>	-	-	2	-	.00	-
F	<i>Machaeranthera canescens</i>	4	-	-	-	-	-
F	<i>Phlox longifolia</i>	4	-	-	2	-	.00
F	<i>Senecio multilobatus</i>	-	-	-	1	-	.03
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	1	-	.00
F	<i>Sphaeralcea coccinea</i>	_c 9	_{bc} 6	_a -	_{ab} 1	-	.03
F	Unknown forb-perennial	3	-	-	-	-	-
Total for Annual Forbs		0	0	5	22	0.00	0.12
Total for Perennial Forbs		22	6	8	4	0.06	0.06
Total for Forbs		22	6	13	26	0.07	0.19

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

BROWSE TRENDS --

Management unit 25C, Study no: 14

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia tridentata wyomingensis</i>	85	83	18.72	17.33
B	<i>Ceratoides lanata</i>	0	1	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	0	6	-	-
B	<i>Ephedra torreyana</i>	4	2	-	.15
B	<i>Eriogonum microthecum</i>	2	2	.03	.03
B	<i>Gutierrezia sarothrae</i>	31	24	.95	.43
B	<i>Juniperus osteosperma</i>	1	3	.38	.38
B	<i>Opuntia spp.</i>	2	0	-	-
B	<i>Pinus edulis</i>	0	2	-	.85
Total for Browse		125	123	20.08	19.18

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 14

Species	Percent Cover
	'03
<i>Artemisia tridentata wyomingensis</i>	9.48
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.03
<i>Gutierrezia sarothrae</i>	.33
<i>Juniperus osteosperma</i>	.45
<i>Pinus edulis</i>	1.06

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 14

Species	Average leader growth (in)
	'03
<i>Artemisia tridentata wyomingensis</i>	3.7

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 14

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	26	28
Pinus edulis	28	28

Average diameter (in)	
'98	'03
3.7	3.4
3.4	3.5

BASIC COVER --

Management unit 25C, Study no: 14

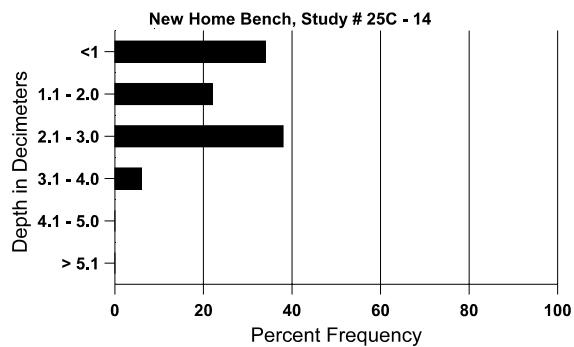
Cover Type	Average Cover %			
	'87	'91	'98	'03
Vegetation	3.00	5.75	31.96	20.92
Rock	0	0	.22	.24
Pavement	0	.25	2.53	2.38
Litter	27.50	20.50	29.28	29.80
Cryptogams	10.00	10.75	12.31	6.17
Bare Ground	59.50	62.75	51.56	51.27

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 14, Study Name: New Home Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.3	63.7 (15.9)	6.8	69.4	12.0	18.6	1.0	12.4	112.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 14

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	38	28	-	-
Cow	-	-	2 (5)	-
Elk	-	3	-	7 (17)
Deer	38	51	66 (163)	95 (235)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 14

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
87	2332	333	566	866	900	-	29	41	39	10	29/30
91	2366	33	566	300	1500	-	41	38	63	35	21/28
98	4120	200	540	2140	1440	1240	39	10	35	6	22/32
03	4100	-	20	340	3740	2200	52	8	91	70	25/36
<i>Ceratoides lanata</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	100	-	0	11/5
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	0	-	-	-	-	-	0	0	0	0	-/-
03	120	-	40	60	20	-	0	0	17	0	11/10
<i>Ephedra torreyana</i>											
87	33	-	33	-	-	-	100	0	0	0	-/-
91	66	-	-	66	-	-	100	0	0	0	9/6
98	180	-	40	140	-	-	44	56	0	0	11/12
03	60	-	-	40	20	-	0	33	33	0	16/17
<i>Eriogonum microthecum</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	40	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	9/10

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	2720	360	800	1900	20	-	0	0	1	0	8/9
03	1180	-	320	780	80	480	0	0	7	2	9/11
Juniperus osteosperma											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	66	-	-	-	100	0	-	0	-/-
98	20	60	20	-	-	-	0	0	-	0	-/-
03	60	-	40	20	-	-	0	0	-	0	-/-
Opuntia spp.											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	133	-	133	-	-	-	0	0	-	0	-/-
98	80	-	-	80	-	-	0	0	-	0	2/7
03	0	-	-	-	-	-	0	0	-	0	-/-
Pinus edulis											
87	66	33	33	33	-	-	0	0	-	0	118/98
91	66	33	-	66	-	-	0	0	-	0	152/86
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	20	20	-	-	0	0	-	0	-/-

Trend Study 25C-15-03

Study site name: Steep Creek Bench .

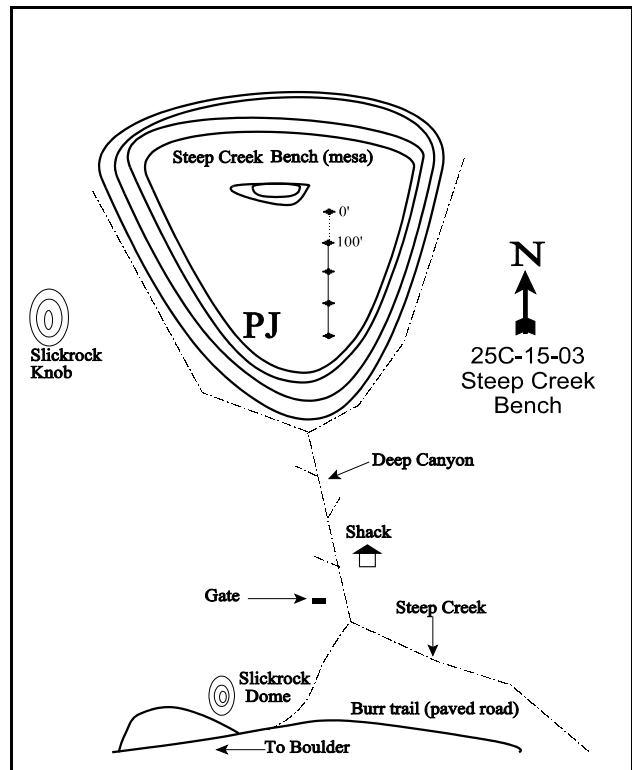
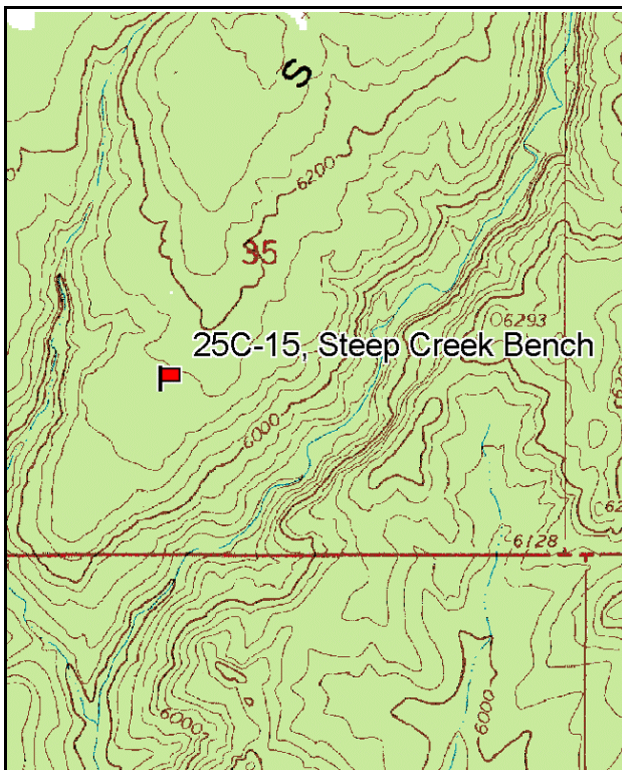
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). No rebar.

LOCATION DESCRIPTION

From the town of Boulder, take the Burr Trail for about 6.2 miles to Deer Creek. Continue on the road for 2.0 miles to a large sandstone monolith on the left and a pullout at its base. This is the start of the trail to Steep Creek. Follow the wash on the east side of the Slickrock Dome, staying on the west side of the ravine following an old cattle trail, 1/2 - 3/4 miles north to Steep Creek. Cross steep creek and travel upstream on the north side of the creek for approximately 1 mile to a minor fork. Pick your way up the ridge between Steep Creek and the fork to the top of the bench. Continue north through the P-J to the first major sage/grass opening. The transect is located in this opening. Bearings to visible landmarks are detailed on the accompanying map. The study markers are 1-foot tall fenceposts, and the 0-foot baseline stake is tagged #7132.



Map Name: Steep Creek Bench

Diagrammatic Sketch

Township 33S , Range 5E , Section 35

GPS: NAD 27, UTM 12S 4193508 N, 471324 E

DISCUSSION

Steep Creek Bench - Trend Study No. 25C-15

Steep Creek Bench is located in the rugged, inaccessible canyon country of "The Gulch" drainage south of Boulder Mountain. Deer and elk that move south off the mountain can end up here in winter. There are a few deer that stay in this low country all year long. Low annual precipitation, slick rock, and sandy soil limit the potential vegetative types to "sparse" pinyon-juniper with scattered small open parks of sagebrush and grass. This extensive type is represented by the study on the south end of Steep Creek Bench. The terrain is nearly level at the site and exposure is insignificant with an elevation of 6,100 feet. The area is used by deer and cattle. Pellet group data from 1998 estimated 27 deer and 9 cow days use/acre (67 ddu/ha and 22 cdu/ha). Cow sign appeared to be from the previous winter. Deer antler sheds were also found in 1998. Pellet group quadrat frequency data shows similar use in 1994. Rabbit sign was also frequent. Pellet group data from 2003 estimated much lower deer use at only 2 days use/acre (5 ddu/ha). One elk pellet group was also encountered. Cattle use was estimated at 6 days use/acre (14 cdu/ha). Rabbit pellets remain common with a quadrat frequency of 46%.

Soil is a deep, loose sand with an effective rooting depth estimated at just over 22 inches. The soil has a neutral reaction (pH 7.2). Phosphorus is low at only 3 ppm as 10 ppm is considered a minimum value. Soil organic matter is also very low at only 0.3%. Percent bare ground is abundant averaging 47% in 1998 and 72% in 2003. There are large bare interspaces between trees and shrubs. There are signs of both water and wind erosion occurring and the erosion condition class was determined to be slight in 2003. However, the slight slope limits water erosion. In some recurrent open spots, constantly shifting dunes are formed by the wind. Weather-scoured depressions and wind deposition may cause more significant soil movement than water erosion.

Mature pinyon and juniper trees are the dominant overstory. The stand is open, with many stunted older trees because of poor site potential. Point-quarter data taken in 1994, 1998, and 2003 estimated tree density at around 60 trees/acre, with pinyon making up over half. Basal diameter of pinyon averaged 6 inches in 2003 while juniper averaged 13 inches. Over half of the pinyon and juniper sampled were greater than 12 feet in height. These trees combine to provide half of the browse cover on the site. The trees provide good cover, but are rarely utilized for forage.

Wyoming big sagebrush occurs within the openings. The stand is old and not very abundant producing around 3 % cover in 1998 and 2003. Density has remained relatively stable since 1994 at around 700 plants/acre. The stand is overly mature with a consistent high rate of decadence since study site establishment. Reproduction has been poor during most readings with few seedlings or young encountered. Utilization has been light to moderate with heavier use reported in 1987 and 1991. Vigor has been poor on about 1/3 of the population during each reading except for 1994 when vigor was normal on all but 8% of the plants sampled.

A few scraggly rubber rabbitbrush and ephedra are the only other palatable browse encountered on this end of the mesa. The most numerous woody plant is a small broom snakeweed which has fluctuated greatly in density over the years. Population density has ranged from 233 plants/acre in 1991 to 3,660 in 1998.

Herbaceous forage is limited. The most abundant grasses, sandpile muhly and blue grama, are both warm season increasers. They are not very palatable or productive, but in high numbers, they can provide good soil protection. Other species include sand dropseed, Indian ricegrass, and bottlebrush squirreltail. All grasses combined produced only 6% cover in 1994 and 1998, dropping to 3% in 2003 with severe drought. Forbs are very limited. The only fairly common species are Carruth sage and a cryptantha which provided 90% of the forb cover in 1998.

1987 APPARENT TREND ASSESSMENT

Ground cover conditions are poor with abundant bare ground exposed. Erosion is occurring but it is not severe due to the gentle terrain. The key browse, Wyoming big sagebrush, has a low density of 532 plants/acre. Use is moderate to heavy, vigor poor on 38% of the plants sampled, and 1/3 of the population is decadent. Young plants appear to be abundant enough to maintain the stand. The herbaceous understory is poor and dominated by warm season increasers, blue grama, and sandpile muhly. A few forbs are moderately abundant.

1991 TREND ASSESSMENT

There is almost no rock or pavement to help protect what soils are left after the soil is eroded away by the wind and water. Vegetative basal cover is almost unchanged, from 4% to 5%. Litter cover has gone from 34% down to 24%. Percent bare ground has increased from 58% to 65%. Cryptogams have increased from 4% to 6%. This still points to a slightly downward trend for soil. The key browse species, Wyoming big sagebrush, has decreased by 12% in density, while percent decadence has increased from 31% to 64%. The population is now at only 466 plants/acre. The only good point for browse on this site was that broom snakeweed's population decreased by 91%. The trend for browse would still be down slightly. The forb component of the herbaceous understory is poor. Most species only occur at very low frequencies. Carruth sage is the only forb with a very high frequency. There are five grasses that occur on the site. All are warm season increaser species except for Indian ricegrass, which is a cool season grass that has increased since the 1987 survey. Trend is considered stable for the herbaceous understory.

TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - stable (3)

1994 TREND ASSESSMENT

Basic ground cover has continued to decline slightly since 1991. Percent bare ground for 1994 is 64% and cryptogamic crusts have declined from 6% cover to 2%. The new method used this year estimates aerial cover instead of basal cover so comparisons between 1991 and 1994 on vegetation cover should not be made. However, aerial cover is quite low at 14%. Trend for soil is slightly down. Trend for browse is mixed. Percent decadence has declined for Wyoming big sagebrush, vigor has improved and no shrubs were heavily hedged. The only down side for sagebrush is the lack of seedling and young plants. Another negative factor is the apparent rebound in the broom snakeweed population. Some, but probably not all of the increase in snakeweed can be explained by the new larger sample taken in 1994. Trend for browse is therefore, stable at this time and will likely improve with normal precipitation patterns. The herbaceous understory is in poor condition and dominated by warm season increasers, sandhill muhly and blue grama, which produce little forage. The more preferred grasses, Indian ricegrass and sand dropseed, occur in small numbers. Indian ricegrass dropped significantly while blue grama and sandpile muhly remained stable. Forbs are scarce. Sum of nested frequency of perennial grasses and forbs have remained similar to 1991 and trend is considered stable.

TREND ASSESSMENT

soil - slightly down (2)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up with a major decline in percent bare ground from 64% in 1994 to 47% by 1998. In addition, litter cover doubled and cover of cryptogamic plants increased from only 2% to 15%. The rise in cryptogamic cover may be partly due to recent rain which makes these crusts easier to see. Vegetative cover also increased from 14% to 20%. Trend for the key browse species, Wyoming big sagebrush, is down slightly. Utilization is heavier than 1994, there is a higher proportion of plants displaying poor vigor, percent decadence is similar, but reproduction is still poor. Currently, there are more decadent/dying sagebrush (140 plants/acre) than young plants to replace them (80 plants/acre). In addition, density has declined 13% since 1994 and broom snakeweed has increased 62%. Trend for the herbaceous understory is up slightly. Sum of nested frequency of perennial grasses and forbs has increased. Production of forbs increased from less than 1% cover in 1994 to 3.7% by 1998. This is most likely due to better precipitation patterns which occurred in 1997 and 1998. Production of perennial grasses remained similar to 1994 at about 6% cover but sum of nested frequency of perennial grasses rose by 19%.

TREND ASSESSMENT

soil - up but poor (5)

browse - down slightly (2)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is down with a 55% increase in percent cover of bare ground from 47% to 72%. Vegetation and litter cover also declined. Cryptogamic cover declined from 15% to less than 1%. Erosion is still not severe due to the slight slope but overland water flow was evident in some areas from recent rain. Trend for Wyoming big sagebrush is down slightly. Use is lighter but the number of plants displaying poor vigor increased to 35% and 43% of the population is now classified as decadent. No seedlings or young were encountered. In addition, 81% of the 320 decadent plants sampled were classified as dying (>50% crown death). Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses declined by 38% with a significant drop in the nested frequency of sandpile muhly and Indian ricegrass. Total perennial grass production declined from 6% cover in 1998 to 3% in 2003. Sum of nested frequency of perennial forbs remained stable but cover declined 49% from 3.6% to 1.9%.

TREND ASSESSMENT

soil - down (1)

browse - down slightly (2)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 15

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	<i>Bouteloua gracilis</i>	ab45	a36	ab49	b71	ab60	.80	1.95	1.49
G	<i>Hilaria jamesii</i>	-	-	5	-	-	.03	-	-
G	<i>Muhlenbergia pungens</i>	ab80	b116	b109	b101	a52	4.89	4.05	1.20
G	<i>Oryzopsis hymenoides</i>	abc22	c35	ab18	bc32	a4	.23	.12	.03
G	<i>Sitanion hystrix</i>	-	-	1	2	-	.03	.01	-
G	<i>Sporobolus cryptandrus</i>	30	23	11	24	27	.13	.23	.51
G	<i>Vulpia octoflora</i> (a)	-	-	a3	b32	a5	.00	.07	.01
Total for Annual Grasses		0	0	3	32	5	0.00	0.07	0.00
Total for Perennial Grasses		177	210	193	230	143	6.13	6.38	3.23
Total for Grasses		177	210	196	262	148	6.14	6.45	3.24
F	<i>Ambrosia acanthicarpa</i>	-	3	-	-	-	-	-	-
F	<i>Arabis</i> spp.	-	-	3	2	-	.00	.00	-
F	<i>Artemisia carruthii</i>	c58	a16	ab26	bc44	ab33	.74	1.16	1.04
F	<i>Astragalus</i> spp.	-	-	-	5	-	-	.01	-
F	<i>Chenopodium album</i> (a)	-	3	-	-	-	-	-	-
F	<i>Cryptantha cinerea</i>	ab2	b7	ab2	c32	a-	.00	2.19	-
F	<i>Descurainia pinnata</i> (a)	-	-	10	5	2	.01	.01	.00
F	<i>Dithyrea wislizenii</i> (a)	-	5	-	-	7	-	-	.19
F	<i>Eriogonum cernuum</i> (a)	-	3	2	-	-	.00	-	-
F	<i>Erigeron</i> spp.	-	-	-	1	-	-	.00	-
F	<i>Euphorbia</i> spp.	a-	a-	a-	a-	b36	-	-	.14
F	<i>Gilia</i> spp. (a)	-	-	a-	b17	a-	-	.10	-
F	<i>Hymenopappus filifolius</i>	5	1	-	-	-	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	-	3	-	-	.00	-
F	<i>Oenothera lavandulaefolia</i>	a-	a-	a-	b25	a3	-	.18	.15
F	<i>Penstemon</i> spp.	-	-	2	4	3	.00	.01	.00
F	<i>Phlox longifolia</i>	-	-	-	4	1	-	.01	.00
F	<i>Stephanomeria exigua</i> (a)	-	a2	a-	a-	b43	-	-	.30
F	Unknown forb-annual (a)	-	-	-	-	7	-	-	.04
F	Unknown forb-perennial	12	-	-	-	-	-	-	-
Total for Annual Forbs		0	13	12	25	59	0.01	0.12	0.54
Total for Perennial Forbs		77	27	33	117	76	0.75	3.60	1.35
Total for Forbs		77	40	45	142	135	0.77	3.72	1.89

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

BROWSE TRENDS --

Management unit 25C, Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	<i>Artemisia tridentata wyomingensis</i>	26	27	24	2.43	3.52	2.88
B	<i>Chrysothamnus nauseosus</i>	0	1	0	-	-	-
B	<i>Chrysothamnus viscidiflorus</i>	0	1	6	-	-	.05
B	<i>Ephedra viridis</i>	1	0	2	.85	-	.85
B	<i>Gutierrezia sarothrae</i>	36	47	14	.50	.93	.21
B	<i>Juniperus osteosperma</i>	0	2	2	1.92	2.38	2.07
B	<i>Opuntia spp.</i>	5	5	1	.00	.15	-
B	<i>Pinus edulis</i>	0	2	2	2.20	2.26	1.82
Total for Browse		68	85	51	7.90	9.27	7.90

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 15

Species	Percent Cover '03
<i>Artemisia tridentata wyomingensis</i>	1.81
<i>Chrysothamnus viscidiflorus</i>	.08
<i>Ephedra viridis</i>	1.64
<i>Gutierrezia sarothrae</i>	.10
<i>Juniperus osteosperma</i>	4.58
<i>Pinus edulis</i>	2.71

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 15

Species	Average leader growth (in) '03
<i>Artemisia tridentata wyomingensis</i>	1.4

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 15

Species	Trees per Acre	
	'98	'03
<i>Juniperus osteosperma</i>	26	25
<i>Pinus edulis</i>	33	35

Average diameter (in)	
'98	'03
22.8	13.0
8.9	6.2

BASIC COVER --

Management unit 25C, Study no: 15

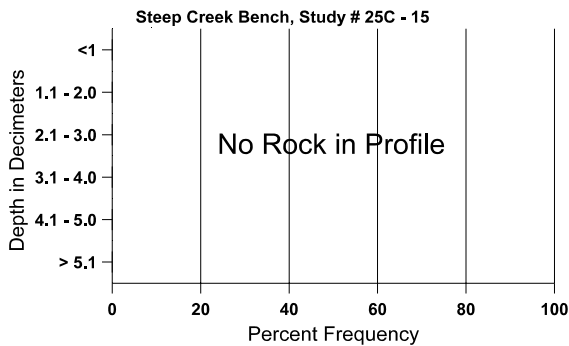
Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	3.75	4.75	13.81	20.29	12.87
Rock	0	0	.04	0	.04
Pavement	0	.25	.05	.13	.26
Litter	34.00	24.25	15.37	29.97	21.97
Cryptogams	4.00	6.00	1.75	14.82	.49
Bare Ground	58.25	64.75	63.95	46.70	72.27

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 15, Study Name: Steep Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
22.4	65.3 (11.6)	7.2	89.4	4.4	6.2	0.3	3.0	67.2	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 15

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	33	34	46
Horse	-	3	-
Elk	-	-	2
Deer	12	18	6
Cattle	2	2	-

Days use per acre (ha)	
'98	'03
-	-
-	-
-	1 (2)
27 (67)	2 (5)
9 (22)	6 (14)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 15

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
87	532	-	133	233	166	-	31	19	31	38	30/27
91	466	-	133	33	300	-	86	7	64	29	13/8
94	780	100	-	460	320	320	13	0	41	8	20/34
98	680	-	80	340	260	340	38	0	38	21	22/34
03	740	-	-	420	320	400	14	0	43	35	24/31
<i>Chrysothamnus nauseosus</i>											
87	33	-	33	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	123/34
98	20	-	-	20	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	35/48
<i>Chrysothamnus viscidiflorus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	15/16
03	160	80	60	100	-	40	0	0	-	0	8/12
<i>Ephedra viridis</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	20	-	-	20	-	-	0	100	-	0	29/48
98	0	-	-	-	-	-	0	0	-	0	-/-
03	100	-	-	100	-	-	0	0	-	0	20/35
<i>Gutierrezia sarothrae</i>											
87	2699	-	600	1966	133	-	0	0	5	9	5/5
91	233	33	-	233	-	-	0	0	0	0	8/8
94	1400	-	300	1060	40	20	0	0	3	0	6/9
98	3660	440	1560	2080	20	160	0	0	1	.54	8/11
03	460	380	60	400	-	-	0	0	0	0	8/10
<i>Juniperus osteosperma</i>											
87	33	-	-	33	-	-	0	0	-	0	236/138
91	33	-	-	33	-	-	0	0	-	0	236/142
94	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	20	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
87	333	33	100	233	-	-	0	0	0	0	3/6
91	633	100	400	200	33	-	5	0	5	5	4/10
94	380	-	20	360	-	-	0	0	0	0	3/16
98	100	-	20	80	-	-	0	0	0	0	4/12
03	20	-	-	20	-	-	0	0	0	0	4/7
Pinus edulis											
87	33	33	-	33	-	-	0	0	-	0	157/108
91	33	33	-	33	-	-	0	0	-	0	165/118
94	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	20	20	-	-	0	0	-	0	-/-
03	40	-	20	20	-	-	0	0	-	0	-/-

Trend Study 25C-17-03

Study site name: Varney-Griffin Chaining.

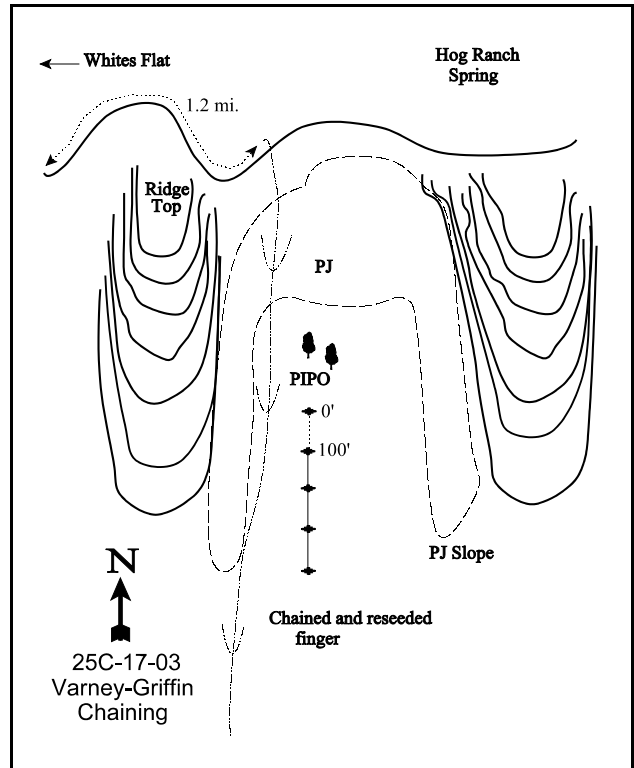
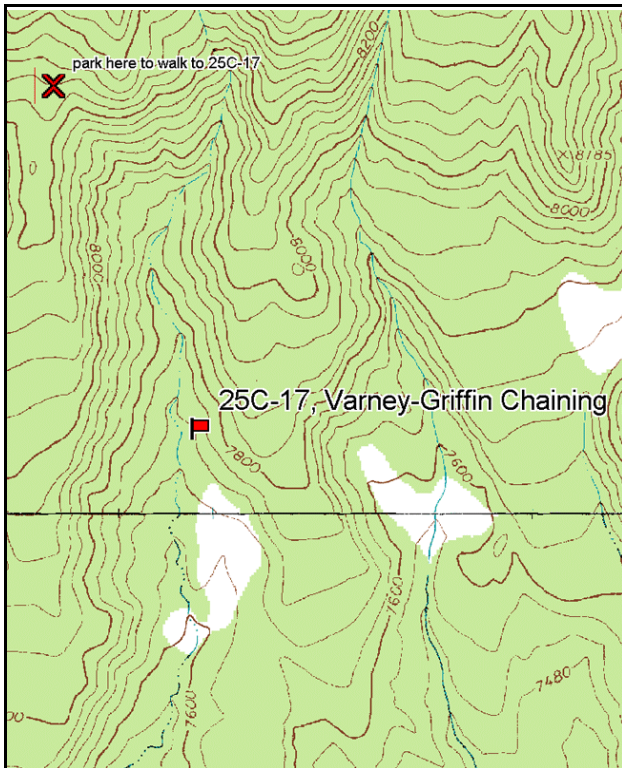
Vegetation type: Chained-Seeded P-J.

Compass bearing: frequency baseline 182 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

North Creek Road begins at mile marker 55 off of SR12. From North Creek Reservoir, continue north on the main road for 2 miles to a fork. Turn right, go 2 miles to Whites Flat. Continue towards Hog Ranch Spring for 1.2 miles. Stop where the road curves across a large ridgetop. Walk along the east edge of this flat-topped ridge to where you can see the chaining in the drainage below. Hike down the side of the ridge toward the chaining. The study area is in the north end of this chained drainage. The study is marked by browse tag #7146.



Map Name: Wide Hollow

Diagrammatic Sketch

Township 34S, Range 1E, Section Unsurveyed

GPS: NAD 27, UTM 12S 4192232 N, 434932 E

DISCUSSION

Varney-Griffin Chaining - Trend Study No. 25C-17

The Varney-Griffin Chaining is a 1,100 acre chaining project completed in 1981. The chained foothills were seeded to grasses, bitterbrush, and fourwing saltbush. The transect is located in the upper end of the chaining in a narrow valley surrounded by mature pinyon-juniper and ponderosa pine. The side of the valley where the study site is located has a southwestern aspect, draining down to a small, intermittent wash which flows south. The slope is approximately 5% to 10% with an elevation of 7,720 feet. The area did not receive much deer use in past years, but it had the potential to be excellent winter and spring range for deer and elk. By 1998, wildlife use had increased on the site. Pellet group data from 1998 estimated 26 deer, 40 elk, and 23 cow days use/acre (64 ddu/ha, 99 edu ha, 57 cdu/ha). A few of the elk pellet groups were from summer use. Pellet group data from 2003 show increased elk use estimated at 71 days use/acre (175 edu/ha). Deer use was minimal at about 1 day use/acre while cattle use was estimated at only 2 days use/acre (5 cdu/ha).

The soil is a moderately deep sandy loam with little rock on the surface or within the profile. Effective rooting depth was estimated at barely 10 inches due to the compact nature of the soil which prohibited deeper soil penetrometer readings. There does not appear to be any rooting restrictions. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.1). Average soil temperature is high for this elevation averaging 62.7°F at a depth of 13.5 inches in 2003. The soil is loose and friable on the surface, permitting the establishment of a dense stand of perennial grass. There is some localized soil movement, but erosion is limited by the excellent herbaceous ground cover. More soil erosion was evident in 2003 due to a decline in herbaceous cover. There was considerable evidence of overland flow, rills, and gullies due primarily to runoff from nearby slopes. The soil condition class was determined to be slight in 2003.

Seeded grasses currently dominate the site but some browse plants are scattered throughout the chaining. Preferred species include mountain big sagebrush and bitterbrush. Density of bitterbrush is low, estimated at only 33 plants/acre in 1987 and 1991, and 80 in 2003. There were no seedling or young bitterbrush encountered during any reading. Bitterbrush displayed heavy use on all plants sampled in 1987 and 1991, but moderate to heavy use in 2003.

Only 66 plants/acre of sagebrush were estimated during the 1987 and 1991 readings, but the larger sample used in 1998 estimated a much higher density of 820 plants/acre. These plants are mostly lightly hedged, in good vigor and have low percent decadence. Seed production was good in 1998 and 2003 and annual leader growth averaged 2.3 inches in 2003. Average height of mature plants has slowly increased from 25 inches in 1987 to 31 inches in 2003.

The most numerous browse species is broom snakeweed which has invaded the site. Population estimates in 1987 numbered 2,999 plants/acre. That number decreased by 81% to only 566 plants/acre in 1991. However, the population rebounded to 1,400 in 1998 and 2,720 by 2003. Stickyleaf low rabbitbrush is also fairly abundant and has increased dramatically since 1998 from 180 plants/acre to 1,740 plants/acre. Surviving pinyon pine trees have also been released since the treatment. Four inch seedlings were quite common in 1987 at an estimated density of 233 plants/acre. There are also a few young junipers and ponderosa pines. Point-quarter data from 1998 estimated a density of 54 pinyon and 22 juniper trees/acre. Average diameter of pinyon was 2.9 inches while that of juniper was 4.9 inches. Most trees were in the 4 to 6 foot height class. Point-quarter data from 2003 show an increase in tree density. Pinyon density was estimated at 104 trees/acre with an average diameter of 2 inches. Fifty-five percent of the pinyon trees sampled were seedlings. Juniper density increased slightly to 30 trees/acre with an average diameter of 3.5 inches. Over half of the juniper trees sampled were in the 4 to 8 foot height class. Other browse occurring in the area include Gambel oak, rubber rabbitbrush, gray horsebrush, and serviceberry.

The herbaceous understory is abundant and dominated by seeded perennial grasses which provide 88% of the

grass cover in 1998. Crested wheatgrass is the most abundant, but the rhizomatous smooth brome and intermediate wheatgrass are also prominent. Blue grama, a warm season grass, is also common while other native grasses are scattered over the site. The grasses appear to be effectively competing with the browse seedlings. Seeded forbs, sweet clover and alfalfa, were observed on the site but not sampled. Eighteen forb species occurred in the frequency belts in 1987 and 1991. Twenty-six perennial and annual species were encountered in 1998. The most notable species are silvery lupine and bastard toadflax. Only light use is evident on the herbaceous plants.

1987 APPARENT TREND ASSESSMENT

Soil conditions have improved compared to the untreated pinyon-juniper woodland. Herbaceous cover is good and erosion is minimal in the chaining. The browse component is lacking but densities should increase in time. Mountain big sagebrush and bitterbrush are moderately to heavily browsed but have good vigor and low decadence. Seeded grasses dominate the herbaceous understory with crested and intermediate wheatgrass being the most abundant. Several native perennial grasses are also found on the site in good numbers. Forbs are diverse but only a few are common. Bastard toad flax and silvery lupine are the most abundant forbs.

1991 TREND ASSESSMENT

Basic cover characteristics for this site have not changed a great deal since 1987 with the exception of a 2 fold increase in vegetative basal cover and a decline in litter cover from 75% to 65%. Much of the loss in litter cover is probably due to the decomposition of chaining litter. Collectively, pavement and rock have gone from only 1% to 3%. Percent bare ground has increased only slightly from 17% to 20%. The site is still in excellent condition and trend for soils is considered stable. There has been no change in densities for two key species, mountain big sagebrush and antelope bitterbrush. One concern for the area was the possible increase in broom snakeweed, but it's population has actually gone down by 81%, from almost 3,000 to 566 plants/acre. Trend for browse on this site is stable, but poor at this time. This site would make a good spring or fall range with the high amounts of grasses and forbs. The herbaceous understory is still in excellent condition, but only 11 out of 33 species have shown any increases in nested frequency and many of these were not in very high frequencies to begin with. Therefore, the trend is slightly downward, but it is still in excellent condition.

TREND ASSESSMENT

soil - stable (3)

browse - stable, but low numbers (3)

herbaceous understory - slightly downward (2)

1998 TREND ASSESSMENT

Trend for soil is up with a decline in percent bare ground from 20% to 11% and a slight increase in litter cover. Trend for browse is also up with an increase in density of the two key species, bitterbrush and mountain big sagebrush. Both species show light use, good vigor and low decadence. Sagebrush also displays improved reproduction with good numbers of seedlings and young. Trend for the herbaceous understory is mixed. Sum of nested frequency of grasses is down slightly while frequency of forbs is up slightly. The decline in nested frequency of grasses is mainly due to a significant decline in the nested frequency of blue grama, a warm season increaser, and needle-and-thread grass. Frequency of intermediate wheatgrass also declined but not significantly. Nested frequency of crested wheatgrass and smooth brome increased slightly. Forbs provide only 18% of the herbaceous vegetation cover on the site. The only forb to increase significantly was silvery lupine which is the dominant forb. With this in mind, trend for the herbaceous understory is considered stable with a change in composition for grasses.

TREND ASSESSMENT

soil - up (5)

browse - up (5)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil down due to drought. Total herbaceous cover has declined 61%. Bare ground increased 3 fold, litter cover declined, and total vegetation cover declined. Erosion was evident, but most was due to runoff from nearby slopes. Trend for browse is stable but still limited in numbers. Mountain big sagebrush remained similar in density. Use was heavier but vigor remains good and decadence low. Bitterbrush is still limited in number. It is moderately to heavily browsed with some plants displaying poor vigor and 25% of the population is decadent. Density increased to 80 plants/acre, but some of the increase may be due to the difficulty identifying individual plants which have an average crown diameter of nearly 5 feet. Pinyon trees are increasing on the site. Point-quarter data estimated 104 trees/acre with 55% of those classified as seedlings. The herbaceous understory trend is down. Sum of nested frequency of perennial grasses declined 57% while nested frequency of perennial forbs increased slightly. All seeded grasses, crested wheatgrass, intermediate wheatgrass, and smooth brome, declined significantly in frequency. Perennial grass production declined 4 fold from 24% cover in 1998 to only 5.4% in 2003. Grass composition has remained similar with crested wheatgrass providing 57% of the grass cover.

TREND ASSESSMENT

soil - down (1)

browse - stable (3)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 17

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
G	Agropyron cristatum	b ₂₁₉	b ₂₁₄	b ₂₂₈	a ₁₂₈	13.38	3.07
G	Agropyron intermedium	c ₁₄₅	b ₁₀₃	b ₆₉	a ₁₄	1.14	.10
G	Bouteloua gracilis	b ₁₄₄	b ₁₂₈	a ₃₉	a ₄₉	.82	.97
G	Bromus inermis	b ₁₂₂	c ₁₇₄	c ₁₈₈	a ₃₀	6.52	.34
G	Carex spp.	a ⁻	a ₅	b ₂₉	a ₃	.46	.03
G	Elymus salina	-	7	4	-	.15	-
G	Oryzopsis hymenoides	11	5	3	-	.00	-
G	Poa fendleriana	ab ₁₀	a ₄	b ₂₃	ab ₁₃	.78	.51
G	Sitanion hystrix	b ₉	ab ₂	a ₃	a ⁻	.00	-
G	Sporobolus cryptandrus	a ⁻	b ₁₂	a ₂	a ⁻	.00	-
G	Stipa comata	bc ₅₉	c ₅₆	ab ₂₈	a ₂₅	.43	.36
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		719	710	616	262	23.74	5.41
Total for Grasses		719	710	616	262	23.74	5.41
F	Alyssum alyssoides (a)	-	-	b ₂₅	a ⁻	.06	-

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
F	<i>Androsace septentrionalis</i> (a)	-	-	8	-	.04	-
F	<i>Arabis</i> spp.	-	1	-	-	-	-
F	<i>Artemisia ludoviciana</i>	4	3	2	-	.15	-
F	<i>Astragalus</i> spp.	2	2	6	2	.04	.00
F	<i>Chaenactis douglasii</i>	-	-	1	-	.00	-
F	<i>Chenopodium fremontii</i> (a)	-	-	-	2	-	.00
F	<i>Chenopodium leptophyllum</i> (a)	-	-	a-	b ¹⁴	-	.53
F	<i>Comandra pallida</i>	29	22	39	29	1.08	.21
F	<i>Cryptantha</i> spp.	b ¹⁰	ab ⁶	b ⁷	a-	.02	-
F	<i>Dalea</i> spp	-	-	-	1	-	.00
F	<i>Descurainia pinnata</i> (a)	6	-	1	-	.00	-
F	<i>Erigeron</i> spp.	-	6	8	-	.04	-
F	<i>Eriogonum racemosum</i>	4	4	10	12	.08	.05
F	<i>Eriogonum umbellatum</i>	6	5	5	2	.04	.03
F	<i>Gilia</i> spp. (a)	1	-	-	-	-	-
F	<i>Ipomopsis aggregata</i>	-	-	5	-	.16	-
F	<i>Lappula occidentalis</i> (a)	-	-	1	11	.00	.36
F	<i>Lesquerella rectipes</i>	b ¹⁸	b ¹²	ab ⁸	a-	.04	-
F	<i>Lotus utahensis</i>	-	-	1	-	.15	-
F	<i>Lupinus argenteus</i>	bc ⁵⁸	a ²⁷	c ⁶³	ab ³³	2.91	1.07
F	<i>Lychnis drummondii</i>	-	-	2	-	.03	-
F	<i>Machaeranthera canescens</i>	b ¹¹	a-	a ⁴	a-	.00	-
F	<i>Medicago sativa</i>	-	-	-	-	.00	-
F	<i>Oenothera</i> spp.	1	3	7	-	.01	-
F	<i>Oenothera pallida</i>	3	12	13	11	.05	.19
F	<i>Penstemon comarrhenus</i>	-	5	-	-	-	-
F	<i>Penstemon</i> spp.	b ²³	a ⁵	a ⁷	a ¹	.04	.03
F	<i>Penstemon pachyphyllus</i>	8	1	-	-	-	-
F	<i>Phlox longifolia</i>	2	8	6	1	.01	.00
F	<i>Polygonum douglasii</i> (a)	-	-	6	-	.01	-
F	<i>Senecio multilobatus</i>	b ⁴⁹	a ³	a ¹²	c ¹²⁹	.08	3.24
F	<i>Sphaeralcea coccinea</i>	a ⁸	b ²²	a ³	a ⁶	.01	.03
Total for Annual Forbs		7	0	41	27	0.12	0.90
Total for Perennial Forbs		236	147	209	227	5.00	4.88
Total for Forbs		243	147	250	254	5.12	5.78

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

BROWSE TRENDS --

Management unit 25C, Study no: 17

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	<i>Artemisia frigida</i>	0	5	-	.21
B	<i>Artemisia tridentata vaseyana</i>	31	34	5.81	8.66
B	<i>Chrysothamnus nauseosus</i>	0	0	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	8	24	.38	.82
B	<i>Gutierrezia sarothrae</i>	30	37	1.21	1.22
B	<i>Juniperus osteosperma</i>	2	2	1.12	1.92
B	<i>Pinus edulis</i>	5	7	1.80	2.71
B	<i>Purshia tridentata</i>	2	4	.38	.68
B	<i>Quercus gambelii</i>	4	5	2.51	3.47
B	<i>Symphoricarpos oreophilus</i>	1	1	.85	.98
B	<i>Tetradymia canescens</i>	1	2	.00	.03
Total for Browse		84	121	14.09	20.70

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 17

Species	Percent Cover	
	'98	'03
<i>Artemisia frigida</i>	-	.23
<i>Artemisia tridentata vaseyana</i>	-	9.56
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.41
<i>Gutierrezia sarothrae</i>	-	1.38
<i>Juniperus osteosperma</i>	.80	1.43
<i>Pinus edulis</i>	-	4.33
<i>Purshia tridentata</i>	-	1.21
<i>Quercus gambelii</i>	1.20	2.90
<i>Symphoricarpos oreophilus</i>	-	.25
<i>Tetradymia canescens</i>	-	.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 17

Species	Average leader growth (in)
	'03
<i>Artemisia tridentata vaseyana</i>	2.3
<i>Purshia tridentata</i>	2.5

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 17

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	22	30
Pinus edulis	54	104

Average diameter (in)	
'98	'03
4.9	3.5
2.9	2.0

BASIC COVER --

Management unit 25C, Study no: 17

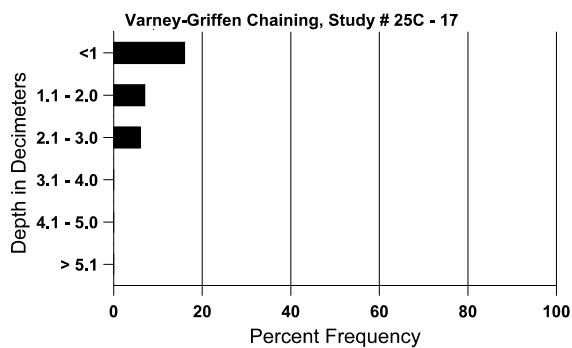
Cover Type	Average Cover %			
	'87	'91	'98	'03
Vegetation	6.25	10.75	48.51	29.84
Rock	0	.50	.16	.23
Pavement	1.25	2.25	1.11	2.62
Litter	74.75	65.00	68.40	55.40
Cryptogams	.50	1.75	.92	0
Bare Ground	17.25	19.75	10.81	30.42

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 17, Study Name: Varney-Griffin Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.8	62.7 (13.5)	6.1	73.1	12.4	14.6	1.4	12.7	134.4	.3

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 17

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	52	20	-	-
Elk	13	41	41 (101)	71 (175)
Deer	9	9	26 (64)	1 (2)
Cattle	6	3	23 (57)	2 (5)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 17

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	52/54
<i>Artemisia frigida</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	140	-	-	140	-	-	0	0	-	0	14/13
<i>Artemisia tridentata vaseyana</i>											
87	66	-	-	66	-	-	50	0	0	0	25/21
91	66	-	-	66	-	-	0	0	0	0	29/31
98	820	80	220	580	20	20	5	0	2	0	29/40
03	780	-	60	600	120	20	28	5	15	0	31/44
<i>Chrysothamnus nauseosus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	46/57
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	33	-	-	33	-	-	0	0	0	0	14/9
98	180	40	20	160	-	-	0	0	0	0	21/21
03	1740	-	180	1500	60	140	2	0	3	1	17/19

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae											
87	2999	133	633	2333	33	-	0	0	1	0	9/8
91	566	333	233	300	33	-	6	0	6	18	7/8
98	1400	520	660	740	-	-	0	0	0	0	12/13
03	2720	-	280	2380	60	100	0	0	2	.73	9/8
Juniperus osteosperma											
87	33	-	33	-	-	-	0	0	-	0	-/-
91	33	-	33	-	-	-	0	0	-	0	-/-
98	40	-	40	-	-	-	0	0	-	0	-/-
03	60	-	-	60	-	-	0	0	-	0	-/-
Pinus edulis											
87	0	266	-	-	-	-	0	0	-	0	-/-
91	233	100	233	-	-	-	0	0	-	43	-/-
98	120	20	100	20	-	-	0	0	-	0	-/-
03	180	-	100	80	-	-	0	0	-	0	-/-
Pinus ponderosa											
87	0	33	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
87	33	-	-	33	-	-	0	100	0	0	12/33
91	33	-	-	-	33	-	0	100	100	0	-/-
98	40	-	-	40	-	-	0	0	0	0	33/51
03	80	-	-	60	20	-	25	25	25	25	36/57
Quercus gambelii											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	320	-	40	220	60	20	0	0	19	6	62/38
03	480	-	-	480	-	40	0	0	0	0	43/32
Symphoricarpos oreophilus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	26/109
03	20	-	-	20	-	-	0	0	-	0	35/58

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Tetradymia canescens</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	20/28
03	40	-	-	40	-	-	0	0	-	0	18/29

Trend Study 25C-20-03

Study site name: Baldys .

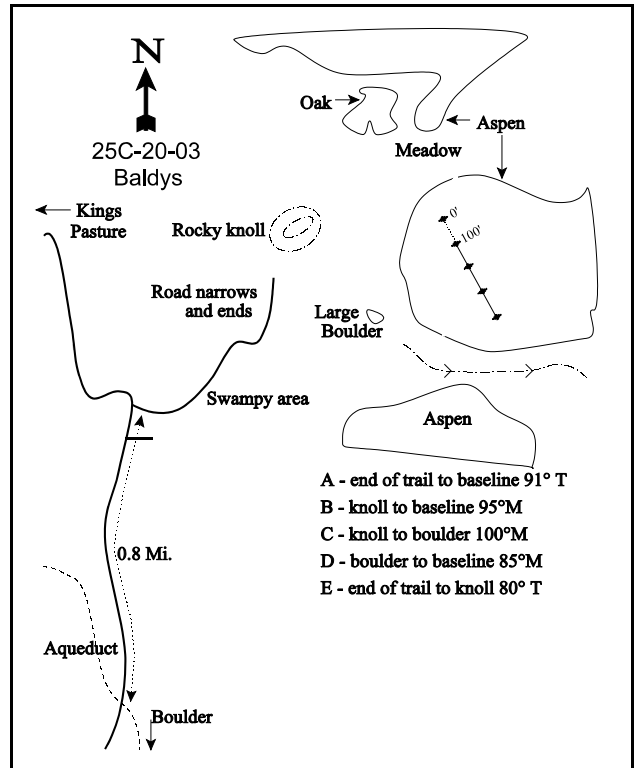
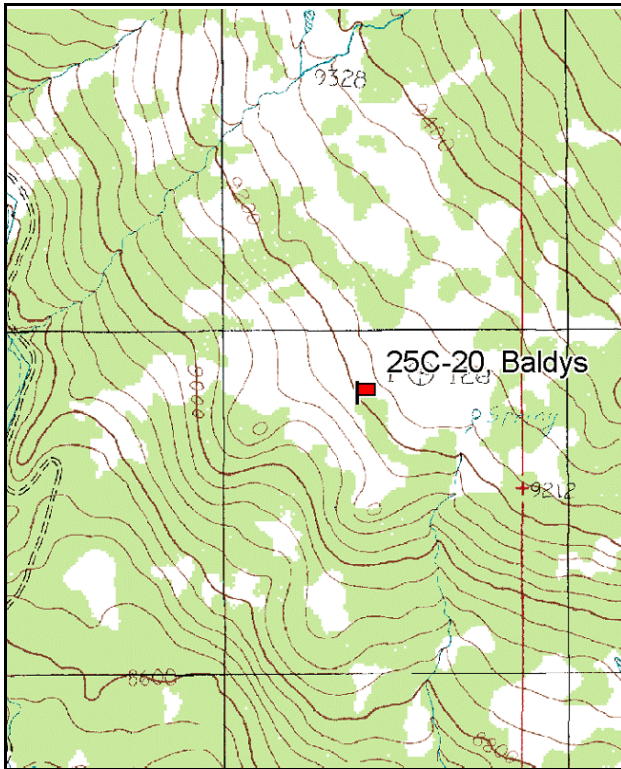
Vegetation type: Quaking Aspen .

Compass bearing: frequency baseline 120 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). No rebar.

LOCATION DESCRIPTION

From SR12 north of Boulder, turn onto the Garkane Power Plant road. Travel 1.8 miles to a fork, and go right toward Kings Pasture. Proceed 1.2 miles to a cattleguard and pipeline crossing. Continue 0.8 miles to a fork at a sharp curve in the road. Be sure to take the second fork, just 150-200 feet before the correct fork is another minor fork. Go 0.2 miles up a rocky road. Park at the creek, then walk across the creek and marshy area and follow the old road up the hill to the northeast. At the end of the road/trail where it tops out on the hill, take bearings to the clump of aspens where the study is located. The rocky knoll, shown on the map, is a small knoll. The aspen stand contains a spruce along line 2 and there are no other conifers around. From the knoll to the site is approximately 600 feet It is marked by short fenceposts. The 0-foot baseline stake is marked by browse tag #7172.



Map Name: Grover

Diagrammatic Sketch

Township 32S, Range 4E, Section Unsurveyed

GPS: NAD 27, UTM 12S 4207786 N, 462387 E

DISCUSSION

Baldy's - Trend Study No. 25C-20

This trend study samples a small aspen grove on deer and elk summer range in the Baldy's area below the rim of Boulder Mountain. It is separated from nearby groves of aspen by rolling meadows dominated by low rabbitbrush and grasses. Elevation at the study site is 9,200 feet with a southwest aspect on a 10% to 20% slope. The area receives considerable use by both elk and cattle and is considered a key area for elk during the summer. Pellet group frequency data indicates equal numbers of elk pellet groups and livestock pats in 1994. Pellet group data from 1998 estimated 7 deer, 32 elk, and 114 cow days use/acre (17 ddu/ha, 79 edu/ha, and 282 cdu/ha). Most of the cow pats were older, but cattle were in the area during the 1998 reading. About 12 elk were also seen near the site during the 1998 reading. Pellet group data from 2003 estimated 12 deer, 32 elk, and 7 cow days use/acre (30 ddu/ha, 79 edu/ha, and 16 cdu/ha). Cattle were in the area in late August of 2003. This area is in a deferred rotation grazing system with use occurring from mid-June to mid-October.

Soil at the site is moderately deep with an effective rooting depth of almost 14 inches. Rocks of volcanic origin are common on soil surface, with some large rocks scattered throughout the soil profile. Parent material is basalt. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.1). Soil organic matter is the highest on the unit at 6.1%. An organic matter rich "A" horizon is detectable to a depth of about 6 inches. Although the terrain has a slope of about 10% to 20%, erosion is not a problem due to excellent ground cover. Historically erosion is evidenced by the gullies which are common in the meadow areas, but the few observed in the aspen are no longer active.

An overstory of mature aspen characterizes the site. About half of the aspen was considered mature in 1987 and 1991. Line-intercept data from 1998 and 2003 estimated aspen canopy cover at 76% and 72% respectively. There were an estimated 866 trees/acre in 1987 and 799 in 1991. The young trees, averaging two feet in height, were moderately utilized in 1991. Aspen density data on the shrub density strips was mistakenly not collected in 1994. During the 1998 reading, aspen density was estimated at 700 trees/acre, 69% of which were classified as mature. Decadent aspen sampled were young trees which appeared to have been hedged in the past. Point-quarter data from 1998 estimated 428 mature trees/acre with an average trunk diameter of 9.2 inches. Density of aspen increased to 1,180 trees/acre in 2003 due primarily to an increase in young trees which accounted for 53% of the population.

The shrub understory is dominated by snowberry. These plants numbered about 2,399 plants/acre in 1987, increasing to 6,266 in 1991. The much larger sample used in 1994 and 1998 estimated 5,780 and 5,080 plants/acre respectively. The majority of the population is mature, although young plants remain abundant. Utilization of snowberry was moderate to heavy in 1987 and 1991, but mostly light in 1994 and 1998. Little use was apparent in 2003. Wood's rose is the second most abundant understory species with an estimated density of 1,540 plants/acre in 1998 and 2,440 in 2003. Utilization is light. A small population of serviceberry are found on the site. These plants averaged only 19 inches in height in 2003. These shrubs showed moderate to heavy use in 2003.

The herbaceous understory is the most important component of this summer range. Tree and shrub cover have a limiting effect on grass cover and frequency. Although grasses are diverse, only 4 species occur more than occasionally. Kentucky bluegrass, an increaser with heavy grazing, is the most abundant and it provided 57% of the grass cover in 1998 and 45% in 2003. Mutton bluegrass, obtuse sedge, and sheep fescue are also fairly common. Diversity of forbs is also good, with at least 19 perennial species sampled each year. Composition is poor however, with low growing increasers including western yarrow, trailing fleabane, and dandelion providing 49% of the forb cover in 1998. Other undesirable increaser forbs found on the site include the poisonous orange sneezeweed and Rocky Mountain iris. More common preferred forbs include thickleaf peavine, silvery lupine and American vetch.

1987 APPARENT TREND ASSESSMENT

Soil condition is good with little bare ground exposed. The site is dominated by mature aspen with snowberry in the understory. The aspen stand appears healthy with a good age class distribution. Since this is summer range, the herbaceous understory is the most important aspect of this site. Herbaceous plants are limited by the thick aspen overstory. Composition is poor with increasers, Kentucky bluegrass, western yarrow, spreading fleabane, Rocky Mountain iris, and dandelion dominating the herbaceous understory.

1991 TREND ASSESSMENT

Basic cover measurements have not changed much since 1987. Vegetative basal cover was unchanged. Rock and litter cover were also almost the same as before. Percent bare ground has increased from 2% to 5%. This is still a very low percentage for bare ground, so trend for soil is considered stable. There are not many browse species in very high frequencies on this site. Snowberry and aspen would be considered the most important. Aspen has decreased in numbers by 8%, while snowberry has increased by 62%. Percent decadency for both species is still low. Overall, trend for browse is up. The overall trend for herbaceous understory is stable. The sum of nested frequency of grasses has increased while frequency of forbs has declined slightly.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - stable (3)

1994 TREND ASSESSMENT

Ground cover characteristics are similar to those of 1991. Bare ground has declined slightly. Trend for soil is stable. Trend for browse is also stable. Aspen was mistakenly not sampled in the shrub belt inventories in 1994, so no comparisons can be made. However, snowberry and Wood's rose show stable trends. The herbaceous understory is diverse and abundant with nearly equal amounts of grasses and forbs. Composition could be better however. The increaser, Kentucky bluegrass, dominates the grass component while the most numerous forbs consist of the increasers yarrow, orange sneezeweed, silvery lupine, and dandelion. Sum of nested frequencies for grasses and forbs have remained similar to 1991 estimates indicating a stable trend.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics between readings. Trend for browse is considered stable for understory shrubs, snowberry and Wood's rose. The aspen component on this site is overly mature with poor reproduction. Density of mature trees is currently stable but the proportion of young plants has steadily declined since 1987. Aspen does not provide an important forage source on this site due to the lack of available forage, but the health of the site depends on the aspen overstory. Trend for the herbaceous understory is up slightly, although the composition is poor. Sum of nested frequency of grasses declined slightly while frequency of forbs increased. Kentucky bluegrass is still the most abundant grass and it increased slightly in nested frequency. Weedy increaser forbs including western yarrow, trailing fleabane, orange sneezeweed, and dandelion, currently produce 59% of the forb cover. There are few of the late successional aspen community forbs present like sweetanise (*Osmorhiza occidentalis*), tall larkspur, meadowrue (*Thalictrum fendleri*) and wild carrot (*Ligusticum filicinum*). Production is up however, with grass cover increasing from 8% in 1994 to 14% by 1998. Forb cover increased from 8% to 26%.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil remains stable with abundant protective ground cover to prevent erosion. There is very little bare ground exposed and herbaceous plants are abundant. Trend for browse is up, but shrubs are not a critical aspect of this summer range. However, aspen has increased in density due primarily to an increase in young plants (180 to 620 plants/acre). Wood's rose and snowberry also increased in density although both are more increasers and not utilized as forage on this site. Serviceberry also increased in density and is moderately to heavily browsed. Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses remained similar to 1998 but sum of nested frequency of perennial forbs declined 22%. Production of perennial grasses remained relatively stable while cover of perennial forbs declined 49% (26% to 13%). Composition of forbs is still poor.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 20

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	Agropyron trachycaulum	a13	a7	b34	a8	a7	.19	.19	.07
G	Bouteloua gracilis	-	-	1	-	1	.00	-	.00
G	Bromus anomalus	ab8	b18	ab15	a3	a2	.63	.00	.03
G	Bromus carinatus	a-	b9	a-	a-	ab3	-	.03	.18
G	Carex obtusata	a66	b126	ab110	a76	a53	.98	1.42	1.04
G	Dactylis glomerata	b16	a-	a1	a-	a-	.00	-	-
G	Festuca ovina	b101	b86	a40	a45	a40	.37	1.31	.53
G	Festuca thurberi	-	-	4	-	-	.07	-	-
G	Juncus balticus	b38	b47	b37	a-	a6	.59	-	.04
G	Koeleria cristata	-	-	4	-	-	.00	-	-
G	Muhlenbergia richardsonis	a-	ab10	a-	b13	a1	-	.48	.00
G	Poa fendleriana	a32	a1	b98	b80	b67	3.08	2.12	2.50
G	Poa pratensis	a134	c193	a142	ab143	bc161	2.33	7.86	5.70
G	Sitanion hystrix	ab12	bc40	cd45	a6	d70	.61	.12	2.34
G	Stipa columbiana	a-	a-	a-	b16	ab5	-	.13	.03
G	Stipa comata	1	1	-	-	-	-	-	-
G	Stipa lettermani	b59	ab24	b45	a14	a9	.76	.12	.16

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
	Total for Annual Grasses	0	0	0	0	0	0	0	0
	Total for Perennial Grasses	480	562	576	404	425	9.65	13.81	12.65
	Total for Grasses	480	562	576	404	425	9.65	13.81	12.65
F	<i>Achillea millefolium</i>	_b 154	_b 140	_a 92	_b 126	_a 91	1.79	3.59	1.49
F	<i>Agoseris glauca</i>	_a -	_a -	_a -	_a 4	_b 18	-	.03	.72
F	<i>Allium cernuum</i>	_c 62	_b 28	_{ab} 20	_{ab} 14	_a 11	.20	.10	.33
F	<i>Antennaria parvifolia</i>	13	14	19	30	22	.11	.58	.29
F	<i>Androsace septentrionalis</i> (a)	-	-	3	9	-	.01	.16	-
F	<i>Artemisia dracunculus</i>	-	-	-	5	5	-	.01	.04
F	<i>Arabis drummondii</i>	_a 3	_b 24	_a -	_a -	_a -	-	-	-
F	<i>Artemisia ludoviciana</i>	2	-	-	-	-	-	-	-
F	<i>Aster chilensis</i>	_a -	_b 23	_{ab} 5	_b 19	_b 13	.04	.06	.08
F	<i>Astragalus convallarius</i>	-	-	-	5	-	-	.18	-
F	<i>Castilleja linariaefolia</i>	-	-	-	-	3	-	-	.03
F	<i>Chenopodium album</i> (a)	-	-	4	12	1	.01	.07	.00
F	<i>Cirsium vulgare</i>	5	-	3	3	3	.06	.03	.04
F	<i>Collomia linearis</i> (a)	-	-	-	2	-	-	.00	-
F	<i>Cymopterus lemmonii</i>	_{bc} 33	_c 40	_{abc} 14	_a 1	_{ab} 25	.09	.01	.39
F	<i>Descurainia</i> spp. (a)	-	-	-	5	-	-	.03	-
F	<i>Erigeron eatonii</i>	-	-	-	-	2	-	-	.00
F	<i>Erigeron flagellaris</i>	25	12	27	27	32	.21	1.06	.26
F	<i>Erigeron</i> spp.	_b 18	_{ab} 4	_a -	_a 3	_{ab} 4	-	.00	.03
F	<i>Eriogonum racemosum</i>	-	3	-	-	-	-	-	-
F	<i>Gentiana amarella heterosepala</i>	-	2	-	-	-	-	-	-
F	<i>Geranium richardsonii</i>	36	26	45	29	17	.57	.28	.29
F	<i>Helenium hoopesii</i>	34	33	38	41	37	.85	2.51	1.20
F	<i>Ipomopsis aggregata</i>	-	-	-	-	4	-	-	.03
F	<i>Iris missouriensis</i>	_a 21	_a 17	_a 16	_b 24	_a 5	.42	.42	.15
F	<i>Lathyrus lanszwertii</i>	_a -	_a -	_b 20	_c 58	_c 28	1.14	3.83	1.40
F	<i>Lomatium</i> spp.	-	-	-	4	-	-	.15	-
F	<i>Lupinus argenteus</i>	_a 7	_a 12	_{bc} 33	_c 39	_{ab} 19	1.66	2.32	.85
F	<i>Lychnis drummondii</i>	-	-	-	2	-	-	.00	-
F	<i>Osmorhiza occidentalis</i>	-	-	-	7	-	-	.01	-
F	<i>Penstemon</i> spp.	_a 1	_a -	_b 10	_a -	_{ab} 3	.03	-	.00
F	<i>Phacelia</i> spp.	-	2	-	-	2	-	-	.03
F	<i>Phlox austromontana</i>	_a -	_a 3	_b 34	_{ab} 15	_b 28	.76	.60	.93

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
F	Potentilla concinna	-	-	5	1	3	.03	.03	.06
F	Polygonum douglasii (a)	-	-	8	13	6	.02	.16	.02
F	Potentilla gracilis	_a -	_{ab} 1	_b 12	_{ab} 4	_a -	.48	.06	-
F	Senecio multilobatus	_{ab} 8	_a -	_b 13	_{ab} 12	_b 11	.08	.07	.14
F	Taraxacum officinale	_b 224	_b 221	_a 157	_b 199	_a 151	1.29	8.17	3.08
F	Tragopogon dubius	-	-	-	-	2	-	-	.03
F	Trifolium repens	1	-	-	-	-	-	-	-
F	Unknown forb-perennial	4	-	-	-	5	-	-	.07
F	Vicia americana	_{ab} 68	_{ab} 73	_a 55	_b 97	_a 51	.32	1.62	.91
F	Viola spp.	-	3	-	4	7	-	.03	.24
Total for Annual Forbs		0	0	15	41	7	0.04	0.43	0.02
Total for Perennial Forbs		719	681	618	773	602	10.18	25.84	13.20
Total for Forbs		719	681	633	814	609	10.23	26.28	13.23

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

BROWSE TRENDS --

Management unit 25C, Study no: 20

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Amelanchier alnifolia	8	0	9	.44	-	.33
B	Populus tremuloides	0	32	35	.91	1.82	11.03
B	Ribes montigenum	1	0	0	.00	-	-
B	Rosa woodsii	19	29	25	.71	1.15	1.20
B	Symphoricarpos oreophilus	61	75	76	11.68	13.44	13.38
Total for Browse		89	136	145	13.75	16.42	25.96

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 20

Species	Percent Cover	
	'98	'03
Amelanchier alnifolia	-	.71
Populus tremuloides	76.00	72.19
Ribes montigenum	-	.43
Rosa woodsii	-	.65
Symphoricarpos oreophilus	-	12.35

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 20

Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Populus tremuloides	428	N/A	9.2	N/A

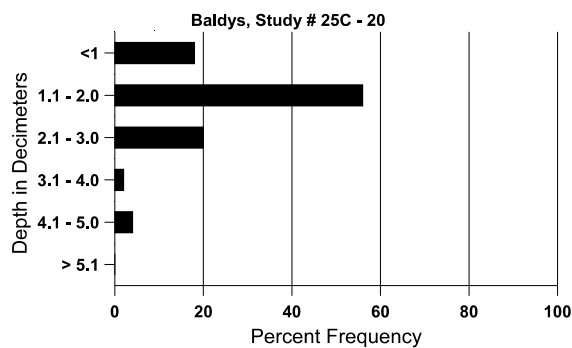
BASIC COVER --
Management unit 25C, Study no: 20

Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	4.00	3.50	29.06	49.69	42.97
Rock	8.25	6.25	9.58	5.89	7.71
Pavement	0	0	.45	1.04	.57
Litter	85.75	85.25	60.19	81.25	65.61
Cryptogams	0	.25	0	.03	.15
Bare Ground	2.00	4.75	4.38	4.92	1.15

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 20, Study Name: Baldys

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
13.5	43.2 (14.5)	6.1	62.7	16.7	20.6	6.1	28.4	329.6	0.6

Stoniness Index



PELLET GROUP DATA --
Management unit 25C, Study no: 20

Type	Quadrat Frequency			Days use per acre (ha)	
	'94	'98	'03	'98	'03
Rabbit	1	-	1	-	-
Elk	3	12	18	32 (79)	32 (79)
Deer	1	5	2	7 (17)	12 (30)
Cattle	4	5	4	14 (35)	7 (16)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 20

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	420	-	-	420	-	-	71	0	0	0	10/6
98	0	-	-	-	-	-	0	0	0	0	-/-
03	740	-	460	140	140	-	22	16	19	5	19/9
Chrysothamnus nauseosus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	66	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Chrysothamnus viscidiflorus lanceolatus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	17/28
Populus tremuloides											
87	999	-	533	400	66	-	20	20	7	7	341/144
91	932	-	466	466	-	-	36	0	0	14	355/124
94	0	-	-	-	-	-	0	0	0	0	-/-
98	1000	-	480	480	40	120	10	0	4	4	-/-
03	1180	-	620	540	20	80	15	0	2	0	-/-
Ribes montigenum											
87	66	-	-	66	-	-	0	0	-	0	30/39
91	66	-	-	66	-	-	0	0	-	0	35/55
94	60	-	-	60	-	-	0	0	-	0	19/63
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Rosa woodsii											
87	132	-	66	-	66	-	0	50	50	0	-/-
91	66	-	66	-	-	-	0	0	0	0	-/-
94	1340	20	400	920	20	20	0	0	1	0	14/11
98	1540	240	560	940	40	20	1	0	3	0	20/15
03	2440	-	-	2400	40	100	0	0	2	.81	13/8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus											
87	2399	66	733	1666	-	-	61	25	0	0	18/27
91	6266	66	1933	3533	800	-	29	7	13	4	16/24
94	5780	20	400	5380	-	-	3	0	0	0	16/24
98	5080	120	1240	3820	20	20	2	.39	0	0	20/29
03	6600	-	1080	5420	100	-	0	0	2	0	16/27

Trend Study 25C-23-03

Study site name: Coal Bench.

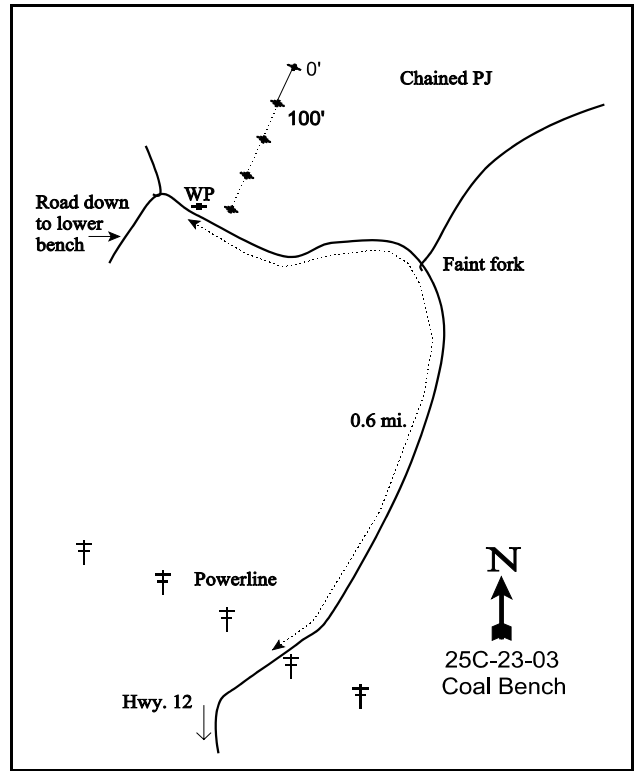
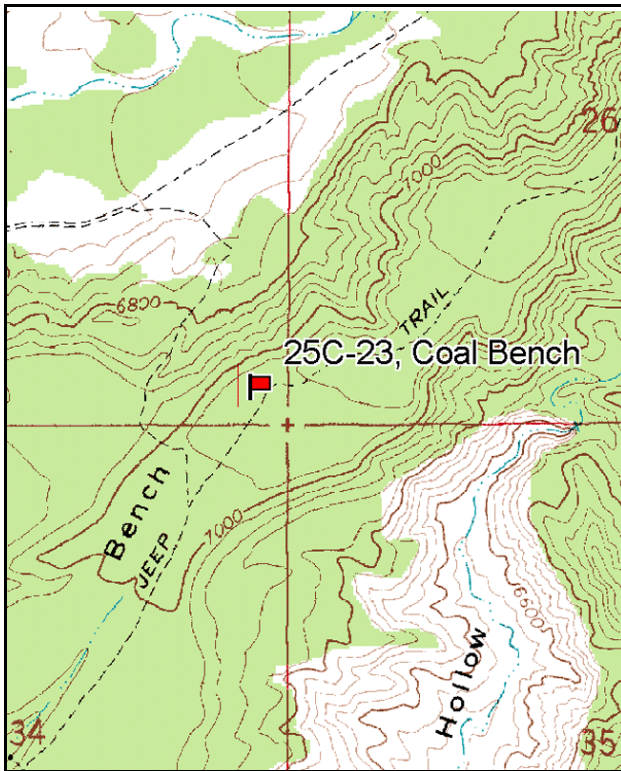
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 208 degrees magnetic.

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

LOCATION DESCRIPTION

Take SR12 west of Escalante towards Henrieville. Go 0.5 mile past mile marker 33, then turn right (north) onto a dirt road which leads toward Coal Bench. Go to a fork (take left fork to cross the wash) and continue 0.3 miles to a gate. From the gate travel 2.0 miles to a fence at the top of the bench. Continue 0.6 miles to a fork, keep right. Continue 1.1 mile to a fence, then pass under the powerlines. Go 1.0 mile to a larger set of powerlines. Continue 0.6 miles to where the road bends and drops down onto a lower bench. There is a witness post (4 foot tall green fencepost) on the right side of the road. From the witness post, walk 100 feet at 114 degrees magnetic to the 400-foot stake. The 0-foot baseline stake, 400 feet northeast, is marked with browse tag #7139.



Map Name: Pine Lake

Diagrammatic Sketch

Township 36S, Range 2W, Section 34

GPS: NAD 27, UTM 12S 4165865 N, 413177 E

DISCUSSION

Coal Bench - Trend Study No. 25C-23

This trend study is located on the large Coal Bench mesa, below the Table Cliffs on a southwest point of the Aquarius Plateau. Most of the suitable acreage (3,500 acres) on Coal Bench has been chained and/or plowed and seeded. Treatments were completed in 1966. The transect is located on the narrow, northern end of upper Coal Bench at an elevation of 7,000 feet. The terrain is nearly level to gently sloping on a mostly south aspect. Deer use the area as a major spring and fall migration route from the Dixie National Forest to winter ranges further south. In mild winters, some deer stay in the area. Pellet group data taken during the 1991 reading estimated 14 deer days use/acre (35 ddu/ha). Data from 1998 estimated 7 deer and 4 cow days use/acre (17 ddu/ha and 10 cdu/ha). One elk pellet group was also found. Deer pellet groups were concentrated around cliffrose plants. Cow sign appeared old and possibly from the previous year ('97). Rabbit sign was abundant. Pellet group data from 2003 estimated similar light use at 7 deer, 2 elk, and 11 cow days use/acre (18 ddu/ha, 5 edu/ha, and 27 cdu/ha). Cattle use appeared to be from the previous grazing season ('02). This area is within a 3 pasture rest rotation grazing system with use occurring in the spring or summer.

The soil is relatively deep with an estimated effective rooting depth of almost 15 inches. At that depth, a hard pan layer was encountered which was impenetrable to the soil penetrometer. Soil texture is a sandy clay loam which is neutral in reactivity (pH 7.0). The soil was formed in alluvium from sandstone and shale. Phosphorus is low at only 4 ppm, when 10 ppm is considered to be the minimum value for normal plant development. Some areas have evidence of continued soil movement with rills, exposed plant roots, soil pedestalling and localized concentrations of pavement on the surface. However, erosion is not severe due to the gentle terrain.

Twenty years after the chaining, and prior to the 1998 reading, young (5-8 foot tall) pinyon and juniper trees were common on the site. Density did not appear great enough to effect understory plants in 1991. During the spring or early summer of 1998, prior to the 1998 reading, most of the pinyon and juniper trees were cut down with chainsaws. Point-quarter data estimated 14 pinyon and 24 juniper trees/acre still on the site. Of these, 1/3 of the juniper trees sampled were cut, but still living because they were not cut close enough to the ground. Pinyon had an average basal diameter of only 1 inch while uncut surviving juniper averaged 2.7 inches in diameter. Shrub density strip data estimated a total of 260 dead pinyon and juniper trees/acre that were killed by the treatment. Point-quarter data from 2003 estimated 13 pinyon and 14 juniper trees/acre with average basal diameters of 2.5 and 2.9 inches respectively. Eighty percent of the pinyon and 64% of the juniper trees sampled were in the 1 to 4 foot height class.

Black sagebrush is the most common browse species which makes up around 80% of the total browse cover. Density was estimated at 933 plants/acre in 1987 increasing to 4,599 by 1991. The much larger sample used in 1998 estimated 2,840 plants/acre. It appears that most of the change in density was caused by the decline in young plants. Mature plants actually increased from 1,233 to 1,660 plants/acre. Black sagebrush density numbered 3,620 plants/acre in 2003. Young recruitment has been good during all readings with the exception of marginal recruitment in 2003. Utilization has been mostly light to moderate with a few plants displaying heavy use. Use was heavier in 1991 when 64% of the shrubs sampled displayed moderate use. Vigor has been good during all readings and percent decadence has remained low.

Other preferred browse species consist of small numbers of curleaf mountain mahogany and Stansbury cliffrose. Curleaf was first picked up in 1998 with the larger sample. Cliffrose numbered an estimated 60 plants/acre. Many of these are 6 to 7 feet tall and mostly moderately utilized where available. Annual leader growth was good in 2003 averaging nearly 3 inches. Annual leaders were only found on plants which had received browsing use during the past winter. Most cliffrose was vigorous in 2003 and many were producing seed. Other browse found on the site include a few Wyoming big sagebrush, rubber rabbitbrush, bitterbrush,

and broom snakeweed.

The understory is productive but dominated by crested wheatgrass which provided 73% of the total vegetation cover in 1998. It provided 99% of the grass cover in 1998 and 2003. Heavy litter buildup is associated with these mature plants. The bunchgrass provides excellent soil protection where it occurs, but there is a lot of exposed soil between plants. Native grasses are uncommon. Forbs are rare and only the large-leaved *Cryptantha* was found more than occasionally.

1987 APPARENT TREND ASSESSMENT

Soil condition is good as herbaceous plants are abundant and well dispersed. Cover of bare ground is relatively high but erosion is not a problem due to the gentle terrain. The key browse is black sagebrush and cliffrose. Sagebrush is not abundant with a density of only 933 plants/acre. Seedling and young recruitment are good however, and the population appears to be expanding. The large cliffrose are moderately hedged where available. The small population appears stable with no seedling or young recruitment. The herbaceous understory is totally dominated by crested wheatgrass. Other grasses are uncommon. The forb component is diverse for a dry site like this, but only *Cryptantha* is found more than occasionally.

1991 TREND ASSESSMENT

There have been large changes in basic cover with only two characteristics that were positive. Vegetative basal cover increased (4% to 6%) and percent rock-pavement decreased (11% to 7%). The negative changes were litter cover declining (54% to 46%) and percent bare ground increasing (31% to 42%). These changes all indicate a downward trend for soils. Most of the more important browse species are in very low numbers, 66 plants/acre or less. The one key species that occurs in high numbers is black sagebrush. Density was estimated at 4,599 plants/acre, up from 933 plants/acre in 1987. Trend for browse is up for Coal Bench. The only common herbaceous species is crested wheatgrass and *Cryptantha*. The overall trend is slightly downward for the sum of nested frequency for both grasses and forbs is down and the nested frequency of crested wheatgrass has dropped significantly.

TREND ASSESSMENT

soil - down (1)

browse - up (5)

herbaceous understory - slightly downward (2)

1998 TREND ASSESSMENT

Trend for soil is up with a major decline in percent bare ground (42% to 27%). Litter cover also increased slightly. Trend for browse is considered stable. Density of the key species, black sagebrush, declined 38% due to a reduced number of young plants (3,233 to 1,060 plants/acre). There is still more than enough young plants to maintain the population at current levels. In addition, the number of seedlings has increased. Utilization of black sagebrush is mostly light, vigor good and percent decadence low at only 4%. Other preferred species, curleaf mountain mahogany and cliffrose, have low but stable densities. Trend for the herbaceous understory is stable. Sum of nested frequency of crested wheatgrass has remained similar to 1991, while frequency of forbs increased slightly. Composition is poor with crested wheatgrass providing 94% of the herbaceous cover.

TREND ASSESSMENT

soil - up (5)

browse - stable (3)

herbaceous understory - stable, but poor composition (3)

2003 TREND ASSESSMENT

Trend for soil is down slightly. Average cover of bare ground has increased 38% while vegetation cover dropped 43%. Litter cover declined slightly. Erosion is not a problem however due to the gentle terrain. Trend for browse is up slightly for black sagebrush and stable for cliffrose. Black sagebrush increased 22% in density to 3,620 plants/acre. Use is similar and vigor is normal on most plants. The number of decadent plants did increase to 15% of the population but young sagebrush are abundant enough to maintain the stand. Cliffrose has remained at a density of 60 plants/acre. All are mature, treelike shrubs with an average height of 5 feet. Browsing is moderate where available. Vigor remains good but there is no sign of seedling or young recruitment. Overall, trend for browse is considered slightly up due to the increase in black sagebrush. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses and forbs declined 41%. In addition, the 2 most abundant species, crested wheatgrass and *Cryptantha* declined significantly in nested frequency. Production also dropped dramatically. Average grass and forb cover declined 3 fold since 1998. This site appears to be quite dry and likely effected by the past few drought years. Weather data from Escalante shows below normal spring precipitation (April-June) for the past 4 years with exceptionally dry conditions in 2000 and 2002.

TREND ASSESSMENT

soil - down slightly (2)

browse - up slightly (4)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 23

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
G	<i>Agropyron cristatum</i>	_c 277	_b 250	_{bc} 249	_a 151	16.34	5.03
G	<i>Agropyron smithii</i>	-	-	3	-	.01	-
G	<i>Aristida purpurea</i>	_a -	_a 3	_a -	_b 11	-	.05
G	<i>Oryzopsis hymenoides</i>	3	5	-	-	-	-
G	<i>Sitanion hystrix</i>	1	-	-	3	-	.00
G	Unknown grass - perennial	3	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		284	258	252	165	16.35	5.08
Total for Grasses		284	258	252	165	16.35	5.08
F	<i>Arabis demissa</i>	-	4	-	-	-	-
F	<i>Astragalus</i> spp.	3	-	2	-	.03	-
F	Cruciferae	1	-	-	-	-	-
F	<i>Cryptantha</i> spp.	_{ab} 40	_a 32	_b 57	_a 22	1.06	.38
F	<i>Gilia</i> spp. (a)	-	-	-	-	.00	-
F	<i>Ipomopsis aggregata</i>	2	-	8	-	.02	-
F	<i>Lesquerella intermedia</i>	2	-	-	-	-	-
F	<i>Lithospermum ruderales</i>	6	-	-	-	-	-
F	<i>Penstemon</i> spp.	-	2	-	1	-	.03

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
F	Phlox austromontana	2	3	3	1	.01	.00
F	Townsendia incana	2	1	-	-	-	-
Total for Annual Forbs		0	0	0	0	0.00	0
Total for Perennial Forbs		58	42	70	24	1.12	0.41
Total for Forbs		58	42	70	24	1.12	0.41

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

BROWSE TRENDS --

Management unit 25C, Study no: 23

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia frigida	0	0	-	.38
B	Artemisia nova	44	49	4.08	7.31
B	Cercocarpus ledifolius	2	0	.38	-
B	Chrysothamnus nauseosus	1	2	.00	.63
B	Cowania mexicana stansburiana	3	3	.53	.81
B	Gutierrezia sarothrae	1	16	-	.22
B	Juniperus osteosperma	1	1	-	-
B	Opuntia spp.	1	0	-	-
B	Pinus edulis	3	2	.03	.18
B	Sclerocactus	1	0	-	-
Total for Browse		57	73	5.03	9.54

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 23

Species	Percent Cover
	'03
Artemisia nova	5.90
Chrysothamnus nauseosus	.56
Cowania mexicana stansburiana	.70
Gutierrezia sarothrae	.08
Pinus edulis	.21
Purshia tridentata	.23

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 23

Species	Average leader growth (in)
	'03
Artemisia nova	1.5
Cowania mexicana stansburiana	2.9

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 23

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	24	14
Pinus edulis	14	13

Average diameter (in)	
'98	'03
2.3	2.9
1.0	2.5

BASIC COVER --

Management unit 25C, Study no: 23

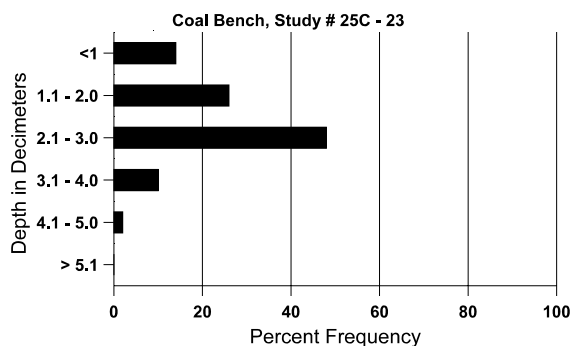
Cover Type	Average Cover %			
	'87	'91	'98	'03
Vegetation	4.25	5.50	24.64	14.16
Rock	.50	1.50	.23	.36
Pavement	10.00	4.75	6.96	7.98
Litter	53.75	45.75	48.13	46.87
Cryptogams	.50	1.00	.87	.15
Bare Ground	31.00	41.50	26.76	37.06

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 23, Study Name: Coal Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.9	64.3 (13.6)	7.0	54.0	19.4	26.6	4.6	4.0	76.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 23

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	42	33	-	-
Elk	-	3	1 (2)	2 (5)
Deer	20	9	7 (17)	7 (18)
Cattle	1	2	4 (10)	11 (27)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 23

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
87	933	3133	300	633	-	-	29	7	0	4	10/14
91	4599	33	3233	1233	133	-	64	2	3	0	8/10
98	2840	1000	1060	1660	120	120	18	6	4	0	11/17
03	3620	-	300	2760	560	140	15	.55	15	7	13/19
<i>Artemisia tridentata wyomingensis</i>											
87	33	-	-	33	-	-	0	0	-	0	26/16
91	33	-	-	33	-	-	100	0	-	0	20/27
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	31/44
<i>Cercocarpus ledifolius</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	100	-	-	60	40	-	0	0	40	0	5/8
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Chrysothamnus nauseosus</i>											
87	33	-	-	-	33	-	100	0	100	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	20	-	-	100	0	0	0	34/41
03	40	-	-	-	40	-	0	0	100	100	34/43
<i>Cowania mexicana stansburiana</i>											
87	66	-	-	66	-	-	100	0	-	0	84/96
91	33	33	-	33	-	-	0	0	-	0	93/107
98	60	-	40	20	-	-	0	0	-	0	74/73
03	60	-	-	60	-	-	67	0	-	0	62/61

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	140	20	-	-	-	0	0	-	0	10/10
03	540	-	100	440	-	-	0	0	-	0	9/11
Juniperus osteosperma											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	40	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	-/-
Opuntia spp.											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	99	-	33	33	33	-	0	0	33	0	4/8
98	40	20	-	40	-	-	0	0	0	0	5/13
03	0	-	-	-	-	-	0	0	0	0	-/-
Pinus edulis											
87	33	-	33	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	80	20	80	-	-	220	0	0	-	0	-/-
03	40	-	40	-	-	-	0	0	-	0	-/-
Purshia tridentata											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	17/24
03	0	-	-	-	-	-	0	0	-	0	23/30
Sclerocactus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Shepherdia rotundifolia											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	75/108

Trend Study 25C-25-03

Study site name: Center Creek.

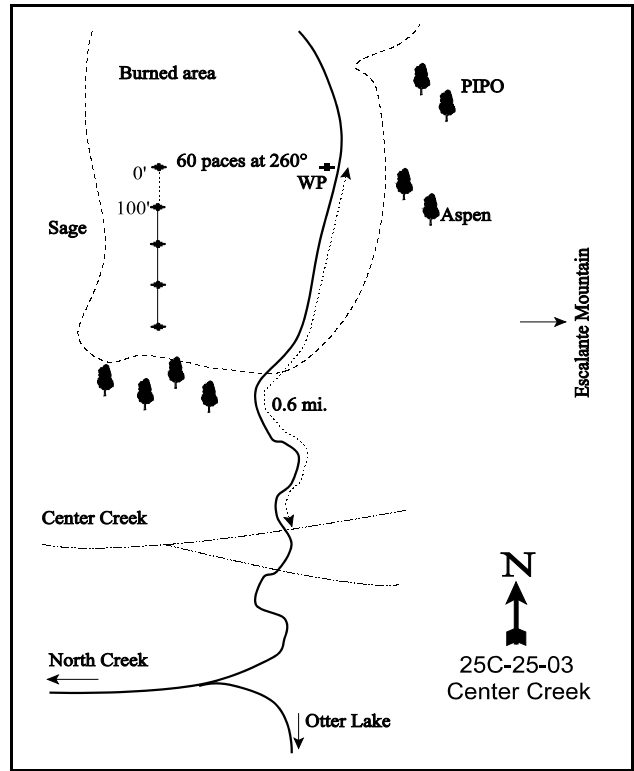
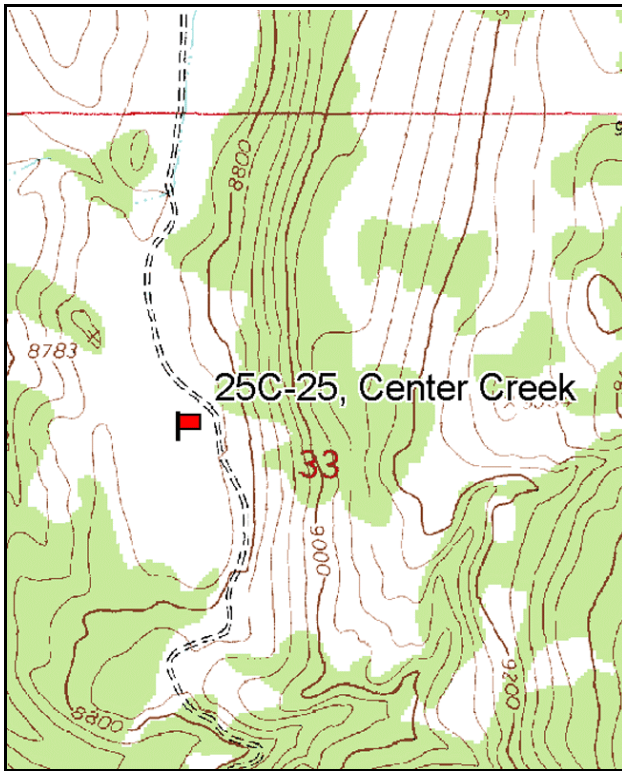
Vegetation type: Burn.

Compass bearing: frequency baseline 183 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft).

LOCATION DESCRIPTION

From the intersection of SR12 and Rt. 1660 (to 22) turn left onto Johns Flat Road. Go 17.2 miles to the Grass Lake Road (USFS sign) and turn east. Travel 1.2 miles on this road to a fork by some fields. Turn right and continue 0.4 miles to the Horse Creek Fork. Turn left and go 1.15 miles to a fork with a sign. Stay left and continue 0.25 miles on the main road. Past the buildings, at Birch Creek, take the right fork and go 0.6 miles. Stay left at the fork and go 0.75 miles to a cattleguard. Continue 0.75 miles to a fork. Stay left and go 1.65 miles to a USFS enclosure. Continue 2.55 miles to a cattleguard. Continue 0.5 miles to North Creek. Go 2.6 miles, past the North Creek transect, to the Center Creek-Otter Lake intersection. Bear left and go 1.25 miles to a witness post on the left side of the road. Walk 60 paces west to the 0-foot baseline stake, a short fencepost marked with a red browse tag.



Map Name: Grass Lakes

Diagrammatic Sketch

Township 32S, Range 1W, Section 33

GPS: NAD 27, UTM 12S 4203857 N, 420338 E

DISCUSSION

Center Creek - Trend Study No. 25C-25

This range trend study is located on a sagebrush flat north and east of Center Creek that was burned as part of a 1984 treatment. It is now occupied by rabbitbrush and herbaceous vegetation. The old sagebrush flat is on a high bench on the west side of the Escalante Mountains (Aquarius Plateau). Terrain in the small valley is relatively flat with a slight southwest aspect. Elevation at the site is 8,750 feet. Deer often utilize high elevation winter ranges on the west side of herd unit between Widtsoe and Antimony during light to moderate winters. There was fairly abundant deer and elk use at 15 deer and elk days use/acre (37 days use/ha) on the site in 1991, with apparently more use made of the surrounding sagebrush hillsides and aspen stands. Pellet group data from 1998 estimated 36 deer, 12 elk, and 33 cow days use/acre (89 ddu/ha, 30 edu/ha, and 82 cdu/ha). Cattle pats appeared to be from the previous year, while most of the elk pellet groups appeared to be from the past 6 months. Deer sign was more recent with about half within a few weeks of age. Pellet group data from 2003 shows similar use at 25 deer, 12 elk, and 27 cow days use/acre (61 ddu/ha, 30 edu/ha, and 66 cdu/ha). Most of the elk and deer pellet groups sampled in 2003 appeared to be from spring use. Cattle use appeared to be from the current year in 2003. There are a considerable amount of ant hills on the site.

Soil on the site is moderately deep with an effective rooting depth of almost 18 inches. Texture is a loam which is slightly acidic in reaction (pH 6.1). Pavement is common on the surface with a cover value of 33% in 1998. There is excellent protective ground cover and little exposed bare ground. Current erosion is minimal due to good soil protection and gentle terrain.

Mountain big sagebrush has reestablish itself since the 1984 burn. It had a density of 200 plants/acre in 1987, 1,380 in 1991, and 2,620 by 2003. Utilization has remained light to moderate through the years with good vigor and low percent decadence. Reproduction remains good.

The dominant shrub is mountain low rabbitbrush which provided 83% of the browse cover in 1998 and 63% in 2003. Density was estimated at almost 4,000 plants/acre in 1987. Ninety-eight percent of those medium-sized shrubs encountered were mature vigorously prolific plants. This population exploded in 1991, increasing it's density nearly 9 times to 35,066 plants/acre, 84% of which were classified as young. Competition and drought have since thinned the high density to 25,360 plants/acre in 1994 and 12,360 plants/acre in 1998. Density increased 32% in 2003 to 18,080 plants/acre. Twenty-one percent of the population consists of young plants. Mature plants are smaller than those sampled in 1998 with an average height of 12 inches compared to 20 inches in 1998. The population appears relatively stable but overly abundant. Utilization of these shrubs is mostly light. There is also some horsebrush, rubber rabbitbrush, and snowberry plants on the site, however at this elevation, it is really the herbaceous vegetation that is important and the woody plants appear to be unutilized.

There is a good mix and diversity of grasses and forbs, but grasses dominate the understory. Average cover of perennial grasses was estimated at 19% in 1994 and 24% by 1998. The most common grasses are the native pinewoods needlegrass and mutton bluegrass, and the seeded grasses, crested wheatgrass and smooth brome. Forbs are diverse, but only a few species are abundant. The large silky lupine is the dominant forb along with redroot eriogonum and Utah deervetch which combined to produce 81% of the forb cover in 1998 and 68% in 2003. Utilization of these plants appears light.

1987 APPARENT TREND ASSESSMENT

Protective ground cover is excellent and erosion is not a problem on this site. Preferred browse are lacking and the shrub composition is dominated by mountain low rabbitbrush. Mountain big sagebrush has a low density of 200 plants/acre, all of which are young. The sagebrush population should increase in time. The herbaceous understory contains a good mix of grasses and forbs. Several seeded grasses have established in good numbers.

1991 TREND ASSESSMENT

The soil trend appears to be stable since percent bare ground has remained at around 10% cover since 1987. The most common browse, low rabbitbrush, has increased dramatically while the key species, mountain big sagebrush, has also increased from 200 to 733 plants/acre. Seedlings and young are moderately abundant and the population should continue to expand. Trend for browse is improving, but still poor because of the overwhelming numbers of the increaser shrub, mountain low rabbitbrush, which was brought on by the fire. The most important aspect of this site is the herbaceous understory. There are 40 species of grasses and forbs sampled on this site. The inspection of the sum of nested frequencies for the grasses and forbs shows that grasses increased, while the forbs declined slightly. The overall trend is considered up slightly.

TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - up slightly (4)

1994 TREND ASSESSMENT

Basic ground cover characteristics have improved in some areas but declined in others. Average cover of pavement declined 42% but litter cover also declined. Cover of bare ground has remained low. Trend for soil is considered stable. The browse component is still dominated by mountain low rabbitbrush. However, it's density has declined considerably since 1991, while the population density of the preferred mountain big sagebrush increased by 47%. The browse composition is still poor, but slowly improving. The herbaceous trend is down due to a major decline in the sum of nested frequencies for both grasses and forbs. Some of this decline may be the result of the natural thinning process after a fire. The extremely dry spring and summer of 1994 is also an additional cause for these declines.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - down (1)

1998 TREND ASSESSMENT

Trend for soil is up slightly due to a slight decline in percent bare ground combined with an increase in litter and vegetation cover. Trend for browse is up. Density of mountain big sagebrush increased slightly, while the number of mountain low rabbitbrush declined 51%. Utilization of the sagebrush remains light, vigor good, and percent decadence low at only 1%. Dead plants counted in 1998 were burned stems from the 1984 fire. Age class analysis suggests that the sagebrush population will probably continue to increase slowly. Mountain low rabbitbrush declined in density, but there are still an estimated 12,360 plants/acre, 48% of which are young plants. Seedlings are also abundant. The decline in density came from the young age class which numbered 19,620 plants/acre in 1994. Mature plant density actually rose from 4,500 to 6,060 plants/acre since 1994. The population will likely become more mature in the future, although density will probably not drop significantly any time soon. Trend for the herbaceous understory is up slightly compared to 1994 data. Sum of nested frequency of perennial grasses and forbs increased. Production is also improved since 1994, especially for forbs. Cover of grasses has increased from 20% to 24% while forb cover has gone from 3% to 12%.

TREND ASSESSMENT

soil - up slightly (4)

browse - up (5)

herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is stable. There is abundant protective ground cover and very little exposed bare ground. Trend for the key browse species, mountain big sagebrush is up. Density has increased 46% and average cover rose from 1.5% in 1998 to 7.4% in 2003. Use remains light to moderate, vigor good, and decadence low. No seedlings were encountered in 2003, but young plants account for 16% of the population. The site is still dominated by mountain low rabbitbrush which provided 63% of the total browse cover in 2003. Density of rabbitbrush increased 32% to 18,080 plants/acre and 21% of the population was classified as young. These shrubs are mostly unutilized. Trend for the herbaceous understory is mixed. Sum of nested frequency for grasses declined 13% with a significant drop in the nested frequency of intermediate wheatgrass, bluebunch wheatgrass, and bottlebrush squirreltail. Dominant grasses, pinewoods needlegrass, crested wheatgrass, smooth brome, and mutton bluegrass remained relatively stable. Perennial forb sum of nested frequency declined 38% with significant declines in dominant forbs, Utah deervetch, silky lupine, and dandelion. Since grasses provide the bulk of the herbaceous cover, overall trend for the herbaceous understory is considered down slightly.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 25

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	Agropyron cristatum	a110	b148	ab131	b165	ab126	3.22	5.21	2.17
G	Agropyron intermedium	ab19	ab11	a5	b25	a5	.03	.29	.06
G	Agropyron spicatum	ab4	ab3	ab4	b12	a-	.03	.24	-
G	Bouteloua gracilis	ab26	ab27	ab26	a15	b44	1.58	.48	1.41
G	Bromus inermis	a58	b124	b124	c176	c211	2.25	6.44	5.12
G	Bromus japonicus (a)	6	-	-	1	-	-	.03	-
G	Carex spp.	8	3	2	4	2	.03	.03	.00
G	Festuca ovina	-	1	5	7	-	.03	.09	-
G	Koeleria cristata	-	-	-	-	-	-	.03	-
G	Poa fendleriana	b49	ab62	a18	c127	c103	.43	3.45	3.48
G	Poa pratensis	-	-	3	3	6	.15	.38	.30
G	Poa secunda	-	-	-	1	8	-	.03	.06
G	Sitanion hystrix	b126	c200	a83	b136	a68	.56	3.11	1.02
G	Stipa comata	a-	c54	a-	b27	b24	-	.38	.37
G	Stipa pinetorum	a171	c198	d272	bc166	b152	11.32	4.17	2.74
Total for Annual Grasses		6	0	0	1	0	0	0.03	0
Total for Perennial Grasses		571	831	673	864	749	19.66	24.35	16.77
Total for Grasses		577	831	673	865	749	19.66	24.38	16.77

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
F	<i>Agoseris glauca</i>	-	4	-	3	1	-	.01	.03
F	<i>Alyssum alyssoides</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Antennaria parvifolia</i>	-	1	4	7	-	.03	.33	-
F	<i>Antennaria rosea</i>	-	-	-	-	4	-	-	.07
F	<i>Androsace septentrionalis</i> (a)	_a 14	_a 5	_a 20	_b 73	_a 4	.07	.35	.01
F	<i>Arabis</i> spp.	-	-	-	3	2	-	.00	.00
F	<i>Astragalus convallarius</i>	_a -	_{ab} 4	_{ab} 6	_b 15	_a -	.01	.22	-
F	<i>Astragalus</i> spp.	-	-	-	1	-	-	.03	-
F	<i>Castilleja linariaefolia</i>	_a -	_a -	_a 2	_b 12	_{ab} 7	.00	.10	.33
F	<i>Calochortus nuttallii</i>	-	-	3	-	3	.00	-	.00
F	<i>Chenopodium album</i> (a)	-	-	5	3	3	.01	.03	.15
F	<i>Chaenactis douglasii</i>	_b 37	_c 46	_b 22	_b 19	_a -	.05	.09	-
F	<i>Chenopodium leptophyllum</i> (a)	-	-	-	-	4	-	-	.01
F	<i>Collomia linearis</i> (a)	-	-	-	2	-	-	.00	-
F	<i>Crepis acuminata</i>	-	-	-	4	-	-	.01	-
F	Cruciferae	4	6	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	_b 17	_b 22	_a -	_a 3	_a 3	-	.00	.00
F	<i>Dracocephalum parviflorum</i>	2	-	-	-	2	-	-	.00
F	<i>Eriogonum cernuum</i> (a)	-	2	-	2	-	-	.01	-
F	<i>Erodium cicutarium</i> (a)	-	-	1	-	-	.00	-	-
F	<i>Erigeron eatonii</i>	_a -	_b 16	_a -	_b 27	_b 15	-	.15	.08
F	<i>Erigeron flagellaris</i>	-	8	-	9	-	-	.05	-
F	<i>Eriogonum hookeri</i> (a)	_b 12	_b 9	_b 20	_a -	_a -	.09	-	-
F	<i>Erigeron pumilus</i>	_{ab} 13	_b 33	_b 36	_a 8	_b 29	.26	.09	.39
F	<i>Eriogonum racemosum</i>	_a 63	_{ab} 79	_{ab} 87	_b 109	_b 106	.77	2.04	1.76
F	<i>Eriogonum umbellatum</i>	-	-	-	-	6	-	-	.01
F	<i>Holosteum umbellatum</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Hymenoxys richardsonii</i>	-	3	-	-	-	-	-	-
F	<i>Ipomopsis aggregata</i>	-	4	6	5	-	.01	.18	-
F	<i>Lappula occidentalis</i> (a)	3	5	-	2	5	-	.00	.01
F	<i>Lotus utahensis</i>	_d 188	_c 136	_b 98	_{bc} 108	_a 41	.40	2.66	.36
F	<i>Lupinus sericeus</i>	_c 132	_b 59	_{ab} 32	_b 54	_a 18	1.29	5.44	2.32
F	<i>Lychnis drummondii</i>	_a 1	_b 22	_a -	_a -	_a 1	-	-	.00
F	<i>Machaeranthera canescens</i>	_a -	_{ab} 3	_{ab} 4	_{ab} 2	_b 13	.03	.03	.19
F	<i>Microsteris gracilis</i> (a)	-	-	-	-	2	-	-	.01
F	<i>Penstemon comarrhenus</i>	_a 12	_a 9	_{ab} 17	_a 5	_b 28	.09	.01	.48
F	<i>Phlox longifolia</i>	_d 198	_c 79	_b 34	_a 5	_a 2	.08	.03	.01

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
F	Potentilla biennis	1	-	-	-	-	-	.00	-
F	Potentilla concinna	-	-	-	-	1	-	-	.00
F	Polygonum douglasii (a)	-	-	6	-	3	.01	-	.00
F	Senecio multilobatus	_a 8	_b 34	_{ab} 22	_a 2	_a 7	.05	.01	.04
F	Taraxacum officinale	_d 209	_d 187	_b 38	_c 74	_a 3	.07	.41	.15
F	Tragopogon dubius	6	6	-	7	8	-	.01	.02
Total for Annual Forbs		46	43	52	87	24	0.19	0.41	0.20
Total for Perennial Forbs		874	739	411	479	297	3.20	11.98	6.33
Total for Forbs		920	782	463	566	321	3.39	12.39	6.53

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

BROWSE TRENDS --

Management unit 25C, Study no: 25

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia tridentata vaseyana	34	37	56	1.42	1.50	7.36
B	Chrysothamnus nauseosus	17	7	14	.33	-	.24
B	Chrysothamnus viscidiflorus lanceolatus	96	100	97	14.60	14.51	13.74
B	Symphoricarpos oreophilus	2	3	2	.41	.76	.15
B	Tetradymia canescens	22	15	13	1.01	.69	.18
Total for Browse		171	162	182	17.79	17.47	21.68

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 25

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	12.33
Chrysothamnus nauseosus	.81
Chrysothamnus viscidiflorus lanceolatus	17.60
Symphoricarpos oreophilus	.15
Tetradymia canescens	.61

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 25

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	2.2

BASIC COVER --

Management unit 25C, Study no: 25

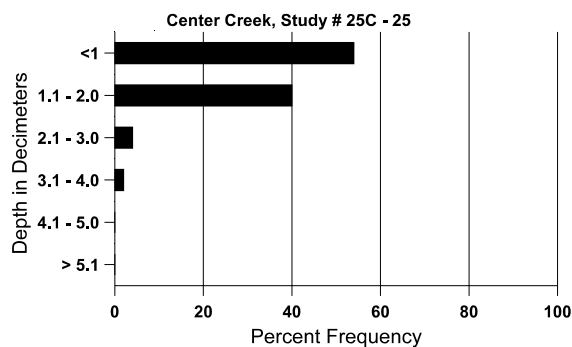
Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	18.25	11.25	36.82	54.06	43.32
Rock	.50	.75	1.92	.29	1.07
Pavement	41.50	42.00	24.34	32.76	44.06
Litter	30.25	35.75	29.96	41.45	20.54
Cryptogams	0	0	0	.01	.04
Bare Ground	9.50	10.25	8.61	4.53	3.86

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 25, Study Name: Center Creek

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
17.9	55.0 (13.5)	6.1	48.4	31.1	20.6	2.7	15.3	249.6	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 25

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	12	14	12
Elk	12	5	6
Deer	29	25	8
Cattle	1	8	17

Days use per acre (ha)	
'98	'03
-	-
6 (15)	12 (30)
36 (89)	25 (61)
33 (82)	27 (66)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 25

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
87	200	66	200	-	-	-	0	0	0	0	-/-
91	733	200	533	200	-	-	27	0	0	0	10/12
94	1380	540	240	1100	40	400	9	0	3	0	33/45
98	1420	240	460	940	20	640	13	0	1	0	19/29
03	2620	-	420	2100	100	-	11	0	4	.76	18/27
<i>Chrysothamnus nauseosus</i>											
87	66	-	-	66	-	-	0	0	0	0	26/26
91	333	-	200	133	-	-	0	0	0	0	34/35
94	740	20	300	400	40	-	8	0	5	3	50/47
98	180	-	40	120	20	-	0	0	11	11	30/22
03	340	-	20	260	60	-	24	0	18	0	29/26
<i>Chrysothamnus viscidiflorus lanceolatus</i>											
87	3999	-	66	3933	-	-	0	0	0	0	19/23
91	35066	34866	29666	5400	-	-	.57	0	0	2	23/30
94	25460	480	19620	4500	1340	40	.23	1	5	.31	49/55
98	12360	860	5980	6060	320	60	.32	.97	3	5	20/24
03	18080	20	3860	13620	600	-	1	0	3	.33	12/15
<i>Leptodactylon pungens</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	15/17
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Symphoricarpos oreophilus</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	60	-	20	40	-	-	0	0	-	0	17/43
98	60	-	20	40	-	-	0	0	-	0	22/74
03	40	-	20	20	-	-	0	0	-	0	22/70
<i>Tetradymia canescens</i>											
87	533	-	200	333	-	-	0	0	0	0	11/11
91	533	-	333	200	-	-	13	0	0	0	13/17
94	640	-	180	440	20	-	6	6	3	0	34/41
98	400	-	20	320	60	-	20	0	15	5	16/22
03	340	-	-	240	100	-	0	0	29	12	11/15

Trend Study 25C-26-03

Study site name: Black Canyon.

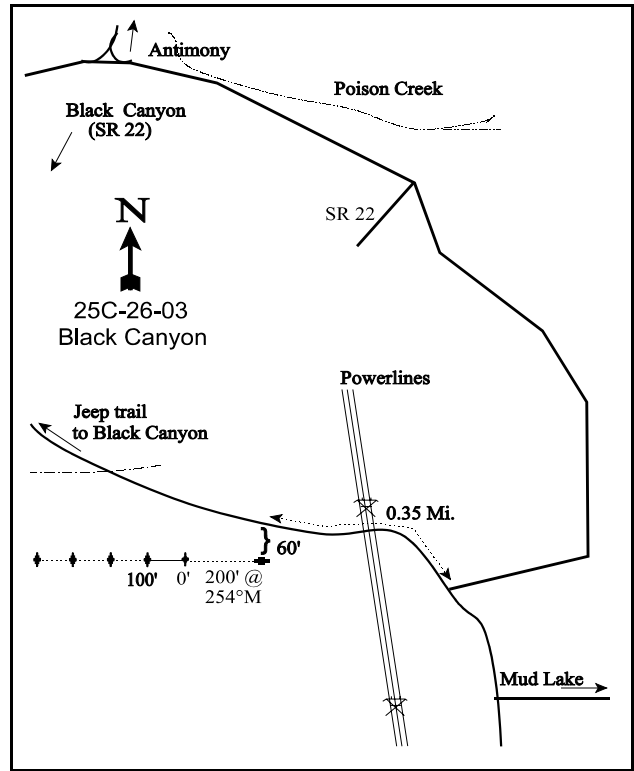
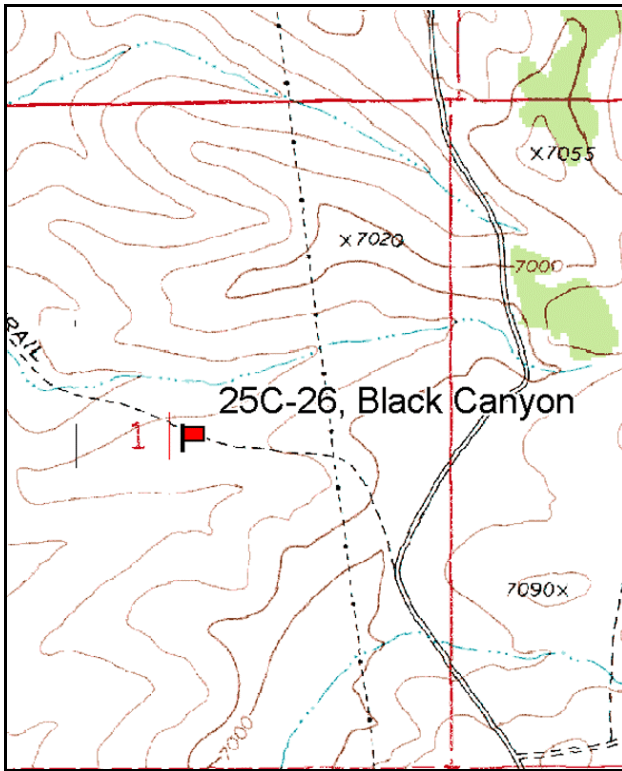
Vegetation type: Big-Black Sagebrush.

Compass bearing: frequency baseline 254 degrees magnetic.

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

LOCATION DESCRIPTION

From Antimony, travel south on SR 22 to the turnoff to the Mud Lake road. Turn east, go along Poison Creek for 1.2 miles to a fork, stay right. Continue southeast for 2.2 miles to another major fork. At this point there is a faint jeep trail heading back to the north. Follow this jeep trail 0.35 miles, under the powerlines and up on the ridge to a green fence post (witness post) about 20 yards off the south side (left) of the road. The transect starts 200 feet west of the witness post. It is marked by 1^{1/2} foot tall fenceposts.



Map Name: Antimony

Diagrammatic Sketch

Township 32S, Range 2W, Section 1

GPS: NAD 27, UTM 12S 4211709 N, 416173 E

DISCUSSION

Black Canyon - Trend Study No. 25C-26

The Black Canyon trend study samples a critical deer winter range south of Antimony. Antelope also use the area during the fall and spring. The Wyoming big sagebrush range type dominates most of this low, rolling bench. The country is marked with short, dry washes which drain west into Black Canyon of the East Fork of the Sevier River. The study is set up on the top of a gentle ridge which is nearly level and has a slight eastern aspect near the start of the baseline, but more of a western aspect near the end. The elevation is 6,950 feet. Pellet group data from 1998 estimated 37 deer, 6 elk, and 19 antelope days use/acre (91 ddu/ha, 15 edu/ha, and 47 adu/ha). Cattle also used the area with 6 cow days use/acre estimated (15 cdu/ha). Some of the antelope pellet groups were more recent but all others appeared older. Pellet group data from 2003 estimated 15 deer/antelope and 4 cow days use/acre (38 ddu/ha and 10 cdu/ha). The area is within an allotment which receives spring use by cattle from May 15 to June 15.

The soil is rocky, hard-packed and moderately deep with an estimated effective rooting depth of almost 14 inches. Texture is a sandy clay loam which is neutral in reaction (pH 7.1). Phosphorus is low at only 3.5 ppm, when 10 ppm is thought to be the minimum necessary for normal plant development. A hard pan appears to be present starting around 14 inches in depth. There is a high percentage of coarse fragments in the profile and concentrated on the surface as erosion pavement. Evidence of slight surface (sheet) erosion is apparent and there is some movement of rock down slope. However, erosion does not appear to be serious due to the adequate protective ground cover combined with the gentle slope.

Except for the rocky slopes covered with pinyon-juniper, the dominant shrub for many miles is Wyoming big sagebrush. The plants are short in stature, and in some places are associated with black sagebrush. On the study site, there were only two plants identified as black sagebrush in 1991. Wyoming big sagebrush numbered 6,799 plants/acre in 1987 and 8,732 by 1991. During the 1998 and 2003 surveys, many of the sagebrush were classified as black sagebrush. It is apparent that these two species are hybridizing which makes identification difficult. Some plants had the color of Wyoming big sagebrush, but the growth form of black sagebrush and vice versa. Combined black/Wyoming big sagebrush density has remained relatively stable since 1987 estimates at around 7,000 plants/acre. Utilization was moderate to heavy in 1987 and 1991 but more light to moderate in 1998 and 2003. Vigor has been good on most plants during all readings but the number of plants displaying poor vigor was higher in 1991 and 2003, both drought years. Percent decadence has also been low with the exception of 1991 and 2003 which had moderate decadence rates of 27% and 32% respectively. Young recruitment was excellent in 1987 and 1991 and good in 1998. No seedlings or young plants were sampled in 2003 however.

Other common shrubs include two increasers, broom snakeweed and narrowleaf low rabbitbrush. During the 1987 reading, it appeared that the broom snakeweed population (11,999 plants/acre) would increase on the site. By 1991, the population had crashed from 11,999 plants/acre to only 2,266 plants/acre, an 81% decrease. This decline continued in 1998 to only 360 plants/acre before slightly increasing to 760 plants/acre in 2003. Narrowleaf low rabbitbrush has a more stable population of 1,065 plants/acre in 1987 declining slightly to 980 by 1998 and 1,160 plants/acre in 2003.

The herbaceous understory is poor and totally dominated by blue grama which provided nearly all of the herbaceous cover in both 1998 and 2003. Other grasses are rare. Only 5 forb species were sampled during the 1998 and 2003 readings. These forbs combined to produce less than 1% cover in 1998 and less than 1/10th of 1% cover in 2003. The lack of herbaceous vegetation lowers the value of this area for deer during the spring period.

1987 APPARENT TREND ASSESSMENT

Soil conditions are poor with abundant pavement cover and low litter cover on the site. However, exposed bare ground is low and there is little erosion occurring due to the gentle terrain. The browse component is in good condition. The key browse species is Wyoming big sagebrush which has an age class distribution of an expanding population. Use is moderate to heavy but vigor is good and decadence low. The herbaceous understory is poor and totally dominated by the low growing warm season, blue grama. Forbs are rare.

1991 TREND ASSESSMENT

Basic cover for soil changed little overall since 1987. There was some improvement of vegetative basal cover (12% to 15%) with increases in pavement cover (34% to 44%) and decreases in litter cover (36% to 25%). Generally, the trend is considered stable as long as there are no substantial increases in bare ground. The key browse species is Wyoming big sagebrush. Its population has grown by 22% to 8,732 plants/acre. The rate of decadency has risen to 26% which is not uncommon for a Wyoming sagebrush site, especially considering the past few years of below normal precipitation. The broom snakeweed population has experienced large reductions in density (11,999 down to 2,266 plants/acre) which again is not unusual during a long period of drought. Trend for browse is up. The herbaceous understory is mostly made up of one species, blue grama. By the inspection of the sum of nested frequencies for grasses and forbs, the trend is stable.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1991. The only significant change is in the decline in pavement cover from 44% to 34%. Trend for browse is stable. Density of black/Wyoming big sagebrush has declined, however this is almost all due to a decline in density of young plants which were extremely abundant in 1991. Currently, utilization is lighter, vigor improved and percent decadence is lower (26% to 11%). In addition, density of broom snakeweed has continued to decline to only 360 plants/acre. Trend for the herbaceous understory is stable. Sum of nested frequency of grasses declined slightly, although the frequency of the dominant grass, blue grama, remained similar to 1991 estimates. Sum of nested frequency of perennial forbs increased slightly. Composition is still poor and perennial forbs are lacking.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable, but poor (3)

2003 TREND ASSESSMENT

Trend for soil remains stable. There were some slight changes in ground cover characteristics but most remained stable. Erosion is not a problem on the site. Key browse consists of a mix of black sagebrush and Wyoming big sagebrush. Difficulty in distinguishing these hybridizing species requires combining sagebrush data to determine trends. Combined black/Wyoming big sagebrush density increased by about 1,000 plants/acre. On the down side, percent decadence increased from 11% to 32% and plants displaying poor vigor also increased. Use was lighter. No seedlings were sampled in 2003 and young plants were rare. In addition, nearly half (46%) of the decadent sagebrush sampled was classified as dying (>50% crown death). Due to the lack of young recruitment, it appears that the population will decline in the future. Taking this into consideration, trend for browse is considered slightly down. The number of mature sagebrush is basically

unchanged and it appears that some of the decadent plants will be thinned. A return to normal precipitation patterns should bring about an improvement in young recruitment. The herbaceous understory is poor and totally dominated by the low growing, warm season, blue grama. It provides 98% of the total grass cover and 97% of the total herbaceous cover. Two other native perennial species, bottlebrush squirreltail and needle-and-thread, occur rarely. Forbs are lacking with only 5 species sampled in 2003. All of these 5 species occurred in only 1 quadrat. Sum of nested frequency of perennial grasses declined slightly while nested frequency of perennial forbs declined more sharply. Trend is considered stable since blue grama remained stable in nested frequency.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - stable, but poor (3)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 26

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
G	Aristida purpurea	b8	a-	a-	a-	-	-
G	Bouteloua gracilis	b261	ab251	ab245	a239	12.51	13.68
G	Sitanion hystrix	1	1	11	4	.06	.06
G	Sporobolus cryptandrus	a2	b17	a3	a-	.03	-
G	Stipa comata	11	12	8	14	.04	.28
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		283	281	267	257	12.65	14.03
Total for Grasses		283	281	267	257	12.65	14.03
F	Astragalus spp.	b15	b32	b26	a-	.48	-
F	Chenopodium spp. (a)	a-	b43	a4	a4	.01	.00
F	Descurainia pinnata (a)	-	-	-	3	-	.00
F	Draba spp. (a)	-	-	1	-	.00	-
F	Erigeron pumilus	ab7	a-	b20	a-	.15	-
F	Lesquerella spp.	-	-	-	2	-	.00
F	Machaeranthera canescens	1	-	-	1	-	.00
F	Phlox longifolia	5	1	5	1	.01	.00
F	Sphaeralcea coccinea	b9	ab6	a-	a-	-	-
F	Unknown forb-perennial	15	-	-	-	-	-
Total for Annual Forbs		0	43	5	7	0.01	0.00
Total for Perennial Forbs		52	39	51	4	0.64	0.01
Total for Forbs		52	82	56	11	0.66	0.02

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

BROWSE TRENDS --

Management unit 25C, Study no: 26

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	56	81	6.09	10.05
B	Artemisia tridentata wyomingensis	73	38	5.59	5.55
B	Chrysothamnus viscidiflorus stenophyllus	12	23	.14	.90
B	Ephedra nevadensis	1	1	.03	.03
B	Gutierrezia sarothrae	13	24	.17	.41
B	Opuntia spp.	3	4	.03	.03
B	Pediocactus simpsonii	0	0	.00	-
Total for Browse		158	171	12.06	16.97

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 26

Species	Percent Cover
	'03
Artemisia nova	7.09
Artemisia tridentata wyomingensis	7.71
Chrysothamnus viscidiflorus stenophyllus	.88
Gutierrezia sarothrae	.33

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 26

Species	Average leader growth (in)
	'03
Artemisia nova	0.8
Artemisia tridentata wyomingensis	1.1

BASIC COVER --

Management unit 25C, Study no: 26

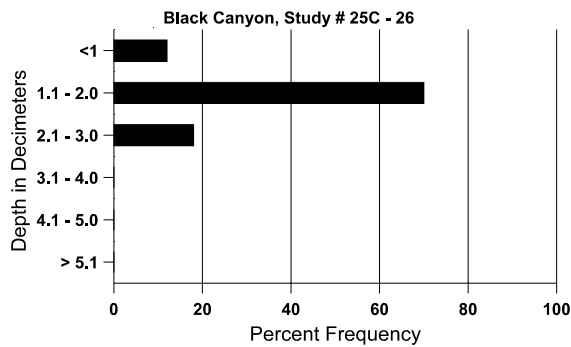
Cover Type	Average Cover %			
	'87	'91	'98	'03
Vegetation	12.00	14.50	28.67	30.86
Rock	7.00	7.50	7.03	7.77
Pavement	34.00	43.75	34.29	32.42
Litter	36.25	24.50	21.10	21.11
Cryptogams	0	0	.59	.46
Bare Ground	10.75	9.75	11.03	16.04

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 26, Study Name: Black Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.6	60.0 (9.5)	7.1	62.0	19.4	26.6	1.8	3.5	134.4	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 26

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	13	2	-	-
Elk	2	-	6 (15)	-
Deer/Antelope	21	7	37 (91)	15 (38)
Cattle	1	-	6 (15)	4 (9)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 26

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	133	-	-	-	133	-	100	0	100	50	-/-
98	2800	140	240	2160	400	620	14	.71	14	7	10/21
03	6060	-	20	4280	1760	880	8	.33	29	14	7/15
<i>Artemisia tridentata wyomingensis</i>											
87	6799	533	4400	2066	333	-	53	29	5	0	11/18
91	8732	133	4800	1666	2266	-	83	11	26	17	7/17
98	3720	180	520	2900	300	460	32	4	8	5	11/22
03	1520	-	-	820	700	140	21	0	46	20	16/33
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
87	1065	66	666	333	66	-	13	0	6	0	10/13
91	1599	-	200	933	466	-	50	0	29	21	5/6
98	980	120	200	540	240	60	0	0	24	12	8/15
03	1160	-	-	860	300	120	0	0	26	5	7/12
<i>Ephedra nevadensis</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	20	-	-	-	0	0	-	0	12/14
03	20	-	-	20	-	-	0	0	-	0	15/10
<i>Gutierrezia sarothrae</i>											
87	11999	800	3333	8133	533	-	0	0	4	1	7/6
91	2266	66	333	1733	200	-	9	0	9	6	6/6
98	360	200	140	200	20	-	0	0	6	0	8/10
03	760	-	-	720	40	40	0	0	5	0	7/8
<i>Opuntia spp.</i>											
87	66	-	-	66	-	-	0	0	-	0	3/4
91	66	-	66	-	-	-	0	0	-	0	-/-
98	60	-	20	40	-	-	0	0	-	0	4/12
03	80	-	-	80	-	-	0	0	-	0	5/14

Trend Study 25C-27-03

Study site name: Poison Creek Bench.

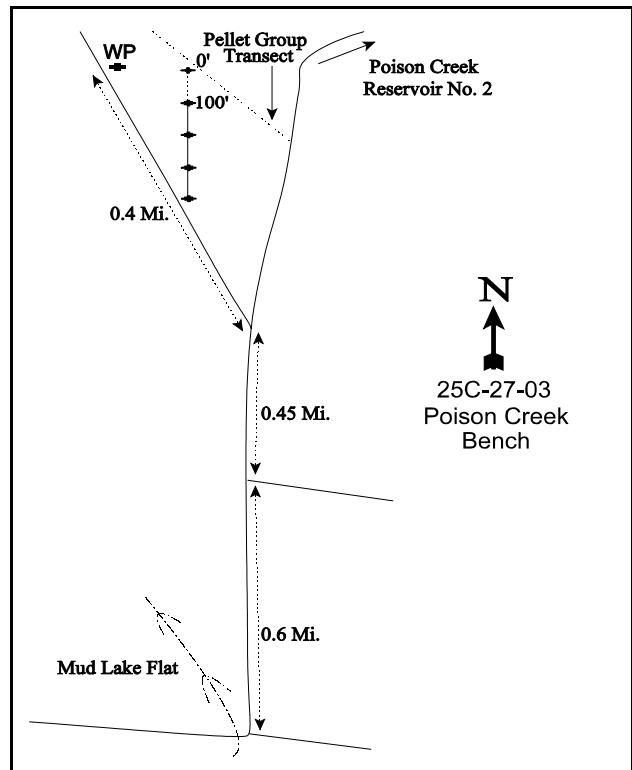
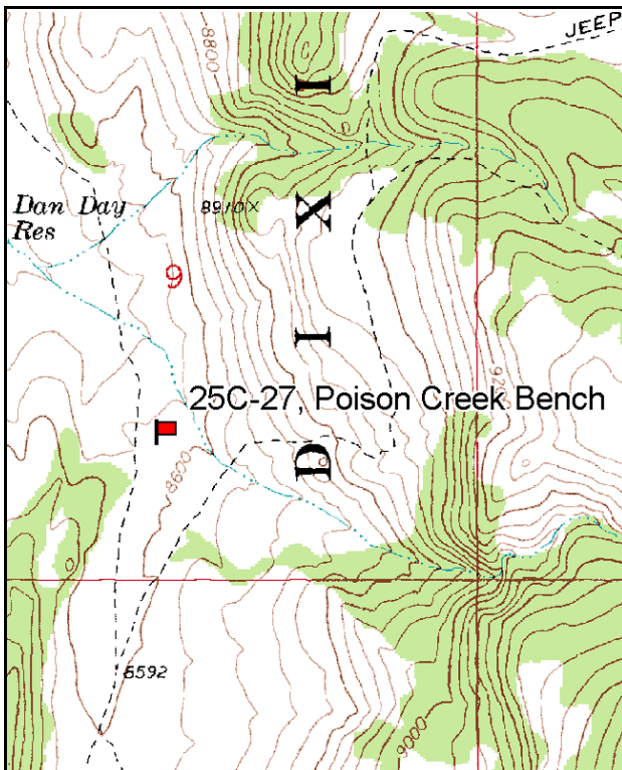
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). Rebar: belt 3 on 2ft.

LOCATION DESCRIPTION

From the Center Creek study site (25C-25), continue north on the main road for 2.3 miles to the Mud Lake/Pacer Lake fork. Continue straight on the main road for 0.4 miles to a fork near an intermittent stream and turn right. This area can also be reached by coming from the north along the Poison Creek and Mud Lake roads. Drive 0.6 miles to a fork. Proceed straight through the fork for 0.45 miles to another fork. Bear left and proceed 0.4 miles to the study site, identified by a witness post on the right side of the road. The 0-foot baseline stake is about 30 paces east of the witness post. The 2-foot metal fencepost has a browse tag, #9001, attached.



Map Name: Antimony

Diagrammatic Sketch

Township 32S, Range 1W, Section 9

GPS: NAD 27, UTM 12S 4209789 N, 420665 E

DISCUSSION

Poison Creek Bench - Trend Study No. 25C-27

The Poison Creek Bench trend study samples high elevation winter range on the west side of the unit which is probably used more by big game as transitional and summer range. The bench where the study is located is dominated by mountain big sagebrush. Surrounding ridges support aspen, Rocky Mountain juniper, and ponderosa pine. The bench slopes gently (1-2%) to the west-northwest at an elevation of 8,600 feet. After the reading in 1994, the area was part of a prescribed burn. Pellet group data from 1998 estimated 11 deer, 1 elk, and 11 cow days use/acre (27 ddu/ha, 2 edu/ha, and 27 cdu/ha). Most of the deer pellet groups appeared fresh. Pellet group data from 2003 estimated 17 deer, 8 elk, and 33 cow days use/acre (41 ddu/ha, 20 edu/ha, and 81 cdu/ha). Most of the deer and elk use appeared to be from spring and early summer. Cattle use was from the previous summer (2002).

Soil at the site is very rocky on the surface and in the profile. Effective rooting depth is estimated at just over 13 inches. Texture is a sandy clay loam which is moderately acidic (pH 6.0). There is little bare ground exposed due to the abundance of vegetation and litter cover. The small areas that are exposed have a protective covering of pavement. Overall, the hazard of erosion is minimal.

Ten browse species occurred on the site prior to the prescribed burn which occurred after the 1994 reading. Shrubs included a dense stand of vigorous mountain big sagebrush. Data from the density plots taken in 1987 and 1991 estimated a stand of around 8,300 plants/acre. During the 1994 reading, a total of 6,760 sagebrush plants/acre were estimated. Most of the decrease in density was the result of the much larger sample taken in 1994, which gives much better population estimates for browse species. Young recruitment was good and seedling sagebrush were abundant. Utilization was moderate to heavy and percent decadence moderate. After the prescribed burn, density of sagebrush was estimated at 1,280 plants/acre in 1998. Thirty-eight percent of the stand was composed of young plants, indicating an expanding population. Sagebrush density increased 48% in 2003 to 2,460 plants/acre. No seedlings were encountered and young plants were rare. Use was mostly light and vigor normal on most plants.

The less common but more preferred bitterbrush had a relatively stable population between 1987 and 1991 of about 1,400 plants/acre. They showed heavier use than sagebrush with 70% of the large, bushy plants displaying heavily hedging in 1987. In 1991, only 26% of the shrubs were heavily hedged, however, nearly half displayed poor vigor and decadence was extremely high at 83%. By 1994, density was estimated at 920 plants/acre. Some of the change is due to the larger sample used in 1994. After the prescribed burn, nearly all of the bitterbrush was eliminated. Density in 1998 was estimated at only 40 young plants/acre. By 2003, bitterbrush density increased to 120 plants/acre. Use was moderate to heavy but vigor good and decadence low.

Parry rabbitbrush was fairly common in 1987 with a high proportion being seedlings and young. These plants appeared to be unutilized. Density remained stable until 1994 but use was heavier. No Parry rabbitbrush was sampled in 1998 but nearly 1,200 plants/acre were estimated in 2003. Use was light, vigor good, and decadence low. Stickyleaf low rabbitbrush was moderately abundant prior to the prescribed burn at 1,920 plants/acre in 1994. Density increased slightly in 1998 to 2,520 plants/acre and remained stable in 2003.

The herbaceous understory was quite diverse and productive even before the fire. Prior to the fire, the most abundant grasses included Letterman needlegrass, bottlebrush squirreltail, mutton bluegrass, a sedge, and blue grama. After the fire, production of perennial grasses doubled, but composition remained similar. The most common species include a sedge (*Carex* species) which provided 49% of the grass cover in 1998 and 2003. Blue grama, mutton bluegrass, bottlebrush squirreltail, needle-and-thread and Letterman needlegrass are also common. It is not known if the site was seeded after the fire, but crested wheatgrass and intermediate wheatgrass were encountered in one quadrat in 1998. Forbs are especially diverse. Twenty-eight species were identified on the transect in 1994. As with the grasses, utilization was very light. Only the tall

narrowleaf paintbrush, a few penstemon, and buckwheat showed any signs of use. Composition remained similar after the fire with 30 species classified in 1998, including many preferred and valuable as forage. The most common species include Indian paintbrush, redroot and sulfur eriogonum, Utah deervetch, silvery lupine, and Uinta groundsel. Sum of nested frequency of forbs had been declining steadily since 1987, but rebounded after the burn. Production also increased dramatically from 3% cover in 1994 to 16% by 1998. Production declined in 2003 to 6% cover which is related to drought conditions.

1987 APPARENT TREND ASSESSMENT

This site samples a high elevation winter or summer/transitional range which contains a thick stand of mountain big sagebrush. Soil conditions are good with abundant protective ground cover to prevent erosion. The shrub composition is diverse but totally dominated by mountain big sagebrush. Density appears to be at carrying capacity with adequate seedlings and young to maintain the stand. The more preferred bitterbrush also appears stable with 70% of the population displaying heavy use. Vigor is good and percent decadence marginally high at 20%. The herbaceous understory is abundant and diverse but limited by the thick sagebrush overstory.

1991 TREND ASSESSMENT

Basic cover features are almost the same except for the decline in vegetative basal cover which dropped from 12% to 8%. Rock-pavement cover has not really changed (39% to 40%) and litter cover has only increased slightly (44% to 45%). The most critical parameter, percent bare ground, only changed from 5% to 7%. Percent bare ground is still very low when compared to most sites. Trend for soil is stable. The two key browse species for the site are mountain big sagebrush and antelope bitterbrush. The mountain big sagebrush population has not shown any significant changes since 1987. It decreased by less than 1%. Rate of decadency has risen from 22% to 37%. This should be monitored closely to see if any significant losses should occur in the future. This rate of decadency should be expected with such a high density (8,332 plants/acre) in association with the extended drought we have been in since 1988. Antelope bitterbrush has actually experienced a 13% increase in it's numbers (1,332 to 1,532), but it too has demonstrated increases in percent decadence (20% to 83%). A high rate of decadence for bitterbrush has been found on many sites throughout Utah and would be expected to decrease with an end to this drought. Trend for key browse is stable, but could decline depending on future trends in decadence. The herbaceous understory is a little more difficult to determine since the grasses are slightly increasing while the forbs are declining. Since this area is considered a summer range for big game, the forb component is weighted more heavily, making the trend slightly down at this time.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - down slightly (2)

1994 TREND ASSESSMENT

Ground cover characteristics are similar to those of 1987, however percent bare ground has steadily increased from 5% in 1987 to 9% by 1994, and pavement cover declined. The trend for soil is still stable due to the abundance of herbaceous vegetation. Percent bare ground will likely decline with the return of normal precipitation patterns. Trend for browse is up slightly. Density of mountain big sagebrush declined 19% due primarily to a reduction in the number of young and decadent plants. Density of mature plants increased from 3,400 to 4,220 plants/acre. Percent decadence has declined from 37% to 21%. Trend for the other key species, antelope bitterbrush, is up due to decreased decadence, improved vigor, and a gradual increase in density. However, biotic and reproductive potentials are low. Trend for the herbaceous understory is down slightly due to declining sum of nested frequencies of forbs and grasses. Nested frequencies of forbs declined 40% while those of grasses declined nearly 17%.

TREND ASSESSMENT

soil - stable (3)

browse - up slightly (4)

herbaceous understory - down slightly (2)

1998 TREND ASSESSMENT

Trend for soil is considered stable. Percent bare ground increased from 9% to 14% and litter declined from 44% to 30% due to the fire. However, vegetation cover increased and herbaceous cover currently provides 87% of that cover. Trend for browse is down due to the fire. Some sagebrush appears to have survived the fire and the current population density is estimated at 1,280 plants/acre. Young plants account for 36% of the population. Most of the bitterbrush appear to have been eliminated and only 40 young plants/acre remain on the site. The increaser, stickyleaf low rabbitbrush, has increased 24% since 1994. Trend for the herbaceous understory is up. Sum of nested frequency of grasses and forbs has increased. Production has also increased especially for forbs which are an important component of big game spring range. Pellet group data suggest that this area is currently used more in the spring and summer than in winter.

TREND ASSESSMENT

soil - stable (3)

browse - down due to the fire (1)

herbaceous understory - up (5)

2003 TREND ASSESSMENT

Trend for soil remains stable. Vegetation cover remains high and cover of bare ground has declined to only 10%. Protective ground cover is abundant and erosion is not a problem on this site. Trend for browse is up. Density of mountain big sagebrush increased 48% and bitterbrush increased 67% from 40 to 120 plants/acre. Use was mostly light on sagebrush, vigor good, and percent decadence low. Bitterbrush is moderately to heavily hedged but has good vigor and low decadence. Seedling and young recruitment is nonexistent on bitterbrush and poor on sagebrush. However, this should rebound with a return to normal precipitation patterns. Trend for the herbaceous understory is mixed. Sum of nested frequency of perennial grasses increased slightly while sum of nested frequency of perennial forbs declined 44%. Average cover of perennial grasses also increased slightly but cover of perennial forbs dropped 3 fold. Trend for the herbaceous understory is considered slightly down.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 27

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	<i>Agropyron cristatum</i>	-	-	-	3	-	-	.03	-
G	<i>Agropyron intermedium</i>	-	-	-	1	-	-	.00	-
G	<i>Agropyron spicatum</i>	-	-	-	-	8	-	-	.04
G	<i>Bouteloua gracilis</i>	_{ab} 64	_b 73	_a 37	_a 33	_{ab} 45	1.07	1.01	2.07
G	<i>Bromus anomalus</i>	-	-	-	-	2	-	-	.00
G	<i>Bromus inermis</i>	8	-	-	-	-	-	-	-
G	<i>Bromus japonicus</i> (a)	-	-	-	-	-	-	.00	-
G	<i>Carex</i> spp.	_a 36	_a 48	_b 130	_c 175	_c 183	2.08	11.49	12.11
G	<i>Koeleria cristata</i>	_{ab} 6	_b 9	_b 14	_{ab} 5	_a -	.10	.06	-
G	<i>Poa fendleriana</i>	_b 84	_{ab} 69	_{ab} 81	_{ab} 55	_a 29	2.15	1.56	.38
G	<i>Poa secunda</i>	-	-	-	-	1	-	-	.00
G	<i>Sitanion hystrix</i>	_c 160	_c 158	_a 76	_{ab} 100	_{bc} 131	.78	2.99	3.66
G	<i>Stipa columbiana</i>	_a -	_a -	_a -	_b 24	_a 3	-	.95	.03
G	<i>Stipa comata</i>	_a -	_b 35	_a 8	_b 59	_c 89	.36	2.41	3.59
G	<i>Stipa lettermani</i>	_b 147	_b 149	_a 106	_a 82	_a 81	3.65	2.75	2.70
Total for Annual Grasses		0	0	0	0	0	0	0.00	0
Total for Perennial Grasses		505	541	452	537	572	10.21	23.27	24.62
Total for Grasses		505	541	452	537	572	10.21	23.28	24.62
F	<i>Agoseris glauca</i>	-	1	-	-	11	-	-	.07
F	<i>Antennaria parvifolia</i>	_c 25	_{bc} 19	_a -	_{ab} 5	_a -	-	.06	-
F	<i>Androsace septentrionalis</i> (a)	-	-	3	30	8	.01	.28	.01
F	<i>Arabis demissa</i>	_c 53	_b 27	_{ab} 11	_{ab} 14	_a 2	.02	.08	.01
F	<i>Artemisia ludoviciana</i>	2	-	1	1	3	.00	.03	.38
F	<i>Astragalus convallarius</i>	13	8	9	17	5	.10	.24	.24
F	<i>Astragalus</i> spp.	3	-	4	-	-	.01	-	-
F	<i>Castilleja linariaefolia</i>	_c 69	_b 33	_{ab} 24	_b 36	_a 4	.32	1.11	.06
F	<i>Chaenactis douglasii</i>	_b 63	_a 8	_a 2	_a 10	_a 3	.01	.07	.03
F	<i>Chenopodium leptophyllum</i> (a)	-	-	_a -	_a -	_b 17	-	-	.21
F	<i>Crepis acuminata</i>	-	3	-	5	-	-	.04	.00
F	<i>Cryptantha flavoculata</i>	_a 5	_b 20	_a 5	_a -	_a -	.01	-	-
F	Cruciferae	-	2	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	8	1	-	.04	.00
F	<i>Erigeron eatonii</i>	_b 72	_b 79	_a 11	_a 26	_a 15	.05	.49	.06
F	<i>Erigeron pumilus</i>	_b 37	_{ab} 32	_a 16	_{ab} 22	_{ab} 37	.14	.43	.42
F	<i>Eriogonum racemosum</i>	_b 67	_b 68	_a 38	_{ab} 37	_{ab} 54	.21	.72	.93
F	<i>Eriogonum umbellatum</i>	_b 35	_{ab} 38	_{ab} 29	_a 12	_{ab} 14	.25	.58	.45

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
F	Gayophytum ramosissimum(a)	-	-	-	-	26	-	-	.12
F	Gilia spp. (a)	_b 23	_a -	_a 5	_a -	_a -	.01	-	-
F	Hymenoxys richardsonii	5	7	3	3	3	.03	.15	.18
F	Ipomopsis aggregata	1	4	5	7	-	.02	.36	-
F	Lappula occidentalis (a)	-	-	-	-	15	-	-	.40
F	Linum lewisii	6	7	2	3	-	.00	.04	-
F	Lotus utahensis	_c 118	_{ab} 28	_b 60	_{ab} 33	_a 8	.22	1.35	.22
F	Lupinus argenteus	_c 101	_b 59	_{bc} 72	_b 63	_a 26	1.46	6.75	1.32
F	Lychnis drummondii	_a -	_b 12	_a -	_{ab} 8	_a -	-	.06	-
F	Lygodesmia spinosa	10	13	2	6	4	.06	.09	.18
F	Machaeranthera canescens	_b 26	_{ab} 13	_{ab} 7	_a 1	_a 4	.07	.03	.03
F	Microsteris gracilis (a)	-	-	-	2	5	-	.03	.01
F	Oenothera pallida	-	-	-	-	1	-	-	.03
F	Orthocarpus luteus (a)	-	-	3	-	1	.00	-	.03
F	Penstemon comarrhenus	_b 17	_{ab} 6	_a 3	_{ab} 16	_a 5	.00	.05	.07
F	Petradoria pumila	2	3	2	1	1	.03	.00	.00
F	Phlox longifolia	_b 67	_b 65	_a 16	_a 12	_a 17	.04	.06	.11
F	Potentilla concinna	6	3	2	1	3	.03	.01	.03
F	Senecio multilobatus	_c 108	_a 23	_a 15	_b 73	_a 14	.04	2.23	.06
F	Taraxacum officinale	7	4	-	5	1	-	.05	.00
F	Tragopogon dubius	-	-	-	-	-	-	-	.01
F	Unknown forb-perennial	2	-	-	-	-	-	-	-
F	Veronica biloba (a)	-	-	-	3	-	-	.15	-
Total for Annual Forbs		23	0	11	43	73	0.02	0.50	0.81
Total for Perennial Forbs		920	585	339	417	235	3.19	15.13	4.97
Total for Forbs		943	585	350	460	308	3.22	15.63	5.78

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

BROWSE TRENDS --

Management unit 25C, Study no: 27

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia nova	7	0	1	1.84	-	-
B	Artemisia tridentata vaseyana	98	23	56	20.42	2.53	7.54
B	Cercocarpus ledifolius	0	1	0	-	-	-
B	Chrysothamnus parryi	19	0	32	.20	-	1.02
B	Chrysothamnus viscidiflorus viscidiflorus	47	58	61	.46	2.99	7.39
B	Gutierrezia sarothrae	4	6	8	-	.01	.18
B	Juniperus scopulorum	0	0	0	.15	-	-
B	Leptodactylon pungens	13	2	11	.36	.00	.01
B	Opuntia spp.	4	0	0	.05	-	-
B	Pediocactus simpsonii	0	10	1	-	.03	-
B	Purshia tridentata	32	2	6	8.53	.18	.15
B	Symphoricarpos oreophilus	1	0	0	-	-	-
B	Tetradymia canescens	3	6	1	.00	.00	.15
Total for Browse		228	108	177	32.02	5.76	16.45

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 27

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	8.53
Chrysothamnus parryi	1.73
Chrysothamnus viscidiflorus viscidiflorus	7.36
Gutierrezia sarothrae	.06
Purshia tridentata	.75

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 27

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	2.0
Purshia tridentata	3.6

BASIC COVER --

Management unit 25C, Study no: 27

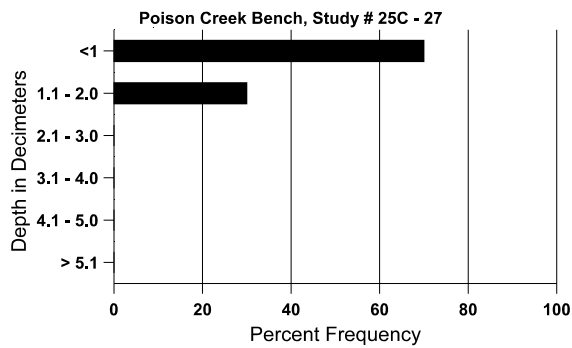
Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	11.75	7.50	42.77	51.95	49.54
Rock	20.50	13.75	18.45	9.80	13.75
Pavement	18.75	26.50	3.72	21.64	20.04
Litter	44.25	45.00	43.79	30.38	22.11
Cryptogams	.25	.25	.12	.01	.00
Bare Ground	4.50	7.00	8.98	13.82	10.18

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 27, Study Name: Poison Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.1	61.5 (7.5)	6.0	54.0	27.4	18.6	5.4	35.2	313.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 27

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	21	9	3
Elk	-	1	2
Deer	30	19	8
Cattle	5	3	15

Days use per acre (ha)	
'98	'03
-	-
1 (2)	8 (20)
11 (27)	17 (41)
11 (27)	33 (81)

BROWSE CHARACTERISTICS --
 Management unit 25C, Study no: 27

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	0	-	-	-	-	-	0	0	0	0	-/-
94	520	-	-	280	240	80	23	0	46	42	6/18
98	0	-	-	-	-	-	0	0	0	0	-/-
03	20	-	-	20	-	-	100	0	0	0	-/-
<i>Artemisia tridentata vaseyana</i>											
87	8398	1800	2066	4466	1866	-	21	10	22	2	28/24
91	8332	800	1866	3400	3066	-	31	2	37	8	25/24
94	6760	1720	1120	4220	1420	360	22	2	21	5	24/34
98	1280	480	460	520	300	3960	20	0	23	3	15/23
03	2460	-	60	2200	200	240	15	0	8	2	18/28
<i>Cercocarpus ledifolius</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	40	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Chrysothamnus parryi</i>											
87	732	200	466	66	200	-	0	0	27	0	8/6
91	799	-	266	200	333	-	17	33	42	25	7/7
94	740	20	20	720	-	-	19	14	0	0	8/5
98	0	-	-	-	-	-	0	0	0	0	-/-
03	1180	-	-	1160	20	-	5	2	2	0	8/9
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	666	133	200	466	-	-	0	0	0	0	15/18
91	999	133	200	666	133	-	33	7	13	7	6/6
94	1920	-	140	1720	60	-	6	8	3	0	12/13
98	2520	60	500	1980	40	-	0	0	2	.79	13/16
03	2260	-	20	2220	20	-	.88	0	1	0	15/22
<i>Gutierrezia sarothrae</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	120	-	-	120	-	-	0	0	-	0	8/7
98	200	60	80	120	-	-	0	0	-	0	8/9
03	520	20	-	520	-	-	0	0	-	0	5/4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Juniperus osteosperma											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Leptodactylon pungens											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	199	-	133	66	-	-	0	0	0	0	9/10
94	740	-	-	740	-	-	0	0	0	0	5/8
98	80	-	-	-	80	40	0	0	100	0	9/11
03	360	-	-	360	-	20	0	0	0	0	5/7
Opuntia spp.											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	80	-	-	80	-	-	0	0	-	0	2/60
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Pediocactus simpsonii											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	0	-	-	-	-	-	0	0	-	0	-/-
98	240	-	60	180	-	-	0	0	-	0	2/3
03	20	-	-	20	-	-	0	0	-	0	1/3
Purshia tridentata											
87	1332	133	133	933	266	-	25	70	20	0	23/29
91	1532	66	66	200	1266	-	26	26	83	48	11/14
94	920	40	100	420	400	40	50	9	43	0	28/59
98	40	20	40	-	-	160	0	0	0	0	29/47
03	120	-	-	100	20	-	33	50	17	0	18/28
Symphoricarpos oreophilus											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
94	20	-	-	20	-	-	0	0	-	0	10/11
98	0	-	-	-	-	-	0	0	-	0	13/36
03	0	-	-	-	-	-	0	0	-	0	15/27

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Tetradymia canescens</i>											
87	133	-	-	133	-	-	0	0	-	0	11/10
91	399	-	333	66	-	-	33	0	-	0	4/3
94	60	-	20	40	-	-	0	0	-	0	3/2
98	140	-	80	60	-	40	0	0	-	0	11/12
03	40	-	-	40	-	-	100	0	-	0	13/17

Trend Study 25C-28-03

Study site name: North Creek.

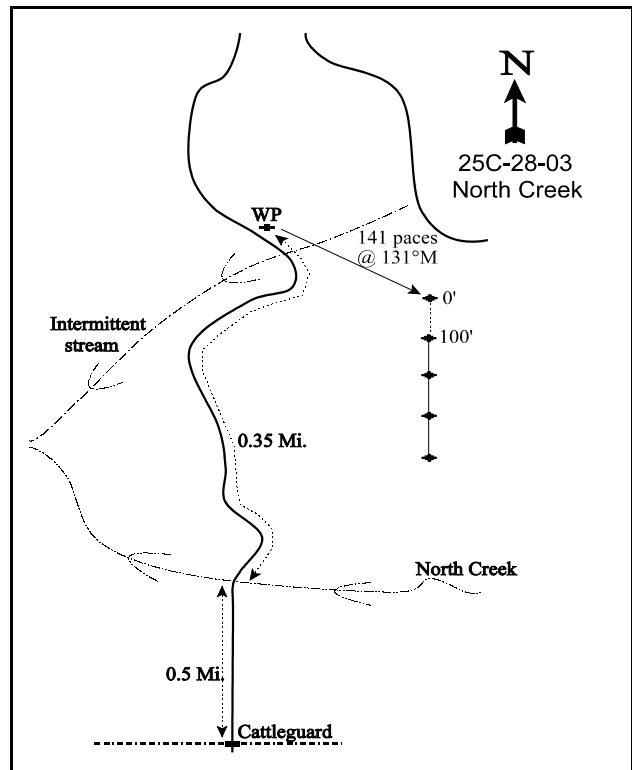
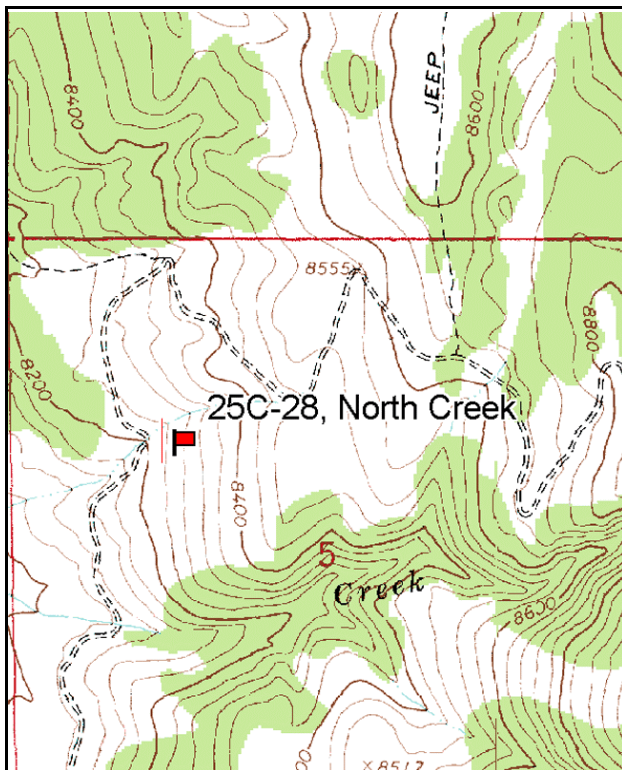
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of SR12 and Rt. 1660 (to 22) turn left onto Johns Flat Road. Drive 17.2 miles north to Grass Lake road (USFS sign) and turn east. Travel 1.2 miles on this road to a fork by hayfields. Turn right and continue 0.4 miles to the Horse Creek fork. Turn left and proceed 1.15 miles to a signed fork. Stay left and continue 0.25 miles on the main road. Pass the buildings, at Birch Creek, take the right fork and go 0.6 miles. Stay left at the fork and go 0.75 miles to a cattleguard. Continue 0.75 miles to a fork. Stay left and go 1.65 miles to a U.S. Forest Service enclosure. Continue 2.55 miles to a cattleguard. Continue 0.5 miles to North Creek. Cross and go 0.35 miles, over an intermittent stream and partway up a hill to a witness post on the right. The transect is 80 paces bearing 118 degrees magnetic up on a hillside. The 0-foot baseline stake is tagged #7168.



Map Name: Grass Lakes

Diagrammatic Sketch

Township 33S, Range 1W, Section 5

GPS: NAD 27, UTM 12S 4202467 N, 418663 E

DISCUSSION

North Creek - Trend Study No. 25C-28

This trend study site, located in the upper drainage of North Creek, samples a mixed mountain brush range dominated by pinyon-juniper, big sagebrush, and bitterbrush. The site has a westerly exposure and a moderate slope of 10%, which extends to a narrow sagebrush valley below. The area receives light to moderate deer use in mild winters, but is more indicative of a transitional range. Study site elevation is 8,300 feet. Pellet group data taken along the study site baseline in 1998 estimated 18 deer and 21 cow days use/acre (44 ddu/ha and 52 cdu/ha). One elk pellet group was also encountered. Rabbit sign was moderately abundant. Most of the deer pellet groups appeared old. Pellet group data from 2003 estimated low use at only 11 deer days use/acre (26 ddu/ha). Deer pellet groups appeared to be from spring and summer use.

The soil is an extremely rocky loam which is slightly acidic in reaction (pH 6.1). Rock and pavement are abundant on the soil surface, providing more than ½ of the total ground cover. Rock consists of basalt which is dark in color. The soil profile also contains high amounts of rock and gravel. Soil depth is relatively shallow with an effective rooting depth of just over 11 inches. Phosphorus is low at 8.3 ppm, when 10 ppm is considered the minimum for normal plant development. An abandoned road on the hillside has water bars to check erosion, which could become a problem on the site except for the protection afforded by the rocky surface. There is some evidence of soil pedestalling around shrubs and other signs of natural erosion.

There is an overstory of scattered pinyon pine and Rocky Mountain juniper on the site. Point-quarter data from 1998 estimated 46 pinyon and 29 juniper trees/acre. Average basal diameter was 3.4 inches for pinyon and 5.4 inches for juniper. Overhead tree canopy cover was variable, but averaged 5% over the site in 1998. The principal understory shrubs include mountain big sagebrush and bitterbrush. Sagebrush provided 56% of the total browse cover in 1998. Density of sagebrush was estimated at 8,466 plants/acre in 1987 increasing to 12,599 plants/acre in 1991. Density was very high considering the limited soil on the site. Over half (1,866 plants/acre) of the decadent plants sampled in 1991 were classified as dying. The larger sample used in 1998 estimated a much lower density of 6,380 plants/acre. Most of the change in density is due to the larger sample as the dead plants in the population can only explain 26% of the decrease. It appears that most of the decadent/dying plants sampled in 1991 died prior to the 1998 reading. Forty-seven percent (580 plants/acre) of the decadent sagebrush sampled in 1998 appeared to be dying, indicating possible further reductions in sagebrush density. Reproduction was limited and not adequate to maintain the stand. Utilization of the sagebrush has been mostly light to moderate since 1987, with some heavy use on some individual plants indicating preferential ecotypic variation within the population. The area burned in 2002. The fire burned all of the shrubs along the first 200 feet of the study site baseline and burned more spotty along the rest of the baseline. Density of sagebrush was estimated at 1,520 plants/acre in 2003, about 1/3 of which were classified as decadent. Use was light and vigor good on all but 11% of the plants sampled. Mature sagebrush that survived the fire produced abundant seed and had excellent annual leader growth averaging 3 inches in 2003. Young plants were moderately abundant.

Bitterbrush is also a key species on the site, although not as numerous. It provided 28% of the shrub cover in 1998. Density increased 64% between 1987 and 1991, from 599 to 1,666 plants/acre. The larger sample used in 1998 estimated a similar density of 1,100 plants/acre. Bitterbrush generally displayed moderate hedging, good vigor, and low decadence. Other preferred browse species such as curlleaf mountain mahogany, serviceberry, and snowberry are found scattered in the area but they are relatively uncommon. Nearly all of the bitterbrush was eliminated by the fire. Density was estimated at only 80 plants/acre in 2003, with half of those being mature plants. Use of bitterbrush was moderate to heavy in 2003. Nearly all of the pinyon and juniper trees were eliminated by the fire.

Grass and forb frequencies are very low, undoubtedly due to the rocky nature of the soil surface. Seven grass species were sampled in 1998 but they combined to produce less than 1% cover. The most common species are bottlebrush squirreltail and blue grama. Forbs are diverse with 17 species encountered in 1998 and 2003.

However, none occur more than occasionally and production is poor with these species combining to produce less than 1% cover in 1998. Forb production increased after the 2002 fire with forb cover averaging over 6% in 2003.

1987 APPARENT TREND ASSESSMENT

Soil conditions on the site are poor with rock and pavement covering 53% of the ground surface. Erosion is not a problem however and there is little exposed bare ground. The site supports a thick stand of mountain big sagebrush which shows light to moderate use, good vigor, and low decadence. The more preferred bitterbrush occurs in small numbers. It also shows light to moderate use, good vigor and no decadent plants were sampled. It appears, due to the high elevation of this site, that this area is used more as transitional and summer range. The herbaceous understory shows good diversity but poor production.

1991 TREND ASSESSMENT

Basic cover characteristics have changed little since 1987. Vegetative basal cover has increased slightly while rock-pavement cover have remained the same. Litter cover decreased from 40% to 36% with percent bare ground increasing from 5% to 7%. With bare ground still less than 10%, the trend for soils on this site would still be considered stable. However, percent bare ground should be monitored closely. There are two key browse species on site, mountain big sagebrush and antelope bitterbrush. Mountain big sagebrush has increased substantially since 1987. Sagebrush decadence is only 26%, which should not be considered a problem with an extremely high density (12,599 plants/acre) and the extended drought are figured in. Bitterbrush has more than doubled its population (599 to 1,666 plants/acre) with a biotic potential of 11% (proportion of seedlings). Bitterbrush decadence is moderate at 32%, but this is consistent with what has been observed in other areas during the extended drought. Trend for browse is up. Trend for grasses and forbs is down slightly due to a slight decline in the sum of nested frequency values for both grasses and forbs.

TREND ASSESSMENT

soil - stable (3)

browse - up (5)

herbaceous understory - down slightly (2)

1998 TREND ASSESSMENT

Trend for soil appears stable with similar amounts of bare ground, rock, pavement and litter cover. Vegetation cover is higher due to the change in methods since 1991. Previously only basal cover was estimated, now total aerial cover is estimated. Trend for browse is mixed. Mountain big sagebrush has a declining population which has gone down 49% in density since 1991. Percent decadence is moderate at 19%, but 47% (580 plants/acre) of the decadent plants appear to be dying. Reproduction is poor and not adequate to maintain the population. Trend for bitterbrush appears stable. Density has declined slightly, although use is lighter and percent decadence reduced from 32% to 9%. Leader growth is excellent and reproduction is good. Since mountain big sagebrush provides 56% of the browse cover on the site, overall browse trend is considered down slightly. The herbaceous understory is deficient producing only 1.6% cover. Sum of nested frequency of grasses has declined while frequency of forbs has remained stable. Overall trend for the herbaceous understory is considered down slightly and in very poor condition.

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - down slightly and very poor (2)

2003 TREND ASSESSMENT

Trend for soil is down due to the fire which burned the area in 2002. Vegetation cover and litter cover declined 2.9 and 2.5 fold respectively. Cover of bare ground increased more than 2 fold but is still relatively low at 11%. Rocks and pavement cover 69% of the ground surface. Erosion is not a problem due to the abundant rock cover. Another positive factor is the 5 fold increase in herbaceous cover. Trend for browse is down. Fire eliminated most of the shrubs on the first half of the study site baseline but burned more spotty along the rest of the baseline. Density of sagebrush declined 76% to 1,520 plants/acre. Use was light, vigor good, and young recruitment is currently adequate to maintain the stand. Surviving mature plants are producing abundant seed and display excellent annual leader growth averaging 3 inches in 2003. Most of the bitterbrush was eliminated by the fire but some mature plants survived. Density was estimated at only 80 plants/acre, half of which are young. Use of the surviving bitterbrush was moderate to heavy. Trend for the herbaceous understory is up slightly. Sum of nested frequency of perennial grasses declined slightly but frequency of perennial forbs increased 33%. In addition, production of perennial grasses more than doubled (0.74% to 1.93%) while cover of perennial forbs rose nearly 8 fold (0.82 to 6.36%). Total herbaceous cover is still low however, averaging only 8.5% cover in 2003. The most abundant grass sampled in 2003 was bottlebrush squirreltail which accounted for 73% of the total grass cover. Common forbs included becwitth milkvetch and lobeleaf groundsel. The herbaceous understory is still poor and limited by the extremely rocky nature of the soil surface.

TREND ASSESSMENT

soil - down (1)

browse - down due to the fire (1)

herbaceous understory - up slightly (4)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 28

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
G	<i>Agropyron cristatum</i>	c ²⁸	b ¹⁰	ab ¹	a ⁻	.01	-
G	<i>Agropyron spicatum</i>	2	-	-	1	-	.03
G	<i>Bouteloua gracilis</i>	-	2	2	2	.15	.15
G	<i>Bromus inermis</i>	b ¹²	ab ⁶	a ⁴	a ⁻	.01	-
G	<i>Bromus tectorum</i> (a)	-	-	a ²	b ¹³	.00	.21
G	<i>Oryzopsis hymenoides</i>	b ⁹	ab ²	ab ¹	a ⁻	.00	-
G	<i>Poa fendleriana</i>	-	3	2	3	.01	.15
G	<i>Poa secunda</i>	2	3	-	-	-	.03
G	<i>Sitanion hystrix</i>	ab ⁸²	b ⁹⁰	ab ⁶⁹	a ⁴⁸	.54	1.57
G	<i>Stipa lettermani</i>	b ¹⁹	a ⁴	a ⁻	a ⁻	.01	-
Total for Annual Grasses		0	0	2	13	0.00	0.21
Total for Perennial Grasses		154	120	79	54	0.74	1.93
Total for Grasses		154	120	81	67	0.74	2.15

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
F	<i>Antennaria rosea</i>	1	1	1	-	.00	-
F	<i>Arabis</i> spp.	_b 16	_{ab} 6	_{ab} 7	_a 1	.02	.01
F	<i>Astragalus beckwithii</i>	_a -	_{ab} 7	_{bc} 14	_c 29	.07	1.73
F	<i>Astragalus convallarius</i>	2	3	5	3	.15	.04
F	<i>Chaenactis douglasii</i>	-	6	5	-	.04	-
F	<i>Crepis acuminata</i>	-	4	3	-	.00	-
F	<i>Cryptantha bakeri</i>	10	8	10	16	.10	.25
F	<i>Descurainia pinnata</i> (a)	-	-	1	-	.00	-
F	<i>Erigeron pumilus</i>	_a -	_a 3	_b 21	_a 8	.14	.24
F	<i>Eriogonum racemosum</i>	7	6	3	10	.05	.20
F	<i>Gayophytum ramosissimum</i> (a)	-	-	_a -	_b 68	-	.55
F	<i>Gilia</i> spp. (a)	-	-	-	5	-	.07
F	<i>Hymenopappus filifolius</i>	_b 10	_a -	_a -	_a 1	-	.15
F	<i>Hymenoxys richardsonii</i>	_b 12	_{ab} 4	_a -	_a -	-	-
F	<i>Linum lewisii</i>	4	2	-	-	-	-
F	<i>Lotus utahensis</i>	5	4	6	9	.01	.22
F	<i>Lygodesmia spinosa</i>	_b 16	_{ab} 11	_a 1	_{ab} 8	.00	.22
F	<i>Machaeranthera canescens</i>	_b 13	_{ab} 6	_a -	_{ab} 2	.03	.19
F	<i>Oenothera caespitosa</i>	8	7	-	7	-	.68
F	<i>Petradoria pumila</i>	15	14	4	3	.09	.18
F	<i>Phlox longifolia</i>	_{ab} 9	_b 20	_a 5	_a 6	.01	.01
F	<i>Physaria</i> spp.	-	3	-	-	-	-
F	<i>Senecio multilobatus</i>	_b 11	_a -	_b 31	_c 52	.06	1.58
F	<i>Streptanthus cordatus</i>	4	3	1	-	.00	-
F	<i>Tragopogon dubius</i>	1	-	-	1	-	.00
F	Unknown forb-perennial	17	-	-	-	-	-
Total for Annual Forbs		0	0	1	73	0.00	0.62
Total for Perennial Forbs		161	118	117	156	0.82	5.75
Total for Forbs		161	118	118	229	0.83	6.36

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

BROWSE TRENDS --

Management unit 25C, Study no: 28

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	4	0	1.67	-
B	Artemisia tridentata vaseyana	97	29	21.14	5.35
B	Chrysothamnus nauseosus	2	12	-	.51
B	Chrysothamnus viscidiflorus viscidiflorus	6	4	.03	.38
B	Gutierrezia sarothrae	8	27	.25	.93
B	Juniperus scopulorum	2	1	1.50	.15
B	Pediocactus simpsonii	0	1	-	.00
B	Pinus edulis	8	0	2.62	-
B	Purshia tridentata	38	4	10.36	.00
B	Tetradymia canescens	0	1	-	-
Total for Browse		165	79	37.60	7.34

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 28

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	6.26
Chrysothamnus nauseosus	-	.46
Chrysothamnus viscidiflorus viscidiflorus	-	.28
Gutierrezia sarothrae	-	1.25
Juniperus scopulorum	1.79	.78
Pinus edulis	3.00	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 28

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	3.0
Purshia tridentata	4.4

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 28

Species	Trees per Acre	
	'98	'03
Juniperus scopulorum	29	N/A
Pinus edulis	46	N/A

Average diameter (in)	
'98	'03
5.4	N/A
3.4	N/A

BASIC COVER --

Management unit 25C, Study no: 28

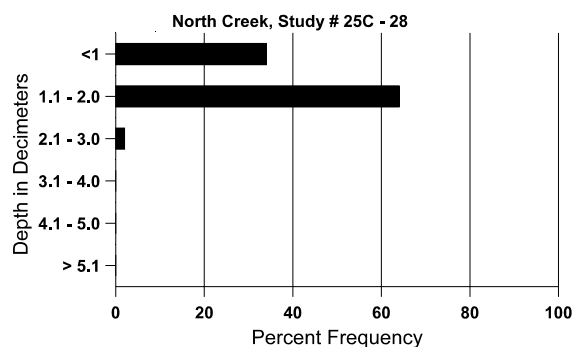
Cover Type	Average Cover %			
	'87	'91	'98	'03
Vegetation	2.50	4.25	42.77	14.67
Rock	18.75	21.25	15.84	30.12
Pavement	34.00	31.25	32.10	38.38
Litter	39.75	36.25	34.57	13.84
Cryptogams	0	0	0	0
Bare Ground	5.00	7.00	4.58	11.23

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 28, Study Name: North Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.3	58.3 (11.6)	6.1	46.0	29.4	24.6	2.7	8.3	211.2	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 28

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	7	1	-	-
Cow	-	-	21 (52)	1 (2)
Elk	-	-	1 (2)	-
Deer	14	1	18 (44)	11 (26)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 28

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>											
87	266	-	-	266	-	-	50	0	0	0	9/11
91	0	-	-	-	-	-	0	0	0	0	-/-
98	340	-	-	280	60	-	29	0	18	6	11/18
03	0	-	-	-	-	-	0	0	0	0	-/-
<i>Artemisia tridentata vaseyana</i>											
87	8466	-	533	6600	1333	-	35	0	16	0	12/15
91	12599	-	733	8533	3333	-	28	6	26	15	12/16
98	6380	40	200	4940	1240	1600	38	1	19	19	15/26
03	1520	40	140	940	440	4840	0	0	29	11	15/26
<i>Chrysothamnus nauseosus</i>											
87	0	-	-	-	-	-	0	0	0	0	-/-
91	266	-	-	133	133	-	0	75	50	25	4/4
98	40	-	-	40	-	-	0	0	0	0	10/14
03	240	-	-	240	-	-	0	0	0	0	11/14
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
87	466	-	-	466	-	-	0	0	0	0	11/7
91	266	-	-	200	66	-	50	0	25	0	5/5
98	140	-	20	120	-	-	0	0	0	0	10/9
03	80	-	-	80	-	-	0	0	0	0	12/16
<i>Eriogonum microthecum</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	66	-	-	66	-	-	0	0	-	0	5/8
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>											
87	800	-	-	800	-	-	0	0	0	0	9/7
91	1132	-	133	866	133	-	0	0	12	6	7/5
98	180	60	20	160	-	-	0	0	0	0	11/9
03	1160	-	20	1140	-	-	0	0	0	0	10/11
<i>Juniperus scopulorum</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	66	-	-	-	-	0	0	-	0	-/-
98	40	60	20	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-
<i>Pediocactus simpsonii</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	1/2
<i>Pinus edulis</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	180	40	140	40	-	-	0	0	-	0	-/-
03	0	-	-	-	-	120	0	0	-	0	-/-
<i>Purshia tridentata</i>											
87	599	-	66	533	-	-	22	0	0	0	33/37
91	1666	200	200	933	533	-	84	8	32	0	35/44
98	1100	60	120	880	100	160	47	0	9	4	28/56
03	80	20	20	40	20	80	25	50	25	25	15/23
<i>Tetradymia canescens</i>											
87	0	-	-	-	-	-	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	10/14

Trend Study 25C-31-03

Study site name: Parker Mtn Aerator .

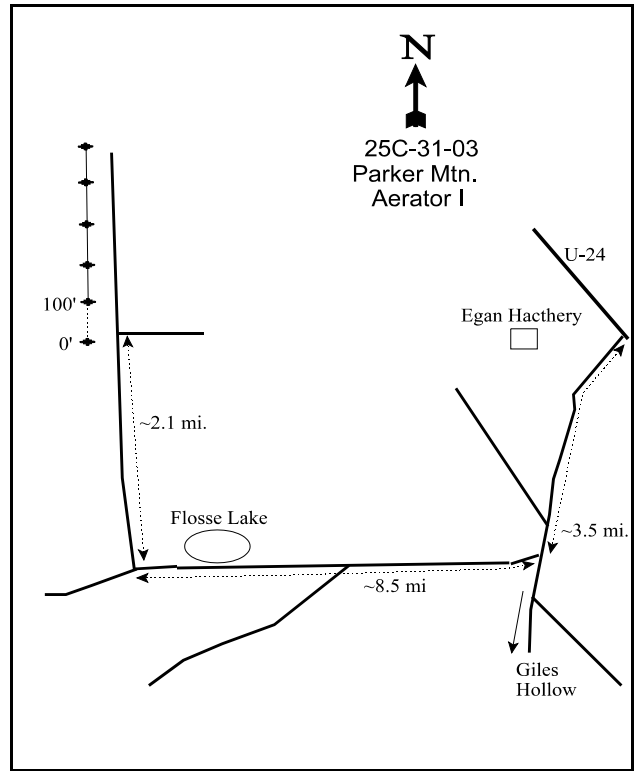
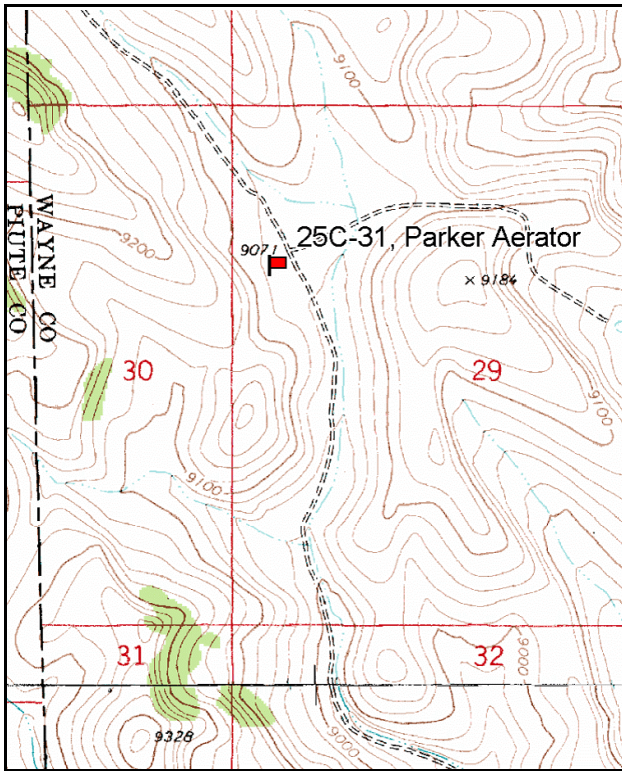
Vegetation type: Mtn. Big Sagebrush .

Compass bearing: frequency baseline 330 degrees magnetic.

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

LOCATION DESCRIPTION

On U-24 south of Bicknell, turn west on Bicknell Cir. Drive 3.5 miles to a left hand turn (you will pass the Egan Fish Hatchery). Drive for 8.5 miles on the main road to a right turn going north. Drive 2.1 miles to a road going off to the right (east). Park here and walk 64 paces at 200 degrees magnetic to the 0ft stake. The 0ft stake is marked by browse tag # 158.



Map Name: Jakes Knoll

Diagrammatic Sketch

Township 29S, Range 1E, Section 30

GPS: NAD 27, UTM 12S 4234938 N, 426952 E

DISCUSSION

Parker Mountain Aerator - Trend Study No. 25C-31

This is a new trend study established on Parker Mountain to monitor a mountain big sagebrush thinning treatment to improve sage grouse summer and brooding habitat. The site samples a sagebrush flat with a slight eastern aspect and a slope of about 3%. Elevation is 8,900 feet. The flat was treated with a meadow aerator which thinned the sagebrush. This area is used yearlong by antelope and during the summer by sage grouse. Cattle grazing also occurs during the summer and heavy grazing was evident prior to study site establishment on Sept 10th of 2003. Pellet group data estimated 13 antelope and 8 cow days use/acre (33 ddu/ha and 20 cdu/ha). Eight adult sage grouse were flushed from the site during the first reading.

Soil at the site is deep with an effective rooting depth of over 15 inches. Soil texture is a loam which is neutral in reaction. There is little rock or pavement on the surface or within the profile. Protective ground cover is good leaving only 17% cover of bare ground. Erosion is minimal due to the gentle terrain combined with the protective ground cover. Litter cover is high due to the aerator treatment which thinned sagebrush and left litter in place.

The site supports a thick stand of mountain big sagebrush. The aerator treatment thinned the population, especially the larger plants. Density of the surviving sagebrush was estimated at 7,100 plants/acre. Seedlings and young were numerous and mature plants numbered 3,420 plants/acre. These surviving mature sagebrush are short in stature, averaging only 12 inches in height. About 10% of the mature plants sampled had reduced vigor due to the treatment. Decadent plants accounted for 35% of the population with a density of 2,520 plants/acre. Sixty-seven percent of the decadent plants sampled had reduced vigor due to the treatment, and another 23% were classified as dying (>50% crown death). Some of the mature and decadent sagebrush sampled will likely die because of the treatment, but young plants appear to be numerous enough to maintain the stand. This area will probably return to a sagebrush dominated community quickly. A more aggressive sagebrush thinning method should have been used in order to open the meadow community longer. Average cover of sagebrush was estimated at about 12%. The only other shrubs found on the site include a few rubber rabbitbrush, Wood's rose, and snowberry.

The herbaceous understory is diverse but not particularly productive. Ten perennial grasses were found on the site. However 2 species, *Carex* and Letterman needlegrass, provided 57% of the total grass cover. Thickspike wheatgrass was also fairly common, but most other species occur sporadically. Most grasses had been heavily utilized which made identification difficult for some species. Total grass cover was estimated at only 8%. Forbs produce nearly as much cover as the grasses. Twenty forb species were encountered on the site. Silky lupine and a Penstemon provided 67% of the total forb cover. Most of the other forbs found on the site are low growing species. Penstemon was heavily utilized where found, but the lupine was untouched. Total herbaceous cover was estimated at 15%.

2003 APPARENT TREND ASSESSMENT

Soil conditions are good on this site. Protective ground cover is high resulting in minimal erosion. The sagebrush stand was thinned by a meadow aerator. Total sagebrush cover was estimated at 12% using the line-intercept canopy cover method. However, sagebrush density is still very high at 7,100 plants/acre. The surviving plants average only 12 inches in height. Thirty-five percent of the population was classified as decadent with 85% of those plants displaying poor vigor due to the treatment. Young plants are numerous, accounting for 16% of the population. Seedlings are also abundant. Age class analysis suggests that this population will increase and likely quickly return to a dense stand of sagebrush, especially with continued heavy livestock grazing. A more aggressive sagebrush thinning treatment should have been used and livestock grazing should be eliminated for a few years to prolong the treatment effect. The herbaceous understory is diverse but not particularly abundant. Total grass and forb cover average only about 15%. The most abundant grasses include a *Carex*, Letterman needlegrass, and thickspike wheatgrass. Forbs are dominated by silky lupine and a penstemon. Heavy livestock use of the herbaceous plants has obviously reduced production.

HERBACEOUS TRENDS --
Management unit 25C, Study no: 31

T y p e	Species	Nested Frequency	Average Cover %
		'03	'03
G	Agropyron dasystachyum	99	.92
G	Carex spp.	231	2.66
G	Festuca ovina	12	.12
G	Poa fendleriana	23	.22
G	Poa pratensis	32	.52
G	Sitanion hystrix	16	.31
G	Stipa columbiana	24	.95
G	Stipa comata	5	.30
G	Stipa lettermani	98	1.82
Total for Annual Grasses		0	0
Total for Perennial Grasses		540	7.84
Total for Grasses		540	7.84
F	Antennaria parvifolia	8	.18
F	Androsace septentrionalis (a)	58	.38
F	Arenaria fendleri	1	.00
F	Astragalus convallarius	5	.04
F	Astragalus spp.	24	.16
F	Chenopodium leptophyllum(a)	3	.01
F	Cirsium spp.	10	.24
F	Descurainia pinnata (a)	12	.03
F	Eriogonum spp.	3	.00
F	Eriogonum racemosum	20	.23
F	Gayophytum ramosissimum(a)	50	.22
F	Hymenoxys richardsonii	4	.06
F	Lupinus argenteus	89	3.67
F	Penstemon spp.	54	.93
F	Phlox longifolia	35	.08
F	Potentilla concinna	5	.04
F	Polygonum douglasii (a)	8	.05
F	Potentilla gracilis	22	.24
F	Senecio multilobatus	8	.04
F	Taraxacum officinale	19	.20
Total for Annual Forbs		131	0.69
Total for Perennial Forbs		307	6.16
Total for Forbs		438	6.86

BROWSE TRENDS --

Management unit 25C, Study no: 31

Type	Species	Strip Frequency	Average Cover %
		'03	'03
B	Artemisia tridentata vaseyana	78	12.98
B	Rosa woodsii	3	.03
B	Symphoricarpos oreophilus	7	.06
Total for Browse		88	13.08

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 31

Species	Percent Cover
	'03
Artemisia tridentata vaseyana	11.80

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 31

Species	Average leader growth (in)
	'03
Artemisia tridentata vaseyana	2.5

BASIC COVER --

Management unit 25C, Study no: 31

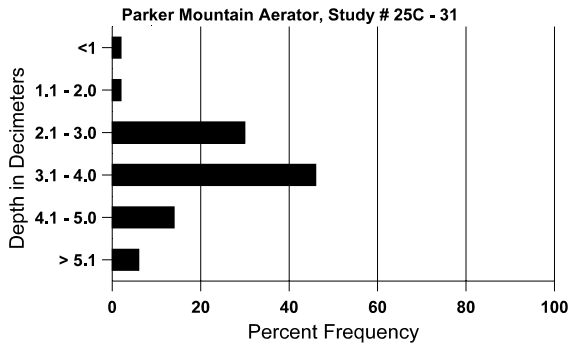
Cover Type	Average Cover %
	'03
Vegetation	25.99
Rock	1.41
Pavement	.74
Litter	63.22
Cryptogams	.08
Bare Ground	16.86

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 31, Study Name: Parker Mountain Aerator

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
15.5	43.4 (17.1)	6.7	44.6	32.7	22.7	2.3	37.7	838.4	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 31

Type	Quadrat Frequency	Days use per acre (ha)
	'03	'03
Rabbit	72	-
Grouse	5	-
Elk	1	-
Deer/Antelope	7	13 (33)
Cattle	3	8 (20)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 31

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>											
03	7100	1740	1160	3420	2520	-	.56	0	35	37	12/17
<i>Chrysothamnus nauseosus</i>											
03	0	20	-	-	-	-	0	0	-	0	-/-
<i>Rosa woodsii</i>											
03	120	-	-	120	-	-	0	0	-	0	6/7
<i>Symphoricarpos oreophilus</i>											
03	200	-	40	120	40	-	0	20	20	10	9/11

Trend Study 25R-2-03

Study site name: Lower Meadow Estates.

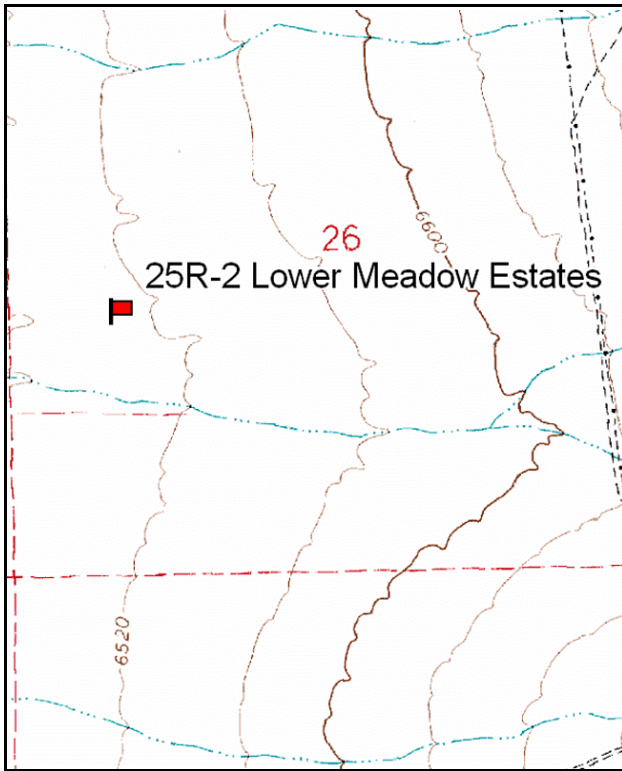
Vegetation type: Winter Fat.

Compass bearing: frequency baseline 62 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft). No rebar.

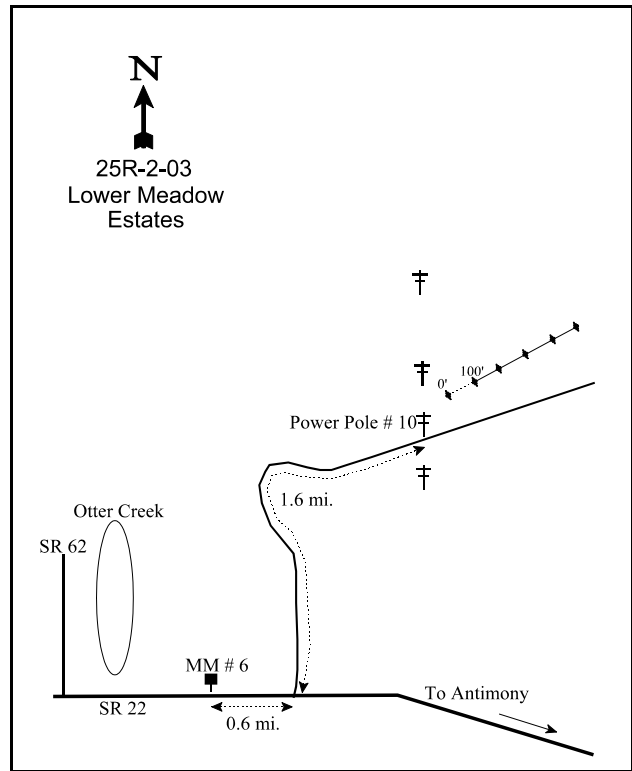
LOCATION DESCRIPTION

Starting from the junction of SR 22 and Highway 62, drive on SR 22 towards Antimony to mile marker #6. From mile marker #6, drive 0.6 miles to a road going left (north) off of SR 22. Drive on this road for 1.6 miles to power lines that cross over the road. Stop at power pole #10. From the power pole walk 20 paces at 334 degrees magnetic to the 0-foot stake.



Map Name: Angle

Township 30S, Range 2W, Section 26



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4224493 N, 413801 E

DISCUSSION

Lower Meadow Estates - Trend Study No. 25R-2

This study was established in 1997 to monitor winter range just north of Antimony. The area has a gentle slope of 2% to 4% and an elevation of 6,500 feet. The site slopes to the southwest. This area is used by wintering deer and elk and grazed by cattle. Two study sites were established in 1997, one at a lower elevation and another about 1 mile further east at a higher elevation. Both these sites were drill seeded sometime prior to the 1997 reading. The purpose of these studies were to monitor heavy elk use of this area in competition with livestock. Pellet group data from 1997 estimated 5 elk and 48 cow days use/acre (12 edu/ha and 119 cdu/ha). Pellet group data from 2003 did not encounter any elk pellet groups but cattle use was estimated at 27 days use/acre (66 cdu/ha). Pellet group data suggests that elk do not use this lower site significantly.

Soil at the site is deep with an effective rooting depth estimated at 16.6 inches. Texture is a sandy loam which is neutral in reaction. Organic matter is low at only 1%. Vegetation and litter cover are low with abundant bare ground exposed. Rock and pavement are concentrated on the surface and accounted for 33% of the ground surface in 1997 and 23% in 2003. However, erosion is not severe on this site due to the gentle terrain.

The site is dominated by winterfat (*Ceratoides lanata*) which accounted for 66% of the total browse cover in 1997 and 84% in 2003. The only other shrubs on the site consist of increasers, narrowleaf low rabbitbrush and broom snakeweed. Winterfat had a cover value of nearly 10% in 1997 with a density of 73,260 plants/acre. These plants were small with an average height of only 4 inches. Use was classified as moderate to heavy but vigor was good. Young recruitment was good with 12% of the population consisting of young plants. Cover of winterfat nearly doubled in 2003 to 18.8% and density increased slightly to 77,900 plants/acre. Winterfat again showed moderate to heavy use and good vigor in 2003. Young recruitment was down in 2003, but no decadent plants were sampled in either survey.

Narrowleaf low rabbitbrush has a stable population of about 3,000 plants/acre. Broom snakeweed had a density of 2,240 plants/acre in 1997 and 3,600 in 2003. Young recruitment was high in 2003 suggesting an expanding population. A few Wyoming big sagebrush and fourwing saltbush are scattered around the site.

The herbaceous understory is poor with low production of perennial grasses and forbs. Four perennial grasses were encountered in 1997 but only blue grama and sand dropseed were found more than occasionally. No seeded grasses were encountered. Total grass cover was estimated at ½ of 1%. Only blue grama and sand dropseed were sampled in 2003. Production remains poor but total grass cover increased to 1.6%. No perennial forbs are found on the site. Only a few annual species were sampled in 1997 and 2003. Slimleaf goosefoot and nodding eriogonum were the only common species found in 1997. In 2003, only halogeton and Russian thistle were encountered.

1997 APPARENT TREND ASSESSMENT

Soil conditions on this site are poor. There is poor vegetation and litter cover, leaving abundant bare ground exposed. The lack of significant slope is the only thing preventing accelerated erosion. Winterfat is the only common preferred browse on the site. It is abundant but very small is stature due to consistent heavy use. The herbaceous understory is very poor.

2003 TREND ASSESSMENT

Trend for soil is down slightly due to an 18% increase in cover of bare ground. Vegetation cover increased

while litter cover remained stable but very low at about 5%. The increase in bare ground comes from a decline in rock and pavement cover which suggests some overland soil movement. Erosion is not severe however, due to the gentle terrain. Trend for winterfat is stable. Density rose slightly while more plants were classified as lightly hedged. Vigor remains good but young recruitment has declined. Average height of mature winterfat has increased from 4 inches to 7 inches. Narrowleaf low rabbitbrush appears stable but broom snakeweed appears to be increasing. The herbaceous understory remains poor but sum of nested frequency of perennial grasses increased due primarily to a significant gain in the nested frequency of sand dropseed. Perennial forbs are still lacking with only Russian thistle and halogeton encountered.

TREND ASSESSMENT

soil - down slightly (2)

browse - stable (3)

herbaceous understory - up slightly but poor (4)

**HERBACEOUS TRENDS --
Management unit 25R, Study no: 2**

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	<i>Bouteloua gracilis</i>	23	31	.40	1.02
G	<i>Oryzopsis hymenoides</i>	4	-	.01	-
G	<i>Sitanion hystrix</i>	3	-	.03	-
G	<i>Sporobolus cryptandrus</i>	_a 7	_b 28	.06	.58
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		37	59	0.51	1.61
Total for Grasses		37	59	0.51	1.61
F	<i>Chenopodium fremontii</i> (a)	-	-	.00	-
F	<i>Chenopodium leptophyllum</i> (a)	_b 31	_a -	.32	-
F	<i>Eriogonum cernuum</i> (a)	_b 233	_a -	1.76	-
F	<i>Halogeton glomeratus</i> (a)	5	2	.03	.03
F	<i>Salsola iberica</i> (a)	_a -	_b 38	-	.10
Total for Annual Forbs		269	40	2.12	0.12
Total for Perennial Forbs		0	0	0	0
Total for Forbs		269	40	2.12	0.12

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

BROWSE TRENDS --

Management unit 25R, Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Atriplex canescens</i>	0	1	-	-
B	<i>Ceratoides lanata</i>	99	100	9.72	18.76
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	41	42	3.53	2.02
B	<i>Gutierrezia sarothrae</i>	28	40	1.46	1.64
Total for Browse		168	183	14.73	22.43

CANOPY COVER, LINE INTERCEPT --

Management unit 25R, Study no: 2

Species	Percent Cover
	'03
<i>Ceratoides lanata</i>	19.18
<i>Chrysothamnus viscidiflorus stenophyllus</i>	2.04
<i>Gutierrezia sarothrae</i>	2.23

BASIC COVER --

Management unit 25R, Study no: 2

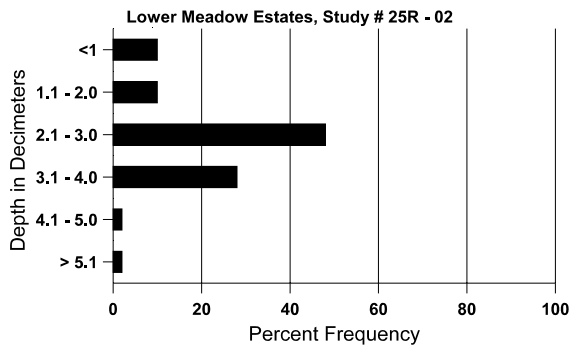
Cover Type	Average Cover %	
	'97	'03
Vegetation	15.75	22.29
Rock	6.74	5.88
Pavement	25.97	17.54
Litter	5.13	5.03
Cryptogams	1.81	.66
Bare Ground	47.18	55.87

SOIL ANALYSIS DATA --

Management unit 25R, Study no: 2, Study Name: Lower Meadow Estates

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
16.6	67.3 (16.1)	7.2	61.0	22.1	16.9	1.1	11.8	428.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25R, Study no: 2

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Rabbit	1	1	-	-
Elk	4	-	5 (12)	-
Cattle	12	13	48 (119)	27 (66)

BROWSE CHARACTERISTICS --

Management unit 25R, Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
97	0	-	-	-	-	20	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
Atriplex canescens											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	10/19
Ceratoides lanata											
97	73260	40	8960	64300	-	-	66	33	0	0	4/6
03	77900	-	380	77260	260	600	21	36	0	.10	7/7
Chrysothamnus viscidiflorus stenophyllus											
97	3100	-	100	2840	160	40	4	.64	5	1	7/12
03	2820	-	300	2200	320	320	0	0	11	6	6/10
Gutierrezia sarothrae											
97	2240	-	-	2220	20	-	0	0	1	0	7/11
03	3600	40	1500	2060	40	400	0	1	1	1	7/10

Trend Study 25R-3-03

Study site name: Upper Meadow Estates.

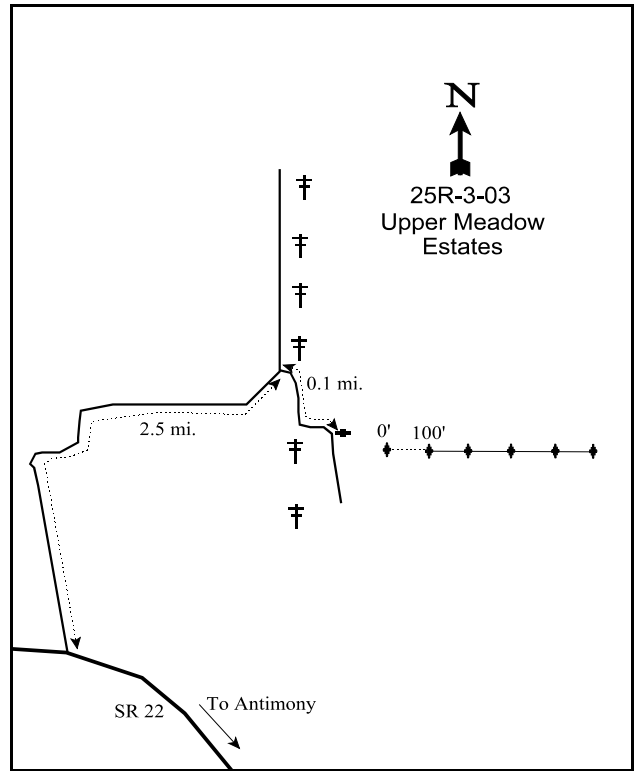
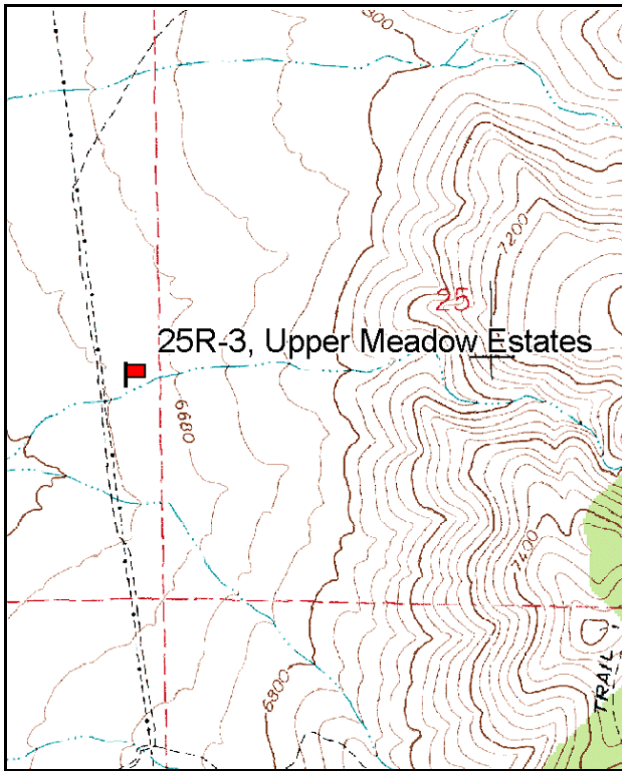
Vegetation type: Winter Fat.

Compass bearing: frequency baseline 79 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (71ft), line 3 (34ft), line 4 (59ft), line 5 (95ft). No rebar.

LOCATION DESCRIPTION

Starting from the junction of SR 22 and Highway 62, drive towards Antimony on SR 22 to mile marker #6. From mile marker #6, drive 0.6 miles to a road going left (north) off of SR 22. Drive on this road for 2.5 miles to second set of power poles crossing the road. From the power poles drive 0.1 miles to the witness post on the left side of the road. From the witness post walk 6 paces east to the 0-foot stake.



Map Name: Angle

Diagrammatic Sketch

Township 30S, Range 2W, Section 26

GPS: NAD 27, UTM 12S 4224479 N, 415118 E

DISCUSSION

Upper Meadow Estates - Trend Study No. 25R-3

This study was established in 1997 to monitor winter range just north of Antimony. It has a gentle slope of 5% to 10% and an elevation of 6,600 feet. The site slopes to the southwest. This area is used by wintering deer and elk and grazed by cattle. Two study sites were established in 1997, one at a lower elevation and this site about 1 mile further east at a higher elevation. The purpose of these studies was to monitor heavy elk use of this area in competition with livestock. This site was drill seeded sometime prior to the 1997 reading, but no seeded grasses or forbs are found on the site. This site receives a little more wildlife use than the Lower Meadow Estates study. Pellet group data from 1997 estimated 2 deer, 19 elk and 27 cow days use/acre (5 ddu/ha, 47 edu/ha, and 67 cdu/ha). Pellet group data from 2003 estimated much lower use at 1 deer, 3 elk and 12 cow days use/acre (3 ddu/ha, 7 edu/ha, and 29 cdu/ha). Wildlife use may be higher during severe winters.

Soil at the site is deep with an effective rooting depth estimated at 17.4 inches. Texture is a sandy loam which is neutral in reaction. Organic matter is low at only 1%. Vegetation and litter cover are low with abundant bare ground exposed. Rock and pavement are concentrated on the surface and accounted for 28% of the ground surface in 1997 and 20% in 2003. Erosion is a problem on this site. Drill rows are still visible and are oriented down slope instead of across the slope which has increased erosion problems on this site. Soil movement, pedestalling, flow patterns, and rills are apparent and the erosion condition class was determined to be moderate in 2003. Much of the soil deposition and runoff onto the site originates from areas above and to the east of the study area.

This site supports a mix of Wyoming big sagebrush and winterfat. Wyoming big sagebrush occurs in small numbers, estimated at only 240 plants/acre in 2003. Use of sagebrush was moderate in 1997 but mostly light in 2003. Vigor was good in 1997 and percent decadence low at 10%. All sagebrush sampled in 2003 were classified as decadent and 83% of those were rated as dying.

Winterfat is fairing much better but the population did decline from 7,500 plants/acre in 1997 to 5,920 in 2003. Use has been moderate to heavy since 1997 but vigor has remained good and no decadent plants were sampled either year. Average height and crown measurements have doubled since 1997, averaging 10 inches in height with a crown diameter of 12 inches. The only other shrubs on the site include low numbers of narrowleaf low rabbitbrush, broom snakeweed, and a couple species of cactus.

The herbaceous understory is much more productive compared to the Lower Meadow Estates study. Total grass cover was estimated at 10% in 1997 and 12% in 2003. Composition is poor however with the warm season, blue grama, providing nearly all of the grass cover. Indian ricegrass, sand dropseed, and needle-and-thread occur rarely. A few seeded Russian wildrye were also encountered in 2003. Perennial forbs are lacking. Only scarlet globemallow is fairly abundant. Total forb cover was estimated at only 2% in 1997 and less than 1% in 2003.

1997 APPARENT TREND ASSESSMENT

Soil condition on this site is poor with abundant bare ground exposed. Erosion is apparent. The browse component consists of a few Wyoming big sagebrush and winterfat. Both populations are moderately to heavily browsed but in good vigor and appear to be stable. The herbaceous understory is poor but much more productive compared to the Lower Meadow Estates site. Total grass cover was estimated at over 10%. The low growing, warm season, blue grama is the only abundant species however. The forb composition is poor and dominated by annuals. The only perennials found include scarlet globemallow and a *Cryptantha*.

2003 TREND ASSESSMENT

Trend for soil is stable but in poor condition. Average cover of bare ground increased slightly but vegetation and litter cover increased. Even though the trend is stable, erosion is ongoing and the erosion condition class was determined to be moderate in 2003. Browse trend is down slightly. Winterfat density declined by 21% due primarily to a reduction in young plants. Use remains moderate to heavy but vigor is good. Mature plants are larger with average height and crown measurements doubling in 2003. The small population of Wyoming big sagebrush has become entirely decadent with 83% of the plants sampled were classified as dying (>50% crown death). Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses declined including a significant drop in the nested frequency of blue grama which provides nearly all of the grass cover. Forbs are lacking and sum of nested frequency of perennial forbs declined slightly.

TREND ASSESSMENT

soil - stable but very poor (3)

browse - down slightly (2)

herbaceous understory - down (1)

HERBACEOUS TRENDS --

Management unit 25R, Study no: 3

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
G	<i>Bouteloua gracilis</i>	_b 355	_a 276	9.82	11.99
G	<i>Elymus junceus</i>	-	10	-	.10
G	<i>Oryzopsis hymenoides</i>	_b 20	_a 1	.11	.03
G	<i>Sporobolus cryptandrus</i>	_b 27	_a 1	.36	.00
G	<i>Stipa comata</i>	_a 9	_b 21	.12	.32
Total for Annual Grasses		0	0	0	0
Total for Perennial Grasses		411	309	10.42	12.44
Total for Grasses		411	309	10.42	12.44
F	<i>Chenopodium fremontii</i> (a)	_b 60	_a -	.66	-
F	<i>Chenopodium leptophyllum</i> (a)	_b 62	_a -	.31	-
F	<i>Cryptantha</i> spp.	14	1	.09	.03
F	<i>Eriogonum cernuum</i> (a)	_b 61	_a 5	.67	.18
F	<i>Euphorbia</i> spp.	-	2	-	.00
F	<i>Halogeton glomeratus</i> (a)	-	-	.00	-
F	<i>Lappula occidentalis</i> (a)	_b 37	_a -	.08	-
F	<i>Navarretia intertexta</i> (a)	_b 9	_a -	.05	-
F	<i>Phlox longifolia</i>	-	3	-	.00
F	<i>Salsola iberica</i> (a)	2	-	.03	-
F	<i>Sphaeralcea coccinea</i>	26	24	.27	.64
F	<i>Townsendia</i> spp.	-	2	-	.00

Type	Species	Nested Frequency		Average Cover %	
		'97	'03	'97	'03
	Total for Annual Forbs	231	5	1.82	0.17
	Total for Perennial Forbs	40	32	0.37	0.68
	Total for Forbs	271	37	2.19	0.86

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

BROWSE TRENDS --

Management unit 25R, Study no: 3

Type	Species	Strip Frequency		Average Cover %	
		'97	'03	'97	'03
B	<i>Artemisia tridentata wyomingensis</i>	9	9	2.49	2.57
B	<i>Atriplex canescens</i>	0	4	-	.79
B	<i>Ceratoides lanata</i>	64	67	1.03	3.66
B	<i>Chrysothamnus nauseosus</i>	1	0	-	-
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	13	14	.45	.33
B	<i>Gutierrezia sarothrae</i>	10	6	.07	.07
B	<i>Opuntia spp.</i>	1	1	-	-
	Total for Browse	98	101	4.05	7.43

CANOPY COVER, LINE INTERCEPT --

Management unit 25R, Study no: 3

Species	Percent Cover
	'03
<i>Artemisia tridentata wyomingensis</i>	2.09
<i>Atriplex canescens</i>	1.73
<i>Ceratoides lanata</i>	4.11
<i>Chrysothamnus viscidiflorus stenophyllus</i>	.28
<i>Gutierrezia sarothrae</i>	.01

BASIC COVER --

Management unit 25R, Study no: 3

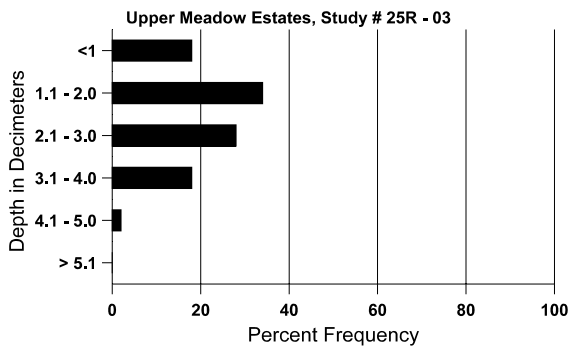
Cover Type	Average Cover %	
	'97	'03
Vegetation	17.38	19.97
Rock	11.63	8.37
Pavement	16.44	11.80
Litter	11.29	17.84
Cryptogams	1.50	.13
Bare Ground	40.90	45.42

SOIL ANALYSIS DATA --

Management unit 25R, Study no: 3, Study Name: Upper Meadow Estates

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
20.4	66.0 (18.0)	7.1	71.4	14.1	14.6	1.1	10.1	176.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25R, Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'97	'03	'97	'03
Rabbit	1	1	-	-
Elk	13	1	19 (47)	3 (7)
Deer	4	2	2 (5)	1 (3)
Cattle	1	4	27 (67)	12 (29)

BROWSE CHARACTERISTICS --
Management unit 25R, Study no: 3

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>											
97	200	20	-	180	20	140	40	10	10	0	16/31
03	240	-	-	-	240	60	8	0	100	83	19/37
<i>Atriplex canescens</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	80	-	-	80	-	-	0	0	-	0	21/37
<i>Ceratoides lanata</i>											
97	7500	20	1060	6440	-	-	63	27	-	0	5/6
03	5920	-	20	5900	-	40	35	22	-	0	10/12
<i>Chrysothamnus nauseosus</i>											
97	120	-	-	120	-	-	100	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	-/-
<i>Chrysothamnus viscidiflorus stenophyllus</i>											
97	560	-	-	380	180	60	0	0	32	21	8/12
03	560	-	-	300	260	240	0	0	46	29	7/13
<i>Gutierrezia sarothrae</i>											
97	340	-	20	320	-	-	0	0	-	0	6/7
03	140	-	20	120	-	-	0	0	-	0	8/8
<i>Opuntia spp.</i>											
97	40	-	-	40	-	-	0	0	-	0	-/-
03	20	-	20	-	-	-	0	0	-	0	5/15
<i>Pediocactus simpsonii</i>											
97	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	1/2

SUMMARY

WILDLIFE MANAGEMENT UNIT 25C - PLATEAU, BOULDER

Trend studies in the Boulder unit were originally established in 1985 and 1987. The majority of these studies sample winter range but several trend studies sample summer and transitional ranges. Fourteen winter range and 6 summer/transitional range trend studies were read in 2003. These were established in 1985 or 1987 and most were reread in 1991, 1994, 1998, and 2003.

Winter Range Trends

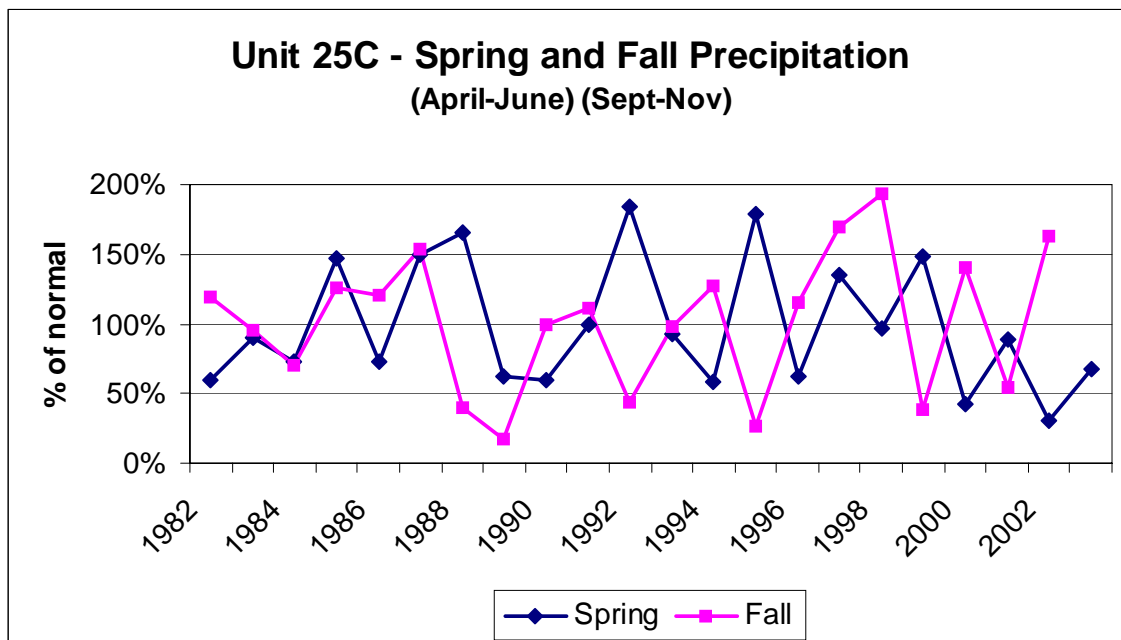
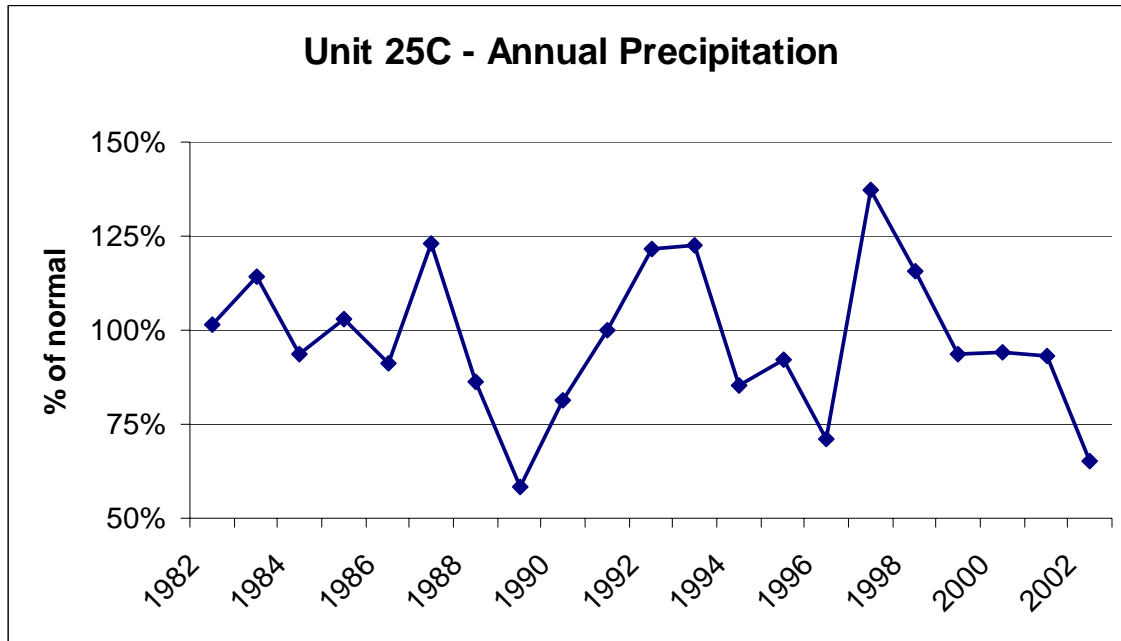
Average winter range trends are slightly down overall for soil, browse, and herbaceous plants. Soil trends were stable at 6 sites, down at 6 sites and upward on 2 studies. Browse trends were stable on 5 sites and down at 8. The only improving browse trend occurred at Coal Bench 25C-23. Nine of the 12 winter range sites showed increasing values for percent decadence on sagebrush. Average percent decadence increased nearly 2 fold from 19% to 32%. Young recruitment, or the proportion of young sagebrush plants in a population, declined at 10 of the 12 sites from an average of 18% to 7%. Herbaceous trends were stable at only 1 site, Black Canyon 25C-26, and downward on the other 13 sites. Drought conditions greatly effected herbaceous production with 11 of the 14 trend studies showing a decline in perennial grass cover. Average perennial grass cover declined 34% from 15% to 10%. All 14 studies displayed a decline in the sum of nested frequency of perennial grasses. Perennial forbs were also negatively effected by drought conditions. Ten sites showed a decline in average cover of perennial forbs while 12 sites had a decline in sum of nested frequency. Cover of perennial forbs declined 57% since 1998, from an average of 3% to 1%.

Summer/Transitional Range Trends

Six trend studies sample transitional or summer ranges. These sites showed mostly stable soil trends with the exception of Varney-Griffin Chaining 25C-17 and North Creek 25C-28 which had downward trends for soil. Browse trends were stable or improving on all sites except for North Creek which showed a downward trend due to fire. Herbaceous plants are the most important aspect of transitional and summer ranges. Herbaceous trends were down on 5 sites and up at only 1 site, North Creek. Average perennial grass cover declined 33% since the 1998 reading, from an average of 18% to 12%. Four of the 6 study sites also showed a decline in cover and sum of nested frequency for perennial forbs. Perennial forb cover declined by 40% from an average of 12% to 7%.

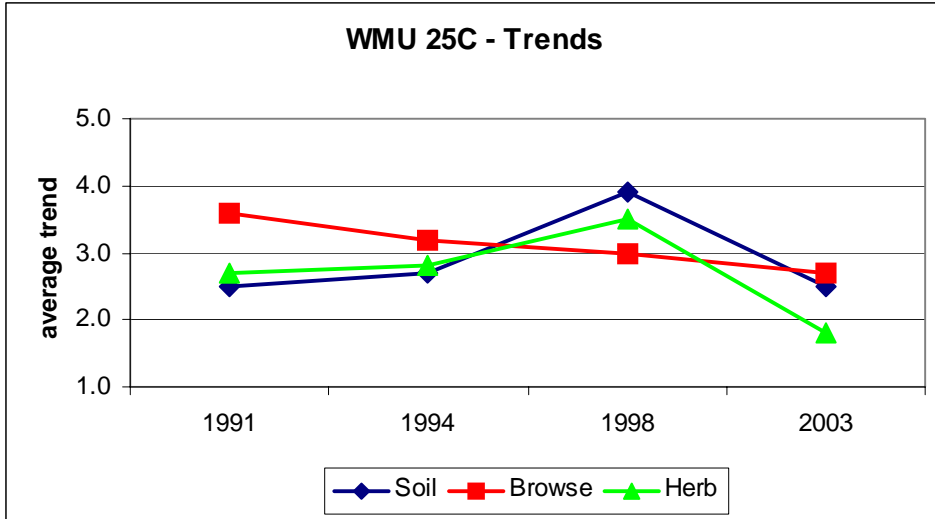
Drought conditions are responsible for these trends. Precipitation data from weather stations surrounding the unit show below normal annual precipitation for 2002 and near normal precipitation from 1999 to 2001 (Utah climate Summaries 2004). However, spring precipitation (May to June), which is critical for herbaceous plants and shrubs, has been well below normal for the past 4 spring periods (2000 to 2003), averaging only 57% of normal. Spring precipitation in 2000 and 2002 were especially low at 42% and 31% of normal respectively. Precipitation graphs and trends for each study site can be found below.

Below are precipitation graphs for the Boulder unit. Data represents percent of normal precipitation averaged for 5 weather stations which include Capital Reef National Park, Escalante, Koosharem, Angle, and Boulder (Utah Climate Summaries 2004).



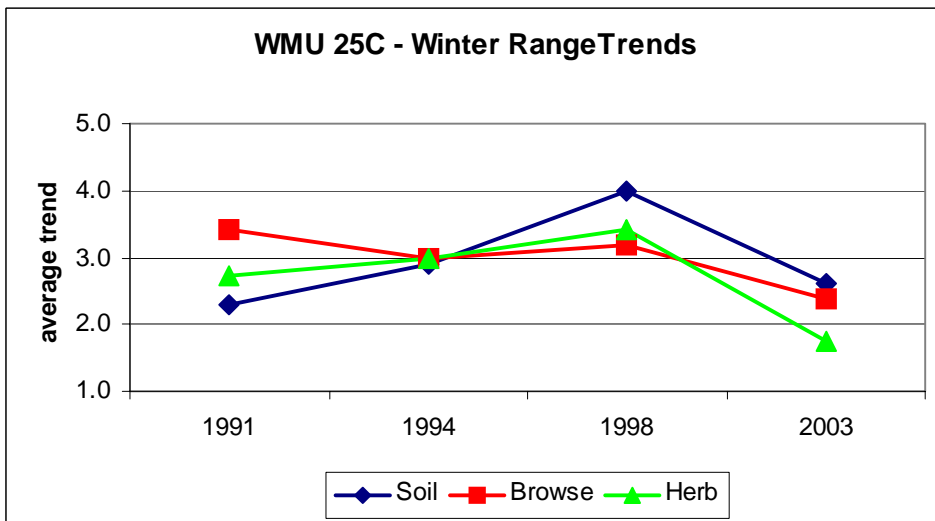
Unit 25C Average Trends

	1991	1994	1998	2003
Soil	2.5	2.9	3.9	2.5
Browse	3.6	3.2	3.0	2.7
Herb	2.7	2.8	3.5	1.8
	20 sites	13 sites	20 sites	20 sites



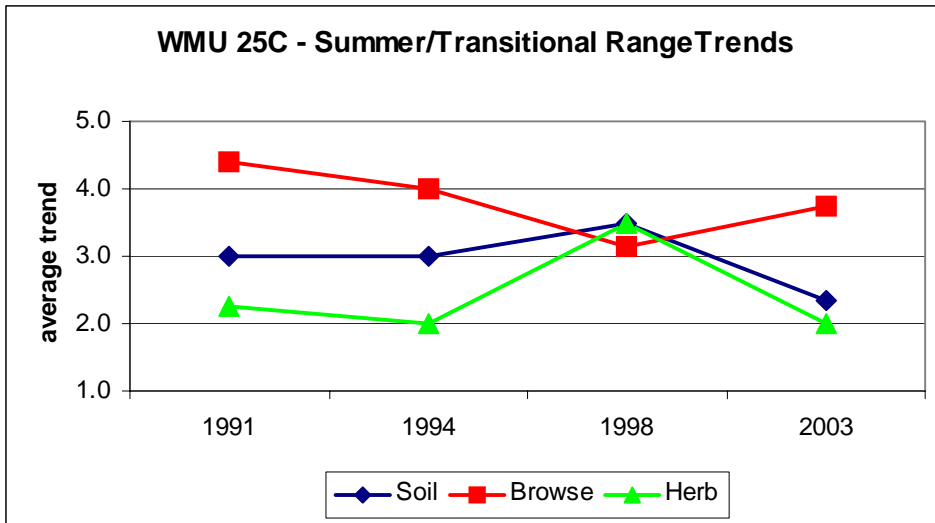
Unit 25C Winter Range Trends

	1991	1994	1998	2003
Soil	2.3	2.9	4.0	2.6
Browse	3.4	3.0	3.2	2.4
Herb	2.7	3.0	3.4	1.8
	14 sites	10 sites	14 sites	14 sites



Unit 25C Transitional/Summer Range Trends

	1991	1994	1998	2003
Soil	3.0	3.0	3.5	2.3
Browse	4.4	4.0	3.1	3.8
Herb	2.3	2.0	3.5	2.0
	6 sites	3 sites	6 sites	6 sites



Trend Summary

	Category	1985	1991	1994	1998	2003
25C-1 Yergy	soil	est	2	1	5	2
	browse	est	5	3	3	3
	herbaceous understory	est	3	3	3	2
25C-2 Wildcat	soil	est	1	4	5	2
	browse	est	5	3	3	3
	herbaceous understory	est	4	3	4	1
25C-3 Happy Valley	soil	est	3	4	3	4
	browse	est	2	2	3	4
	herbaceous understory	est	4	3	5	2
25C-4 North Slope	soil	est	3	NR	3	3
	browse	est	3	NR	3	3
	herbaceous understory	est	3	NR	3	1
25C-5 Giles Hollow	soil	est	3	2	4	3
	browse	est	2	3	3	3
	herbaceous understory	est	2	3	4	2
25C-6 Terza Flat	soil	est	2	4	2	2
	browse	est	1	3	3	1
	herbaceous understory	est	1	3	3	1
25C-7 Cedar Grove	soil	est	3	NR	4	2
	browse	est	3	NR	2	2
	herbaceous understory	est	4	NR	2	2
25C-8 South Narrows	soil	est	2	3	3	3
	browse	est	4	3	2	1
	herbaceous understory	est	3	4	3	2

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

	Category	1987	1991	1994	1998	2003
25C-9 Dry Wash	soil	est	3	3	3	4
	browse	est	2	3	3	2
	herbaceous understory	est	1	4	3	2
25C-12 Nazer Draw	soil	est	2	3	5	3
	browse	est	5	3	3	2
	herbaceous understory	est	2	3	4	1
25C-13 Short Neck	soil	est	3	3	5	3
	browse	est	4	4	4	3
	herbaceous understory	est	3	1	4	1
25C-14 New Home Bench	soil	est	2	NR	4	3
	browse	est	3	NR	4	1
	herbaceous understory	est	3	NR	3	1
25C-15 Steep Creek Bench	soil	est	2	2	5	1
	browse	est	2	3	2	2
	herbaceous understory	est	3	3	4	2
25C-17 Varney-Griffin Chaining	soil	est	3	NR	5	1
	browse	est	3	NR	5	3
	herbaceous understory	est	2	NR	3	1
25C-20 Baldys	soil	est	3	3	3	3
	browse	est	5	3	3	5
	herbaceous understory	est	3	3	4	2
25C-23 Coal Bench	soil	est	1	NR	5	2
	browse	est	5	NR	3	4
	herbaceous understory	est	2	NR	3	1
25C-25 Center Creek	soil	est	3	3	4	3
	browse	est	4	5	5	5
	herbaceous understory	est	4	1	4	2

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

	Category	1987	1991	1994	1998	2003
25C-26 Black Canyon	soil	est	3	NR	3	3
	browse	est	5	NR	3	2
	herbaceous understory	est	3	NR	3	3
25C-27 Poison Creek Bench	soil	est	3	3	3	3
	browse	est	3	4	1	5
	herbaceous understory	est	2	2	5	2
25C-28 North Creek	soil	est	3	NR	3	1
	browse	est	5	NR	2	1
	herbaceous understory	est	2	NR	2	4
25C-31 Parker Mountain Aerator	soil					est
	browse					est
	herbaceous understory					est
	Category				1997	2003
25R-2 Lower Meadow Estates	soil				est	2
	browse				est	3
	herbaceous understory				est	4
25R-3 Upper Meadow Estates	soil				est	3
	browse				est	2
	herbaceous understory				est	1

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

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