UTAH BIG GAME RANGE TREND STUDIES 1996 Volume 2

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REPORT FOR FEDERAL AID PROJECT W-135-R-17

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME
RANGE TREND STUDIES
1996 Volume 2

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Performance Report for Federal Aid Project W-135-R-17

Publication No. 98-10

UTAH DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources
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PROGRAM NARRATIVE

State: UTAH Project Number: W-135-R
Project Title: Statewide Big Game Range Trend Studies

Problem and Need: The ability to monitor vegetation composition changes (range trend) on key big game areas is an important part of a big game management program. The health and vigor of big game populations are closely associated with the quality and quantity of forage in key areas. Key areas are defined as those areas "where deer or other big game have demonstrated a definite pattern of use during normal climatic conditions over a long period." This project will emphasize deer and elk habitat although monitoring efforts may include other big game species as needed. Winter ranges for both deer and elk will comprise the bulk of the trend studies, although there are certain herd units where summer range is the portion of the unit that limits carrying capacity. Most of the key areas are located on public lands (BLM, USFS or State Lands) that are impacted by livestock grazing programs. Most of these programs are summarized in allotment management plans (USFS) or resource management plans (BLM) which are used to direct the management of a variety of resources on public lands (rangelands, watersheds, energy and minerals, recreational opportunities, etc.). This project was initiated to direct the attention of local interagency committees on the proper management of key big game areas throughout the state. The Division adopted monitoring guidelines established by the Utah State Interagency Committee (staff level biologists from BLM, USFS and DWR) which assures that data collected by DWR is compatible with that collected by both federal agencies. This limits the amount of duplication involved in monitoring certain key areas where either BLM, USFS or DWR may have overlapping responsibilities or concerns about range trend.

Objectives:

1. Continue to monitor range trend in all key areas within a DWR administrative region annually. This could also include requests for any area of the state that has need of current range trend information because of special habitat needs or concerns regarding big game and livestock interactions.

2. Classify every trend study site according to ecological site and identify habitat objectives based on site potential.

3. Prepare an annual report which will include herd unit descriptions, trend study narratives and herd unit evaluations for all herd units in a region annually.

4. Foster cooperative efforts among Interagency personnel with respect to trend study site selection, sharing trend data, development of trend monitoring procedures and data analysis, and the identification of management objectives for study sites.

5. Monitor vegetation in wildlife habitat improvement projects.

6. Use the information generated by this project to inform local interagency

committees of key habitat areas that are declining in value for big game.

7. Propose management strategies that are designed to correct habitat limitations in key areas.

Expected Results and Benefits:

Every five years the trend studies in each of the five regions will be reread and the status of the vegetation in key areas of each herd unit will be evaluated. The local interagency committee will be able to use the information to determine if key areas are declining in habitat value and if so, to recommend adjustments in management programs that would help restore big game habitat.

REMARKS

The work completed during the 1996 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northern Region. Trend studies surveyed in these management units were established in 1983 and 1984 with rereads on most sites in 1990 and 1996.

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

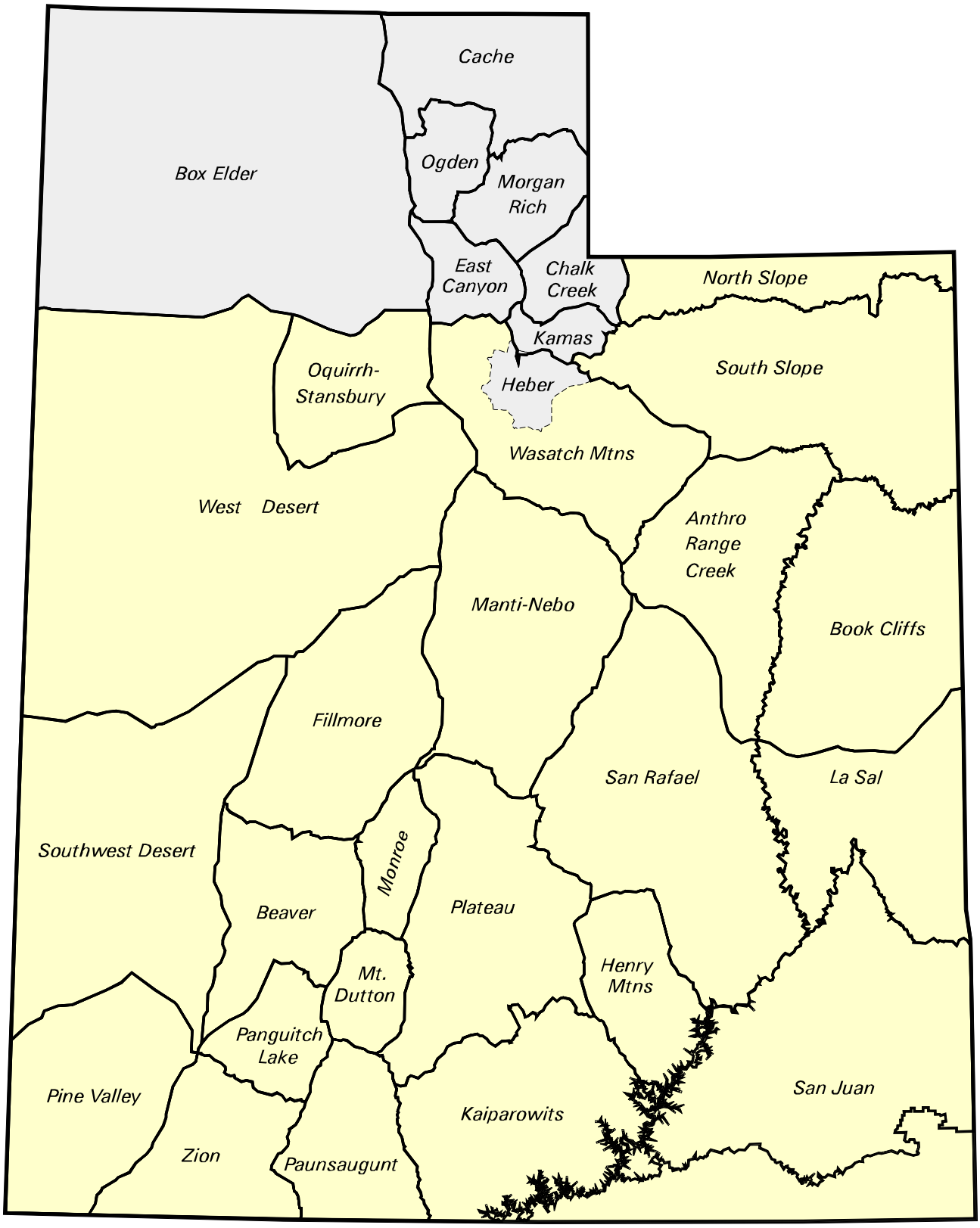
Uinta National Forest
- Heber Ranger District

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

Bureau of Land Management
- Bear River Resource Area

Most private landowners were extremely cooperative in allowing access to study sites located on their land. However, several studies could not be accessed, especially due to lack of cooperation on the private landowners part.

Management Units Surveyed in 1996



UDAF GIS May, 2000

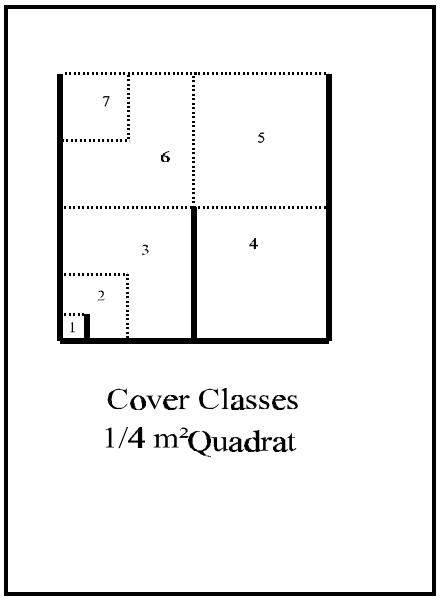
RANGE TREND STUDY METHODS

Trend monitoring studies depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or “key” areas within distinct plant communities on big game ranges. These “key” areas should be where big-game have demonstrated a definite pattern of use during normal climatic conditions over a long period of time. Trend studies are located within these areas of high use and/or critical habitat as agreed upon by DWR, BLM, and USFS personnel. Often, the 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 the transects proper identification.

Vegetative composition

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

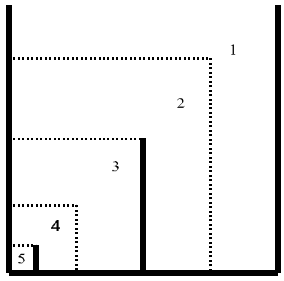
Currently, cover is determined using a slightly modified Daubenmire (1959) cover class method. The seven cover class are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, 7) 95.1-100%. For example, to estimate vegetative cover with this method, an observer would visualize which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



Cover Classes
1/4 m^2 Quadrat

Canopy cover of shrubs or trees above eye level 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.

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



Nested Frequency
1/4 m² Quadrat

Higher nested frequency scores represent a higher abundance for that plant species. These values are used to help determine changes in trend and composition through time. It has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (Mosley and others 1986). Plant cover and density values are not reliable indicators of trend and can fluctuate greatly with precipitation and time of season sampled. Therefore, plant cover and density values can be misleading if used by themselves and do not necessarily indicate changes in composition and/or distribution of key plant species. Quadrat frequency is used to give another quantitative, but less sensitive measure to help corroborate the trends being illustrated by the sum of nested frequency values.

Nested frequency, quadrat frequency, and average percent cover data for individual grass and forb species are summarized in the "Vegetative 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. Strip frequency is determined by dividing each of the five 100 foot belts into 20 equal five foot segments, allowing 100 five foot segments. For example, if a species was rooted in 25 of the shrub strips, strip frequency for this species would be 25%. All shrubs rooted within each strip are counted and placed in the following classes ([1]U.S. Department of Interior Bureau of Land Management 1996).

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

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

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

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

Dead: A plant which is no longer living

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

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

Lightly hedged: 0 to 40 percent of twigs browsed.

Moderately hedged: 41 to 60 percent of twigs browsed.

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

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

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

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

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

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

A more accurate method of determining shrub frequency is being used in this and all subsequent reports. It was found that nested and quadrat frequency of shrubs in previous reports did not usually reflect actual trends in shrub populations. Each 100^{th} acre shrub strip is divided into 20, 5 foot segments. Presence or absence is determined for these strip segments to give a measure of shrub frequency. This larger sample will better reflect trends in the shrub populations. This data along with shrub cover is recorded in the browse trends table.

In addition, each mature shrub species closest to every 10 foot mark along a sampling belt is measured to determine average height and crown. This allows a possible sample of 50 plants per species depending on their respective densities. Tree density is determined by the point-center quarter method centered on each end of the 5, 100 ft base lines. This allows sampling trees on a much larger scale. The strip method, used to estimate shrub density, can in most cases effectively estimate seedling and young tree densities.

TREND DETERMINATION

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

1) changes in density or number of plants/acre
2) proportion of decadent plants
3) biotic potential or proportion of seedlings in population
4) proportion of young plants in population
5) proportion of individuals heavily browsed
6) proportion of plants in poor vigor
7) changes in height and crown diameter measurements
8) changes in browse composition
9) strip frequency values

Trends in herbaceous plants as a group or as a single “key” species are determined by comparing the sum of nested and quadrat frequency values between readings. Attention is also given to changes in species composition of grasses and forbs through time. A non-parametric statistical test (Friedman test which is analogous to analysis of variance) (Conover 1980) is conducted on nested frequencies of each species to determine significant changes at "=.10. Ground cover parameters are analyzed and compared in the discussions of the reread studies. Trends for soil are determined by comparing these basic ground cover measurements and cover composition (herbs vs shrubs) between years as well as comparing photos and observer observations between readings. On newly established studies, a more subjective or apparent assessment is made from qualitative comparisons.

The following tables and partial tables have been taken from Herd Unit 33-1 vegetative trends summary to help illustrate some basic comparisons that can be made with the data. The “vegetative trends” table summarizes average cover, quadrat frequency, and nested frequency data for individual grass and forb species. The table contains all the grass species found on site 33-1. The 1987 readings included only nested and quadrat frequency data for perennial species. The 1994 trend studies have data for all perennial and annual species as well as cover estimates for individual species. Grasses had a combined total cover of 11.52%. *Agropyron cristatum* for example, had a sum of nested frequency of 135. By 1994, the sum of nested frequency value declined to 106. The asterisk indicates that the change was statistically significant. Quadrat frequency also indicated a decline from 55 to 39. Cover was estimated at 2.46% for *A. cristatum*. Trend for this grass is down due to a significant decline in nested frequency. In 1987, perennial grasses had a sum of nested frequency value of 560. This value declined to 485 by 1994, indicating a slightly downward trend for grasses on this site.

VEGETATIVE TRENDS --
Herd unit 33, Study no: 1

Type	Species	Nested Frequency '87	'94	Quadrat Frequency '87	'94	Average Cover % '94
G	Agropyron cristatum	135	*106	55	39	2.46
G	Bouteloua gracilis	15	19	5	6	1.07
G	Bromus inermis	75	*67	31	27	.63
G	Koeleria cristata	61	*3	23	1	.03
G	Oryzopsis hymenoides	-	3	-	1	.00
G	Poa bulbosa	220	*256	81	85	7.14
G	Poa fendleriana	-	*16	-	7	.06
G	Sitanion hystrix	6	1	3	1	.00
G	Stipa comata	48	*14	21	7	.11
Total for Grasses		560	485	219	174	11.52

* indicates a significant difference at " .10

The browse trends table below summarizes strip frequency and cover for all shrub species. Three of the shrubs found on site 33-1 are listed. Wyoming sagebrush, for example has a stip frequency of 86 out of a possible 100. Cover is estimated at 16.28%.

BROWSE TRENDS --
Herd unit 30A, Study no: 1

Type	Species	Strip Frequency '94	Average Cover % '94
B	Amelanchier utahensis	18	2.25
B	Artemisia tridentata wyomingensis	86	16.28
B	Chrysothamnus viscidiflorus	71	3.62
Total for Browse		175	22.15

The basic cover table summarizes nested frequency and average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Average cover for the previous method used ('87) adds up to only 100%, while cover with the current method ('94) can estimate several layers of plant and ground cover and will usually exceed 100%. For vegetation cover, the previous method only sampled basal vegetative cover (15.25) while the new method estimates projected vegetational cover (33.38). Therefore, comparisons can be made for all cover measurements except for general vegetation cover which now examines projected foliar cover rather than just basal cover.

BASIC COVER --
Herd unit 33, Study no: 1

Cover Type	Nested Frequency '94	Average Cover % '87	'94
Vegetation	333	15.25	33.38
Rock	10	0	.02
Pavement	18	0	.03
Litter	387	61.00	46.05
Cryptograms	111	3.50	1.50
Bare Ground	301	20.25	32.20

The soil analysis table summarizes data for the site. Effective rooting depth is an average of 25 soil pentrometer 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, 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., 61.2°F), with the average depth (in inches) as the lower measurement (18.3). Chemical and textural characteristics are also listed and were determined by a soils laboratory analysis of a composite sample taken near each of the 5 baseline starting stakes.

SOIL ANALYSIS DATA --
Herd Unit 33, Study no: 01

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
19.7	61.2 (18.3)	8.2	43.6	34.4	28.0	1.6	15.5	700.8	.61

The descriptive terms to use for ranges in pH are as follows:

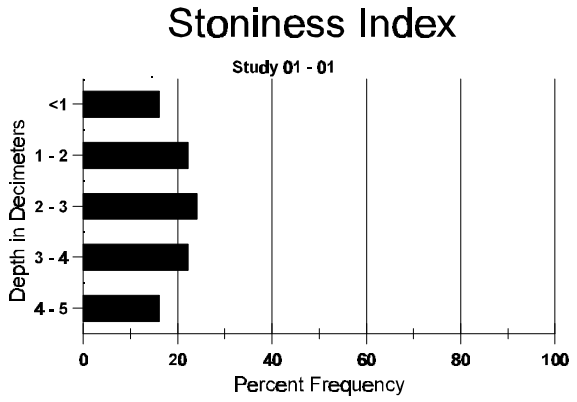
Ultra acid	<3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	>9.1

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

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 get a better awareness of how rock is distributed throughout the upper soil profile, a stoniness index is determined for each of the sites. Depth to the nearest rock is estimated at the first 10 feet (at one-foot intervals) of each of the 5 baselines, which allows 50 measurements. These data are then analyzed for each of the 5 incremental decimeter measurements, making it possible to visually determine the proportion (relative percent of rock at each depth) of rock there is from 1 to >5 decimeters.



The pellet group frequency table summarizes the quadrat frequency of wildlife and livestock droppings found on the site. This data was not included in reports done prior to 1992. For example in 1994, rabbit pellet groups were found in 44% of the quadrats placed on study 33-1, indicating the relative amount of rabbit use. With future readings, this data can help characterize changes in wildlife patterns use on the site.

PELLET GROUP FREQUENCY --
Herd unit 36, Study no: 1

Type	Quadrat Frequency '94
Rabbit	44
Elk	28
Deer	14

The following is part of a browse table which summarizes characteristics of shrubs on study 33-1. Total plants/acre for Wyoming big sagebrush, excluding seedlings (S) and dead (X) was 3,199 in 1987 and 4,800 in 1994. Seedlings are excluded from the population estimate because with summer drought, they may all die by late fall causing great fluctuations in population estimates from year to year. Since 1992, a much larger shrub sample is utilized to better characterize

the shrub populations. Therefore, changes in density do not necessarily indicate changes in trend. Especially those species that are clumped and/or have discontinuous distributions. This is where smaller samples can either over estimate or under estimate populations depending where they were sampled. Other characteristics like percent decadency, vigor, percent heavy hedging, biotic and reproductive potential, etc. should be given more weight in determining shrub trend. The following data on Wyoming big sagebrush shows the proportion of decadent shrubs (abbreviated as Dec: in the table) in the population increased from 12% in 1987 to 42% by 1994. This kind of change in percent decadence has not been unusual with prolonged drought since 1986. More seedlings were encountered in 1994, yet the number of young plants remained about the same. Only 2% of the sagebrush displayed poor vigor or were classified as dying in 1987, this increased to 10% by 1994. This is determined by dividing the number of shrubs in vigor classes 3 and 4 by the total number of shrubs sampled (yearly totals for each grouping; Y, M, and D). The proportion of shrubs displaying heavy hedging declined from 8% in 1987 to only 2% by 1994. This is determined by dividing the number of shrubs in form classes 3, 6 and 9 by the total number of shrubs sampled (total column). The proportion of shrubs displaying moderate use has gone from 42% in 1987 down to 13% in 1994. This is determined by dividing the number of shrubs in form classes 2 and 5 by the total number of shrubs sampled. The average height of sagebrush and crown diameter has increased from 13" x 17" to 18" x 32" indicating large healthy plants. Considering all these factors, trend for sagebrush is stable to slightly up due to an improved biotic potential (number of seedlings), lack of heavy use, good vigor, and the moderately high decadency rate is tolerable for only 10% of the decadent plants are classified as having poor vigor or dying.

BROWSE CHARACTERISTICS --
Herd unit 33, Study no: 1

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Artemisia tridentata wyomingensis																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	45	-	-	2	-	-	-	-	-	47	-	-	-	940			47
Y	87	2	1	1	-	-	-	-	-	-	4	-	-	-	266			4
	94	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	87	20	15	3	-	-	-	-	-	-	37	-	1	-	2533	13	17	38
	94	96	26	3	4	-	-	-	-	-	121	-	8	-	2580	18	32	129
D	87	2	4	-	-	-	-	-	-	-	6	-	-	-	400			6
	94	94	4	2	1	-	-	-	-	-	85	-	3	13	2020			101
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6
Total Plants/Acre (excluding Dead & Seedlings)													'87		3199	Dec:		12%
													'94		4800			42%

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

confusion with earlier published reports.

Other types of sampling have been added to the overall trend survey methodology because it was felt that more information was needed with regard to the soils. Now we measure soils for: effective soil depth, amount of rock in the upper soil profile (stoniness index), and soil temperature at approximately 21 inches in depth. A composite soil sample is taken from each of the vegetative sampling belts. Soil analysis includes: pH, texture analysis (percent sand, silt, and clay), percent organic matter, and amounts of trace elements (phosphorus, potassium, and electrical conductivity).

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

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Report Format

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

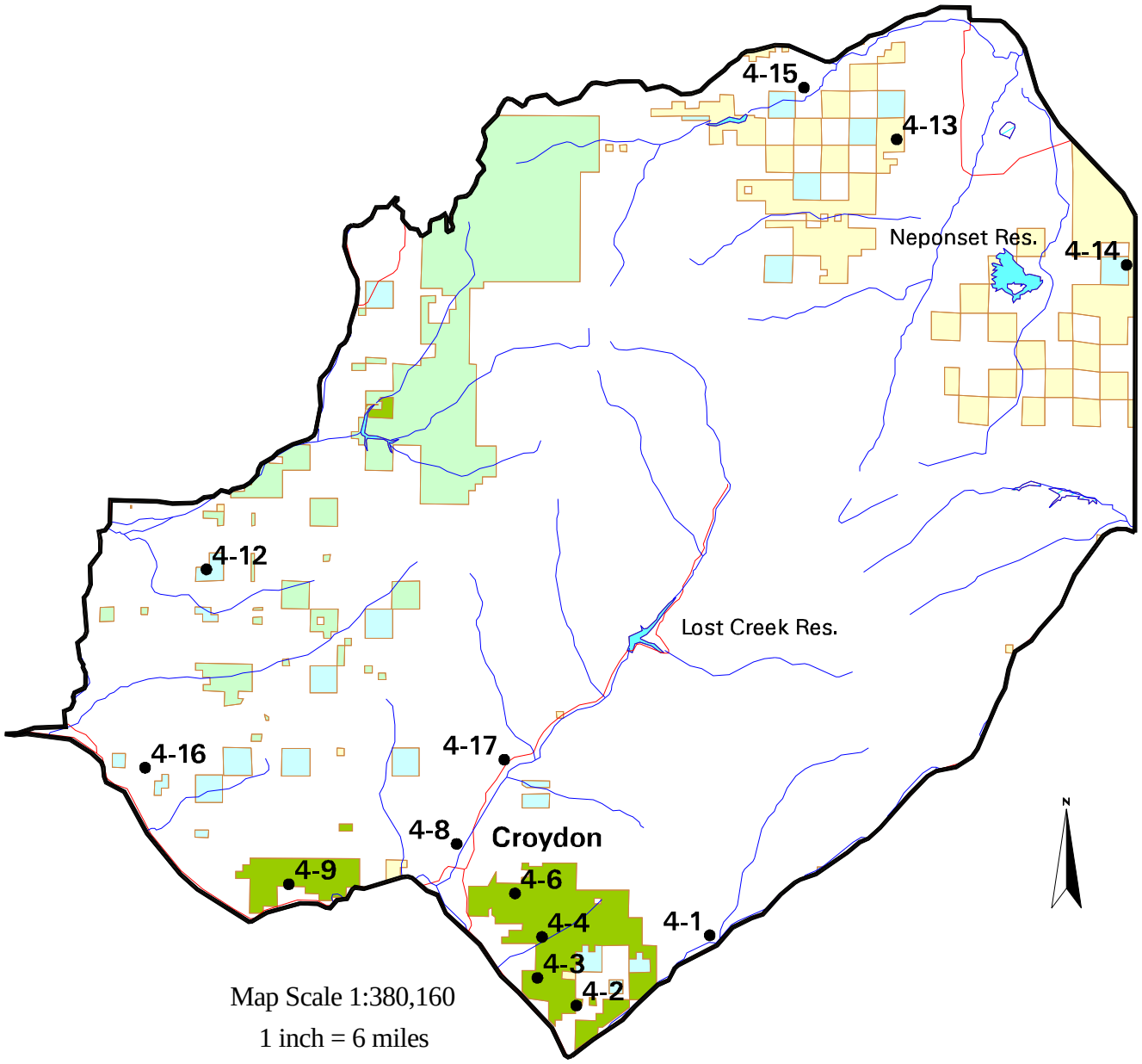
The name of the site and directions for locating the site are given on the location page. Due to many changes in management unit boundaries, trend studies have been renumbered. The previous trend study number is found in parenthesis following the trend study number currently being used. Also included on this page are the range type, arrangement and diagrammatic sketch of the baseline, and the location on a topographical map. The 7.5 minute topographical map name and public land survey description are located below the map. In addition, UTM coordinates follow the public land survey location. Compass bearings are in degrees relative to magnetic north, unless specified as true north (T).

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

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

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

Morgan Rich Management Unit



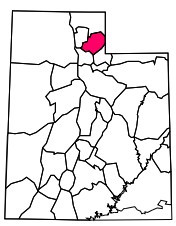
Map Scale 1:380,160

1 inch = 6 miles

Legend

- Forest Service
- Bureau of Land Management
- State of Utah
- Private Land
- State Wildlife Ref.
- Water Body
- Transect Location
- Road
- Water Course

Unit Location



UDAF GIS May, 2000

MANAGEMENT UNIT - 4 - MORGAN RICH

Boundary Description

Morgan, Rich, Summit and Weber counties - Boundary begins at the junction of I-80 and I-84 near Echo, Utah; east on I-80 to the Utah-Wyoming state line; north along this state line to SR-16; north on SR-16 to SR-39 near Woodruff; west along SR-39 to SR-167 (Trappers Loop road); south on SR-167 to SR-30 at Mountain Green; west on SR-30 to I-84; east on I-84 to I-80 and beginning point.

Unit Description

Management unit 4 prior to 1993 referred to the Wellsville mountains in Cache and Box elder counties. In 1993 unit boundaries were changed and unit 4 was created from parts of units 5, 6 and 7. Unit 4 incorporates the south eastern part of Weber county south east of Huntsville, the northern half of Morgan county and Summit county and the southern portion of Rich county south west of Woodruff. Municipalities along the unit boundaries include Woodruff on the north side, Huntsville, Mountain Green, Croydon and Echo.

Twelve of the 17 study sites in the unit occur along the I-84 corridor on critical winter range. Most winter range is located in the major drainages and on the slopes north of the Weber River. A detached, smaller wintering area is found on the south-facing slopes above Cottonwood Creek. These are the areas most highly developed by people. Highway I-80 and I-80N which run through Echo Canyon and along the weber River, form the unit's southern boundary. There are several towns along the highways. Croydon is the only town in the unit not on I-80. Surrounding Croydon, the majority of the Lost Creek bottoms have been converted to alfalfa fields. Lost Creek Reservoir, managed by the Division of Parks and Recreation, is primitively developed and the road is not maintained in winter. However, approximately 1,320 snowmobilers, winter fishermen and other recreationists used the facilities during the 1985 winter months. Two areas of land in the unit are managed by the Division of Wildlife Resources. One area is north of I-80N just east of Morgan, and the Henefer-Echo Canyon. The Henefer-Echo area is managed primarily as big game habitat. Controlled grazing, vehicle restrictions and re-vegetation projects are major management tools.

The earlier inventory studies described six vegetation types. The sagebrush type is most common and is found over the whole area. It forms part of a continuum, based on moisture conditions, with the browse/sagebrush and browse types. The lower elevation sagebrush and browse/sagebrush types are productive and utilized heavily by deer, while the browse type mostly provides cover and is unavailable in many winters. The other types occupy comparatively little area, but have the potential for increase. Burns occur frequently in the unit, and unless seeded, production of desirable species is very low. Deer use the burned areas infrequently, possibly because of lack of cover. Although a very small area, the mahogany type is important to deer wintering in Cottonwood Canyon. The scattered juniper areas also are important in providing cover, but produce little forage.

In severe winters, winter range is greatly reduced from its normal winter range boundaries. The upper limit is 6,500 feet on most of the unit. Acreage of all vegetation types, except agricultural land is reduced during severe winters. Range trend studies done in the unit in 1984 were all conducted on winter range. Most sampled critical and/or heavily used areas.

The Lost Creek, Weber River and Echo Canyon area are traditional deer wintering areas. There is considerable migration both from higher elevations in the unit and from other herd units to this area, especially in severe winters. The largest number of deer probably come from the East Canyon unit, where deer summer

on the east side of the Wasatch Mountains. Development in Morgan Valley is disrupting this migration route. Deer also come from the Ogden, Woodruff and Coalville units which are other units with adequate summer range but limited winter range.

Big Game Trends

Fawn production on Unit 4 is apparently high, averaging 93 fawns per 100 does in preseason classification counts over the last 10 years (1975 to 1985)(Jense et al. 1985). Post season antlerless hunts have been conducted on the unit's winter range to control herd numbers, and lessen agricultural depredation and damage to the range.

The buck harvest has been good over the last 30 years. The management objective has been to take 2,000 to 2,500 bucks annually. Current objectives are to maintain a target winter herd of 12,500 deer with a buck to doe ratio of 20 bucks to 100 does. Of the bucks, 30% will be 3-point or larger. Harvests have been variable through the years since 1950. It is best to look at the regression of the trend through the last 40 years. It displays a downward trend through this time period with many ups and downs, but most notably during the critical winters of 1949-50, 1983-84 and 1992-93. A downward trend is also noted for doe/fawn ratios during these years. Two thousand doe permits were issued for regular and post season hunts in 1980-83. The 1984-85 seasons were the first since 1977 in which no control permits were issued on this unit. Harvesting of deer has been complicated in many instances by restricted access on private lands.

Elk hunting opportunities have been steadily increasing in the Lost Creek area. To better regulate the harvest, a new unit, the Morgan-South Rich elk herd unit was established in 1984 from portions of the Ogden River and Cache units. The open bull hunt in 1984 had 70% success and a high percentage of mature bulls harvested because of trophy type hunts conducted on private land. The Morgan county part of the unit has limited antlerless permits (Jense et al. 1985). In contrast to the trends noted for deer in the area, the regressions of trends for elk have shown steadily increasing numbers for bull harvest, calf/cow ratios, and aerial counts.

The Lost Creek area provides critical habitat for wintering big game. The abundance of summer range, high productivity of the herds and generally increasing numbers of big game animals leads to heavy use on the limited winter range in that part of the state. Development, the predominance of private land and heavy impact from both livestock and big game has led to problems every winter.

The 17 trend studies are located in the Morgan-Rich herd unit (which is a combination of the old units 5, 6, and 7) to monitor wintering areas important to a large number of deer and elk. Maps, trend assessment, and baseline data for each study site follow.

TREND STUDY 4-1-96 (old 6-1)

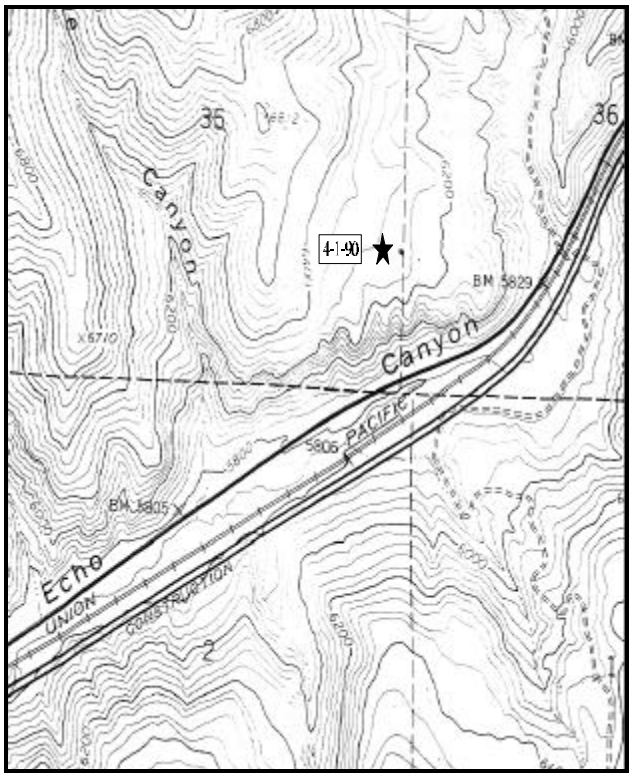
Study site name: Heiner's Creek . Range type: Mixed mountian brush .

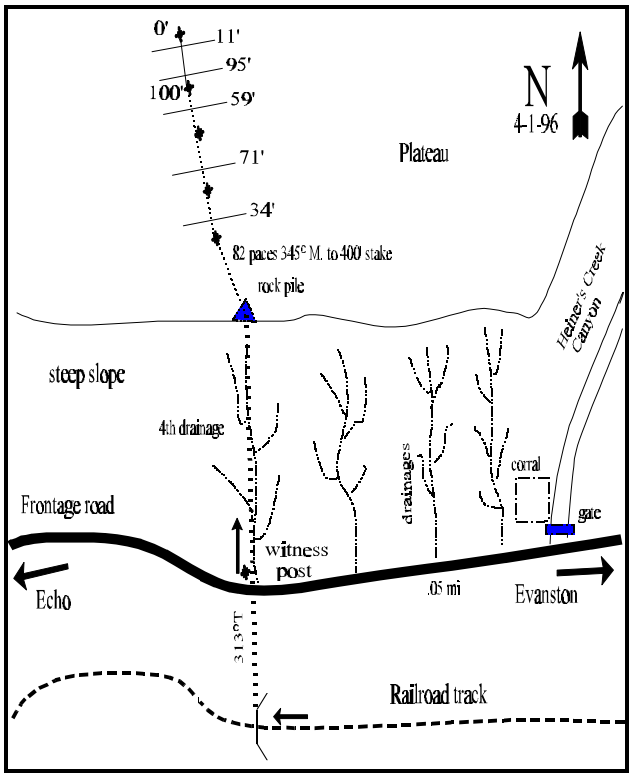
Compass bearing: frequency baseline 146 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

From exit 169 on I-80, travel 6.2 miles northeast on the frontage road to a witness post on the north side of the road next to a large rock. Look for a drainage to the right which runs up a very steep slope to a plateau (should be the 4th drainage west of Heiner's Canyon). Walk up the drainage to a rockpile at the plateau edge. From the rockpile, walk 85 paces at 343 degrees magnetic to the 400-foot baseline stake. The 0-foot baseline stake is 400 feet to the north at a bearing of 326 degrees magnetic.





Map Name: Heiner's Creek Diagrammatic Sketch

Township 4N , Range 5E , Section 35 , UTM COOR: 4-71-259E 45-42-760N

DISCUSSION

Trend Study No. 4-1 (6-1)

The Heiner Creek study samples critical deer winter range on the north side of Echo Canyon, just west of Heiner's Creek. The site is considered important to deer and to a lesser extent, elk. It is on a 10% south facing slope at 6,240 feet in elevation. This places the study above the steep bluffs or cliffs so prevalent in Echo Canyon. The range type is mixed mountain brush which appears to have been burned prior to the 1984 reading. As a result, fire tolerant shrubs and invader species currently dominate the site.

Soil on the site is moderately deep and almost rock and pavement free on the surface. It has a clay loam texture with a neutral pH of 6.6. Effective rooting depth was estimated at only 10 inches due to a compacted clay horizon. The soil is derived from a limestone-sandstone conglomerate. There are abundant signs of soil movement including soil pedestalling around shrubs and an active gully near the end of the base line.

The key browse species mountain big sagebrush, antelope bitterbrush and serviceberry. The sagebrush numbered only about 300 plants/acre during the 1984 and 1990 readings. Most of these shrubs were classified as mature. Due to the larger sample size used in 1996, accuracy for estimating shrub densities with clumped or discontinuous distributions was greatly improved. As a result, estimated density of sagebrush increased to 1,060 plants/acre. Nearly 80% are classified as mature plants which display low decadence, light to moderate use, and good vigor. Seedlings and young are present in good numbers. Bitterbrush are scarce with only 33 plants/acre estimated in 1990 and 100 in 1996. These shrubs were very heavily utilized in 1990. During the 1996 reading no bitterbrush were producing seed and 40% were heavily hedged. Due to the heavy use and dry conditions, 20% displayed poor vigor. Serviceberry are also in low numbers with an estimated density of 80 plants/acre.

The most abundant shrubs are increaser species such as Woods rose and stickyleaf low rabbitbrush. These shrubs currently provide the bulk of browse forage and provide nearly 80% of the total shrub cover. Stickyleaf low rabbitbrush provides 73% of the shrub cover with an estimated population density of 14,240 plants/acre. The population has shown a 61% increase since 1990, partly due to the increased sample size. Wood’s rose is also abundant, yet provides only 6% of the browse cover. Population density ranged from 7,500 plants/acre in 1984 to 8,565 by 1990. Most of these plants were classified as young. During the 1996 reading, density dropped to 3,780 plants/acre. No dead or decadent plants were encountered so this change in density is mostly due to the larger more representative sample used in 1996. Wood’s rose appears unutilized and in good vigor.

Herbaceous understory vegetation is patchy and includes several low growing weedy species. Grasses are diverse and fairly abundant, but do not produce much forage. Common grasses include bluebunch wheatgrass, Sandberg bluegrass, mutton bluegrass, and Kentucky bluegrass. Forbs are almost absent on the site. The most abundant perennial forbs include weedy species such as western yarrow, pacific aster, thistle, and longleaf phlox. The site had been heavily utilized by cattle prior to the 1996 reading (7/1/96).

1984 APPARENT TREND ASSESSMENT

Soil trend is marginal. This soil is potentially erodible and has undergone some soil loss. As this site continues to recover from fire, some improvement in dispersion of ground cover can be expected and perhaps a lessening of erosion problems. vegetative trend appears stable, but current range condition,

especially with regard to plant composition, is well below optimum. The key browse species are going to have a difficult time increasing their numbers and productivity.

1990 TREND ASSESSMENT

Basal vegetative cover increased since 1984, but percent bare ground also increased slightly while litter cover declined. The large amount of bare soil allows for active gullies and increased plant pedestaling. Trend for soil is considered down slightly. Mountain big sagebrush has remained at a similar density compared to 1984. The mature sagebrush are vigorous and moderately to heavily hedged. Sagebrush canopy cover averages 3%. No seedling or young sagebrush were encountered. The few bitterbrush sampled on the site are all heavily hedged. Increaser species, stickyleaf low rabbitbrush has declined slightly in density, while wood's rose increased. Both populations appear to be stable to slightly increasing. Trend for browse is slightly down and in poor condition. Trend for the herbaceous understory is down slightly. Nested frequency of bluebunch wheatgrass shows a significant decrease while mutton grass and Sandberg bluegrass increased significantly. Sum nested frequency of perennial forbs declined.

TREND ASSESSMENT
soil - downward slightly
browse - slightly downward and in poor condition
herbaceous understory - slightly downward

1996 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground. However, erosion is still occurring. Trend for browse is up slightly for mountain big sagebrush. Density has increased 72% since 1990, but this is primarily due to the larger sample size used in 1996. Age class analysis indicates a stable to slightly increasing population. Utilization is mostly light, vigor normal, and percent decadence low at only 1%. The other preferred browse, antelope bitterbrush and serviceberry, occur in small numbers and have received continued heavy use. The increaser, stickyleaf low rabbitbrush, still dominates the site by providing 73% of the browse cover. The large increase in it's population also appears to be the result of the larger sample size which better samples shrub populations which often have a aggregated and/or discontinuous distributions. Trend for the herbaceous understory is up. Sum of nested frequency for perennial grasses increased, while sum of nested frequency for forbs remained similar to 1990 estimates. Sum of nested frequency for thickspike and bluebunch wheatgrass increased while that for mutton bluegrass declined. Forb composition is still poor.

TREND ASSESSMENT
soil - up slightly
browse - up slightly but poor composition
herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 1

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	a41	b2	c92	14	1	35	.55
G	Agropyron spicatum	a169	b69	a130	71	32	55	2.67
G	Bromus tectorum (a)	-	-	140	-	-	46	1.60
G	Carex spp.	-	-	3	-	-	2	.03
G	Elymus cinereus	3	1	9	2	1	4	.21
G	Koeleria cristata	1	3	3	1	1	1	.03
G	Melica bulbosa	-	-	3	-	-	2	.01
G	Poa fendleriana	a85	b152	c88	45	65	36	1.73
G	Poa pratensis	a6	a7	b42	3	2	14	1.00
G	Poa secunda	a11	b208	b209	6	74	74	5.17
G	Sitanion hystrix	a14	b3	b1	8	2	1	.00
G	Stipa comata	a9	a12	b-	4	4	-	-
G	Stipa lettermani	a-	a-	b30	-	-	13	.66
Total for Grasses		339	457	750	154	182	283	13.69
F	Achillea millefolium	a137	b40	c71	57	17	31	.80
F	Allium acuminatum	a54	b-	b2	26	-	2	.01
F	Antennaria spp.	4	2	1	2	1	1	.00
F	Arabis spp.	5	2	4	2	2	2	.03
F	Artemisia ludoviciana	3	4	-	1	1	-	-
F	Aster chilensis	ab87	a67	b100	32	32	42	1.87
F	Astragalus convallarius	12	7	4	7	4	2	.01
F	Astragalus lonchocarpus	-	2	-	-	1	-	-
F	Cirsium spp.	13	31	18	7	13	10	.52
F	Comandra pallida	a68	a51	b4	34	23	3	.01
F	Collinsia parviflora (a)	-	-	5	-	-	2	.01
F	Eriogonum umbellatum	19	14	10	11	7	4	.23
F	Hackelia patens	-	-	7	-	-	3	.06
F	Helianthus annuus (a)	-	32	-	-	15	-	-
F	Helianthella uniflora	a28	b-	b-	14	-	-	-
F	Heterotheca villosa	-	-	3	-	-	1	.00
F	Lithospermum ruderale	-	-	1	-	-	1	.03
F	Lupinus argenteus	a3	a3	b11	1	1	6	.10
F	Machaeranthera canescens	-	-	5	-	-	3	.01
F	Phlox longifolia	a-	b33	b52	-	14	23	.14
F	Polygonum douglasii (a)	-	-	39	-	-	20	.12
F	Ranunculus testiculatus (a)	-	-	105	-	-	40	.37
Total for Forbs		433	288	442	194	131	196	4.39

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 1

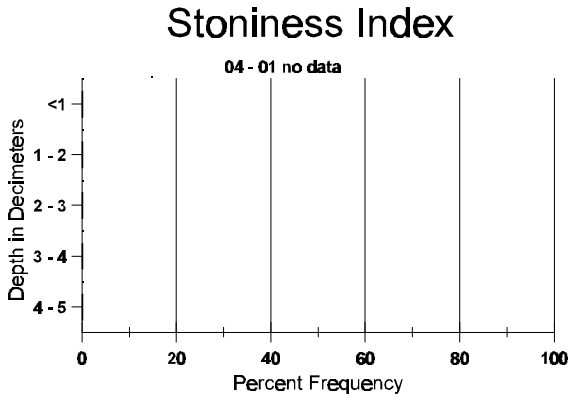
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	4	.41
B	Artemisia tridentata vaseyana	34	4.92
B	Chrysothamnus nauseosus albicaulis	1	.38
B	Chrysothamnus viscidiflorus viscidiflorus	99	22.09
B	Purshia tridentata	5	.00
B	Rosa woodsii	29	1.77
B	Symphoricarpos oreophilus	8	.67
Total for Browse		180	30.26

BASIC COVER --
Herd unit 04 , Study no: 1

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	363	6.75	10.25	48.59
Rock	40	0	0	.14
Pavement	134	3.00	1.25	.72
Litter	396	58.75	51.75	45.24
Cryptogams	37	.75	.75	.34
Bare Ground	289	30.75	36.00	22.39

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.1	66.2 (14.1)	6.6	31.9	32.1	36.0	3.2	19.9	144.0	.4



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 1

Type	Quadrat Frequency '96
Horse	3
Deer	15
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	20	1
	96	-	-	-	2	-	1	-	-	-	3	-	-	-	60	18	30	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		33			-
													'96		80			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	84	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	84	6	-	-	-	-	-	-	-	-	6	-	-	-	200	19	17	6
	90	3	2	3	-	-	-	-	-	-	8	-	-	-	266	24	23	8
	96	30	12	-	-	-	-	-	-	-	42	-	-	-	840	26	35	42
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		333	Dec:		0%
													'90		299			11%
													'96		1060			2%
Chrysothamnus nauseosus albicaulis																		
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33	20	31	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	35	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		0%
													'90		33			100%
													'96		20			100%
Chrysothamnus viscidiflorus stenophyllus																		
S	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	31	-	-	-	-	-	-	-	-	31	-	-	-	1033			31
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	159	-	-	-	-	-	-	-	-	159	-	-	-	5300	15	24	159
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	17	-	-	-	-	-	-	-	-	17	-	-	-	566			17
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		6899	Dec:		8%
													'90		0			0%
													'96		0			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	33	-	-	-	-	-	-	-	-	33	-	-	-	1100			33
	96	103	-	-	-	-	-	-	-	-	103	-	-	-	2060			103
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	93	11	-	1	-	-	-	-	-	105	-	-	-	3500	11	15	105
	96	565	15	-	8	-	-	-	-	-	588	-	-	-	11760	14	23	588
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	29	-	-	-	-	-	-	-	-	29	-	-	-	966			29
	96	13	7	-	1	-	-	-	-	-	19	-	2	-	420			21
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		5566			17%
													'96		14240			3%
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	2	-	-	-	-	-	-	-	2	-	-	-	66	8	21	2
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	33	13	39	1
	96	-	-	-	-	1	1	-	-	1	2	-	1	-	60	14	41	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		33			-
													'96		100			-
Rosa woodsii																		
S	84	23	-	-	-	-	-	-	-	-	23	-	-	-	766			23
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	25	-	-	-	-	-	-	-	-	25	-	-	-	500			25
Y	84	220	-	-	-	-	-	-	-	-	220	-	-	-	7333			220
	90	242	-	-	-	-	-	-	-	-	242	-	-	-	8066			242
	96	59	-	-	-	-	-	-	-	-	59	-	-	-	1180			59
M	84	5	-	-	-	-	-	-	-	-	5	-	-	-	166	14	11	5
	90	7	-	-	-	-	-	-	-	-	7	-	-	-	233	12	8	7
	96	130	-	-	-	-	-	-	-	-	130	-	-	-	2600	14	16	130
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		7499	Dec:		0%
													'90		8565			3%
													'96		3780			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	4	6	1	-	-	-	-	-	-	11	-	-	-	366	14	29	11
	90	3	1	2	-	-	-	-	-	-	6	-	-	-	200	17	27	6
	96	6	2	-	1	-	-	-	-	-	9	-	-	-	180	17	36	9
Total Plants/Acre (excluding Dead & Seedlings)													'84		399	Dec:		-
													'90		200			-
													'96		200			-

TREND STUDY 4-2-96 (old 6-2)

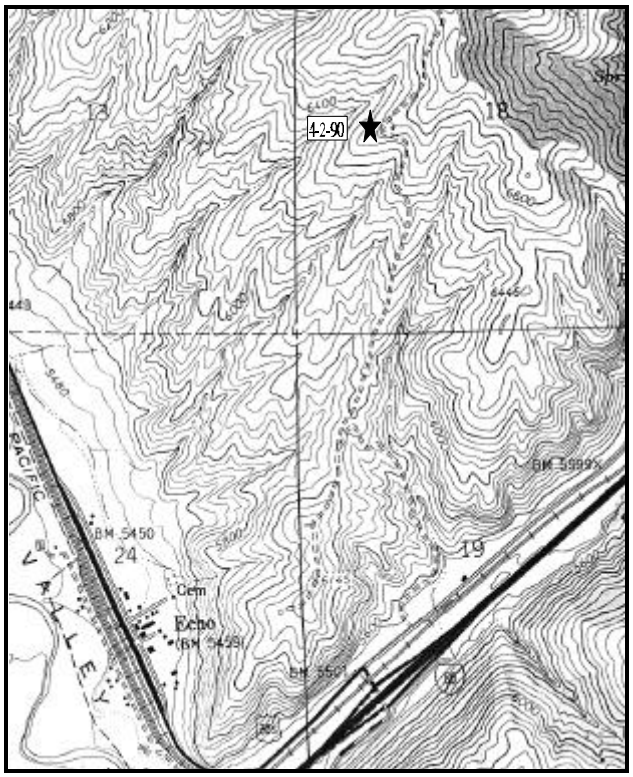
Study site name: Echo Canyon. Range type: Sagebrush/grass.

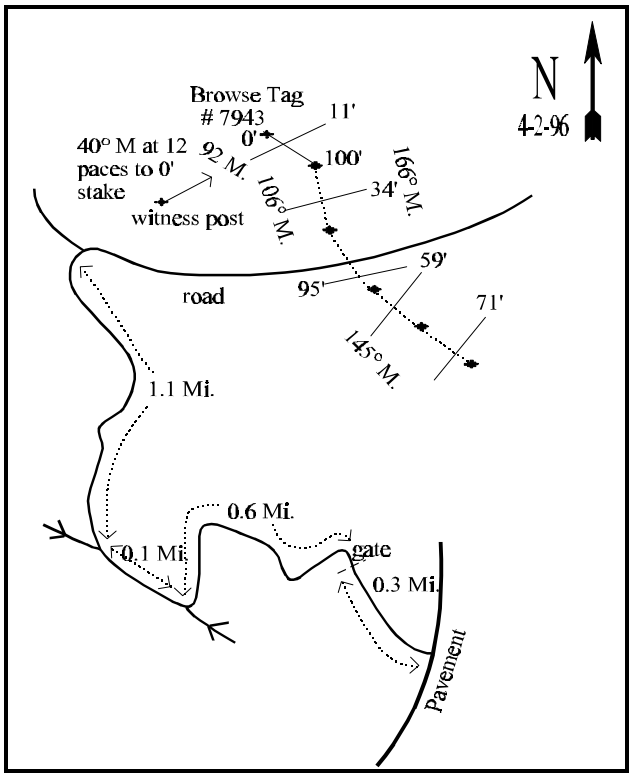
Compass bearing: frequency baseline 92 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (95ft), line 4 (59ft), line 5 (71ft).

LOCATION DESCRIPTION

From Echo Reservoir to Echo town underpass junction, travel northeast towards Emery 0.1 miles, and turn left to a dirt road. Proceed up the mountain 0.7 miles (passing through locked DWR gate) to a fork, and turn right. Proceed north 1.1 miles to a fork in the road and stop. From this point, walk 12 paces at 40 degrees magnetic to the witness post. The 0-foot baseline stake is 18 paces at 40 degrees magnetic from the witness post. The 0-foot baseline stake is marked by a browse tag # 7943. The baseline doglegs along the hillside. Line 1 runs 92 degrees magnetic. Line 2 runs 106 degrees magnetic. Line three runs 166 degrees magnetic. Lines 4 and 5 run 145 degrees magnetic.





Map Name: Coalville Diagrammatic Sketch

Township 3N, Range 5E, Section 18, UTM COOR: 4-63-461E 45-38-650N

DISCUSSION

Trend Study No. 4-2 (6-2)

The Echo Canyon study samples critical deer winter range located approximately one mile north of Echo Junction. The study site is dominated by a moderately dense but heavily browsed stand of mountain big sagebrush. Elk do not normally use this site, but did during 1983-84 because of the severe winter conditions. Physically, the study site is on a steep (40%) southwest slope with an elevation of 6,560 feet. Pellet group quadrat frequency was equal for deer and elk in 1996. Sign of cattle use was also found on the area.

Parent material is a conglomerate, which breaks down into a gravelly soil of moderately shallow depth. Rock fragments are most often round in shape as a result of water action over geologic time. The soil appears excessively drained and probably holds little available water in mid-summer. Soil texture is a sandy clay loam with a neutral pH of 7.0. Effective rooting depth is estimated at 10.5 inches. Ground cover of vegetation and litter are sufficient to protect the soil from serious erosion.

Browse forage comes almost exclusively from mountain big sagebrush which accounts for 94% of the browse cover as of 1996. Population density was estimated at nearly 6,000 plants/acre in 1984. That number declined to just under 3,000 plants/acre in 1990. Utilization was extremely heavy in 1984 with 76% of the sagebrush displaying heavy use. Utilization was heavy on only 23% of the sagebrush in 1990, but percent decadence increased from 28% to 63%. Density is currently similar to 1990 estimates (3,300 plants/acre). Heavy use has continued to decline and decadency has dropped to only 19%. Seedlings are rare, yet young plants account for 16% of the population.

The primary danger to this site is wildfire. A moderately dense understory of cheatgrass brome has demonstrated the capability to carry fire in this area. Nearby fires have consumed and virtually eliminated sagebrush on thousands of acres. The only other common shrub is broom snakeweed which was picked up for the first time in 1996 at a density of 1,340 plants/acre. Seedlings and young are abundant indicating the possibility of an expanding population. A few other shrub species occur on this site, but all are distinctly secondary with the exception of fire or some other disturbance, will remain so.

Perennial grasses and forbs provide relatively minor amounts of forage and ground cover. Only bluebunch wheatgrass is fairly numerous and productive enough to be a significant forage producer or ecological consideration. Cheatgrass appears to have increased in photos since 1984. It currently accounts for 56% of the grass cover. Other relatively common perennial grasses include bulbous bluegrass and Sandberg bluegrass. Forbs are diverse and fairly abundant. However, annual species account for 62% of the forb cover. Common perennial species include Louisiana sage, three species of milkvetch, and silvery lupine.

1984 APPARENT TREND ASSESSMENT

Soil trend is currently stable. Past erosion has produced a ground surface relatively resistant to further erosion. Extreme rockiness, erosion pavement, and shrub cover all act to minimize erosion. Vegetative trend is also considered stable. Mountain big sagebrush is the dominant browse and appears to be a stable population. The herbaceous understory is depleted however, with an excess of annual weeds posing an increased fire hazard.

1990 TREND ASSESSMENT

The soil trend has improved. Percent bare ground has declined from almost 12% to

only 4%. Litter cover has also increased, while basal vegetative cover has increased dramatically. Mountain big sagebrush population declined 51% since 1984. Percent decadency has also increased from 29% to 64%. But, there was a large number of seedlings found in 1990, almost 2,000 seedlings per acre. There was actually more seedlings than decadent plants. The sagebrush have been moderately to heavily hedged yet display generally good vigor. Sagebrush canopy cover is 15%. While the understory remains dominated by cheatgrass, the sum of nested frequency for bluebunch wheatgrass increased significantly. The annual grass provides the bulk of the vegetative and litter cover. Nested frequency of perennial forbs have declined. The site appears to have supported increased elk winter use in recent years.

TREND ASSESSMENT
soil - up
browse - down for the key browse, mountain big sagebrush
herbaceous understory - stable but still proportionally too many annuals

1996 TREND ASSESSMENT

Trend for the soil is stable. Percent bare ground has remained low at around 3% while litter cover continues to be high at 59%. Unfortunately, most of the vegetation and litter cover comes from the dense stand of annual cheatgrass. Erosion does not appear to be a major problem at this time. Trend for mountain big sagebrush is up. Population density has remained comparable, yet utilization is lighter, percent decadence lower, and with improved vigor. Few seedlings were encountered in 1996 but young plants are fairly numerous. Trend for the herbaceous understory is also up. Sum of nested frequency for perennial grasses and forbs has increased. However, composition is still poor as cheatgrass currently accounts for 56% of the grass cover and annual forbs provide 62% of the forb cover.

TREND ASSESSMENT
soil - stable
browse - up
herbaceous understory - up but understory still dominated by annuals

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 2

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	[a]125	[b]179	[b]182	56	70	69	7.53
G	Bromus japonicus (a)	-	-	16	-	-	6	.07
G	Bromus tectorum (a)	-	-	330	-	-	91	13.71
G	Poa bulbosa	[a]-	[a]-	[b]58	-	-	20	1.31
G	Poa fendleriana	-	-	6	-	-	2	.01
G	Poa pratensis	7	17	10	4	9	5	.12
G	Poa secunda	[a]20	[a]22	[b]83	8	11	30	1.81
G	Sitanion hystrix	-	-	1	-	-	1	.00
G	Sporobolus cryptandrus	-	-	4	-	-	2	.03
Total for Grasses		152	218	690	68	90	226	24.62
F	Achillea millefolium	-	2	4	-	1	2	.01

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Agoseris glauca	6	9	6	3	5	2	.01
F	Allium acuminatum	$_{a}$145	$_{b}$6	$_{b}$-	60	3	-	-
F	Alyssum alyssoides (a)	-	-	199	-	-	67	5.09
F	Artemisia ludoviciana	$_{a}$45	$_{a}$65	$_{b}$19	19	23	6	1.32
F	Astragalus beckwithii	-	-	9	-	-	3	.07
F	Astragalus cibarius	$_{a}$163	$_{b}$-	$_{c}$15	67	-	9	.09
F	Astragalus utahensis	$_{a}$6	$_{a}$5	$_{b}$75	4	2	35	1.76
F	Castilleja linariaefolia	-	-	2	-	-	1	.00
F	Calochortus nuttallii	1	-	1	1	-	1	.00
F	Cirsium spp.	6	17	13	3	7	7	.29
F	Collomia linearis (a)	-	-	14	-	-	7	.04
F	Collinsia parviflora (a)	-	-	22	-	-	9	.07
F	Crepis acuminata	-	-	1	-	-	1	.00
F	Draba spp. (a)	-	-	106	-	-	38	.31
F	Erodium cicutarium (a)	-	-	97	-	-	32	2.56
F	Galium spp. (a)	-	-	14	-	-	7	.08
F	Grindelia squarrosa	$_{a}$-	$_{a}$-	$_{b}$22	-	-	10	.10
F	Heterotheca villosa	-	1	3	-	1	1	.00
F	Holosteum umbellatum (a)	-	-	239	-	-	78	1.67
F	Lactuca serriola	-	-	3	-	-	2	.01
F	Lomatium spp.	$_{a}$-	$_{a}$3	$_{b}$28	-	3	14	.09
F	Lupinus argenteus	$_{a}$1	$_{a}$3	$_{b}$25	1	3	13	.97
F	Machaeranthera spp.	-	-	42	-	-	20	.10
F	Penstemon spp.	$_{a}$19	$_{b}$-	$_{b}$-	9	-	-	-
F	Ranunculus testiculatus (a)	-	-	24	-	-	10	.10
F	Sphaeralcea grossulariaefolia	-	-	4	-	-	2	.18
F	Tragopogon dubius	$_{a}$-	$_{b}$35	$_{c}$61	-	18	26	.37
F	Vicia americana	$_{a}$-	$_{b}$10	$_{c}$63	-	4	25	.57
F	Zigadenus paniculatus	-	1	-	-	1	-	-
Total for Forbs		392	157	1111	167	71	428	15.94

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 2

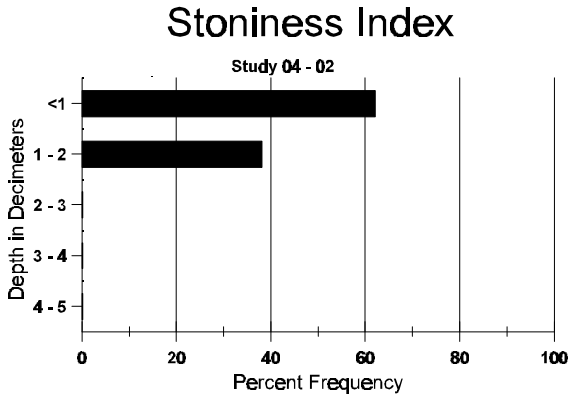
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	75	14.32
B	Chrysothamnus nauseosus albicaulis	4	-
B	Chrysothamnus viscidiflorus viscidiflorus	4	.45
B	Gutierrezia sarothrae	20	.29
B	Opuntia fragilis	6	-
B	Symphoricarpos oreophilus	4	.18
Total for Browse		113	15.25

BASIC COVER --
Herd unit 04 , Study no: 2

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	387	2.50	10.50	49.46
Rock	254	23.00	13.50	9.88
Pavement	219	13.25	9.25	6.84
Litter	394	49.75	63.00	59.37
Cryptogams	16	0	0	.03
Bare Ground	137	11.50	3.75	2.89

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 02

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.5	47.4 (10.6)	7.0	46.7	27.0	26.3	3.1	25.9	192.0	.7



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 2

Type	Quadrat Frequency '96
Elk	17
Deer	17
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	32	29	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	84	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	90	29	-	-	-	-	-	-	-	-	29	-	-	-	1933			29
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	27	-	-	-	-	-	-	-	-	27	-	-	-	540			27
M	84	-	18	45	-	-	-	-	-	-	63	-	-	-	4200	26	35	63
	90	1	10	5	-	-	-	-	-	-	16	-	-	-	1066	26	35	16
	96	41	61	4	-	-	-	-	-	-	105	-	1	-	2120	18	37	106
D	84	-	3	23	-	-	-	-	-	-	26	-	-	-	1733			26
	90	4	19	5	-	-	-	-	-	-	25	-	-	3	1866			28
	96	17	12	3	-	-	-	-	-	-	31	-	-	1	640			32
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	860			43
Total Plants/Acre (excluding Dead & Seedlings)													'84		5999	Dec:		29%
													'90		2932			64%
													'96		3300			19%
Chrysothamnus nauseosus albicaulis																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	18	30	4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		80			-
Chrysothamnus viscidiflorus stenophyllus																		
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	7	9	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		0			-
													'96		0			-
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	1	-	-	-	-	-	-	-	1	-	66	9	20	1
	96	3	-	-	1	-	-	-	-	-	4	-	-	-	80	12	22	4
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		66			-
													'96		80			-
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	49	-	-	-	-	-	-	-	-	49	-	-	-	980			49

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	26	-	-	-	-	-	-	-	-	26	-	-	-	520			26
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	41	-	-	-	-	-	-	-	-	41	-	-	-	820	8	11	41
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		1340			-
Opuntia spp.																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220	6	12	11
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		240			-
Symphoricarpos oreophilus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	25	25	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		80			-

TREND STUDY 4-3-96 (old 6-3)

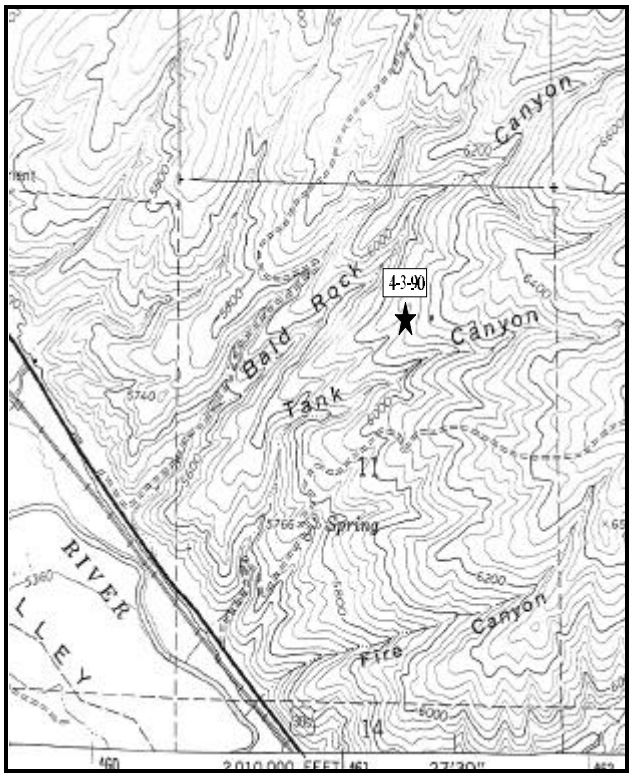
Study site name: Tank Canyon. Range type: Sagebrush/grass.

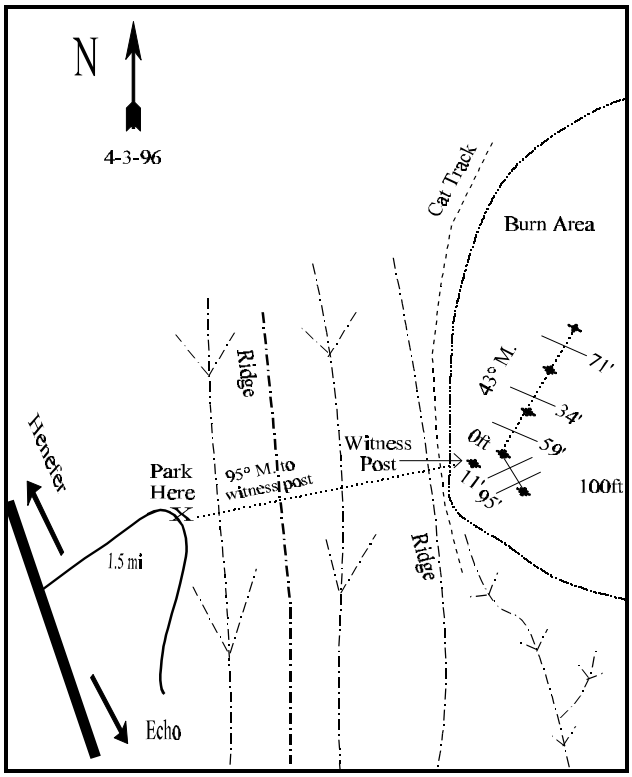
Compass bearing: frequency baseline 146 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (95ft).

LOCATION DESCRIPTION

Proceed 0.15 miles up the Fire Canyon Access road to a point where the road switchbacks. Park here, walk up a ridge, down the other side and up the next ridge to an open area that has been burned. A witness post is in the opening. The 0-foot baseline stake is just north of the witness post. The 0-foot baseline stake is marked with browse tag #7944. Line 1 runs at a bearing of 146 degrees. The rest of the baseline runs off the 0-foot baseline in a direction of 43 degrees magnetic.





Map Name: Henefer Diagrammatic Sketch

Township 3N, Range 4E, Section 11, UTM COOR: 4-61-191E 45-40-271N

DISCUSSION

Trend Study No. 4-3 (6-3)

The Tank Canyon study samples critical deer winter range on the Henefer-Echo wildlife management area between Tank Canyon and Bald Rock Canyon. The study is on a 30% west facing slope at 6,160 feet elevation. The range type is an extension or pocket of mountain big sagebrush/grass which is closely bordered by an extensive burn from a 1982 fire. Another small fire burned the area some time between 1984 and 1990. The original frequency baseline and one density plot were burned while the other two density plots remained in the sagebrush. The site was read in 1990 with no change to the layout making the frequency data totally different from the density data. During the 1996 reading, the stakes were moved into the burned area. Deer used of the area fairly heavily in 1984. Pellet groups were abundant and several winter-killed carcasses were seen in the immediate vicinity during the that reading. Currently (1996) pellet group quadrat frequencies are low for deer and elk. Some sheep have used the area this summer.

Soil should be similar to that described for study number 4-2 insofar as drainage, parent material, depth, and available water capacity are concerned. One major difference is that this site contains markedly fewer large cobblestones and may be slightly less gravelly in texture. Soil texture is a clay loam with a neutral pH of 7.0. Effective rooting depth is estimated at just over 16 inches with a moderate soil temperature of 64°F at 16 inches in depth. Phosphorus is marginal at only 9.8 ppm. Soil erosion is minimal.

Prior to the burn between 1984 and 1990, the browse composition consisted primarily of mountain big sagebrush, with lesser amounts of stickyleaf low rabbitbrush, mountain snowberry, and Saskatoon serviceberry. Long-term utilization of big sagebrush appeared at the time to be moderate. Utilization during the winter of 1983-84 was relatively light because deep crusted snow cover remained for most of the winter, which gave all but the tallest browse plants a temporary rest from use. Population density of mountain big sagebrush was estimated at nearly 8,000 plants/acre in 1984. The mountain big sagebrush population was vigorous and fully capable of maintaining itself. After 1984, a small fire of approximately 40 acres burned the slope. One of the three original density plots was burned along with the frequency baseline. As a result, density of mountain big sagebrush declined to 4,599 plants/acre. Utilization was light to moderate. During the 1996 reading, the baseline was lengthened and placed inside of the burned area. This resulted in the density of sagebrush declined to only 200 plants/acre. Utilization of these shrubs is light.

The most numerous shrub on the site is stickyleaf low rabbitbrush which has a current density of 3,500 plants/acre. Density was extremely high in 1990 due in part to a large number of young plants (5,000 plants/acre). The current population appears stable and mostly unutilized.

Grasses and forbs were rare prior to the burn. The small burned area was seeded prior to the 1990 reading. Sum of nested frequency for perennial grasses tripled as a result. Seeded alfalfa and small burnet were also abundant. The two most numerous grasses consisted of bulbous bluegrass and crested wheatgrass. Intermediate wheatgrass and smooth brome were also seeded. By 1996, sum of nested frequency for perennial grasses increased slightly while frequency of perennial forbs doubled. Crested wheatgrass and bulbous bluegrass increased significantly in nested frequency. Alfalfa also increased significantly in frequency while small burnet declined significantly.

1984 APPARENT TREND ASSESSMENT

This study area has stable soil and vegetation trends. No serious erosion is apparent and the current plant community should persist unless some outside disturbance occurs.

1990 TREND ASSESSMENT

This site has burned since 1984. The 1990 data will provide baseline data on successional changes following the fire. Currently, bulbous bluegrass, crested wheatgrass, intermediate wheatgrass, and smooth brome dominate. Seeded alfalfa is also abundant within the burned area. Herbaceous vegetation is very limited in the dense, unburned sagebrush stands where sagebrush canopy cover averages 16%. Sagebrush was completely eliminated by the fire, but already a few seedlings have become established on the site.

TREND ASSESSMENT
soil - stable
browse - downward, 42% loss to fire
herbaceous understory - upward, good establishment of seeded species

1996 TREND ASSESSMENT

The soil trend is up due to a decline in percent bare ground from 23% to only 2%. Litter cover has also increased by 30% with no noticeable erosion. Trend for browse is down when compared to the unburned area adjacent to the site. During the 1990 reading, two of the three density plots occurred outside of the burn. In 1996, the base line was lengthened and placed inside of the burn. As a result the density of sagebrush dropped from 4,599 plants/acre to only 200. Trend for browse inside of the burn is considered stable. No seedlings were encountered, but young plants account for 30% of the population. In addition, use is light and vigor good. Trend for the herbaceous understory is up slightly. Sum of nested frequency for perennial grasses and forbs has increased including a significant increase in the frequency of crested wheatgrass, bulbous bluegrass, smooth brome, and alfalfa.

TREND ASSESSMENT
soil - up
browse - stable
herbaceous understory - slightly up

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 3

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	a2	b231	c275	2	83	89	14.40
G	Agropyron dasystachyum	a-	a-	b12	-	-	6	.10
G	Agropyron intermedium	a-	b96	c56	-	48	23	.77
G	Agropyron spicatum	a15	b3	a15	7	1	5	1.08
G	Bromus inermis	a-	b50	b52	-	27	23	.70
G	Bromus japonicus (a)	-	-	3	-	-	1	.00
G	Bromus tectorum (a)	-	-	15	-	-	8	.21

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Festuca ovina	-	-	3	-	-	2	.18
G	Oryzopsis hymenoides	1	-	-	1	-	-	-
G	Poa bulbosa	$_a$-	$_b$228	$_c$287	-	83	81	18.70
G	Poa fendleriana	-	1	-	-	1	-	-
G	Poa nevadensis	194	-	-	71	-	-	-
G	Poa pratensis	$_a$12	$_b$-	$_b$-	7	-	-	-
G	Poa secunda	$_a$59	$_a$58	$_b$-	25	25	-	-
G	Sitanion hystrix	-	-	1	-	-	1	.00
Total for Grasses		283	667	719	113	268	239	36.18
F	Achillea millefolium	3	-	-	1	-	-	-
F	Alyssum alyssoides (a)	-	-	69	-	-	27	.26
F	Astragalus spp.	$_a$13	$_b$1	$_b$-	8	1	-	-
F	Cirsium spp.	-	-	2	-	-	1	.00
F	Comandra pallida	-	-	1	-	-	1	.00
F	Eriogonum ovalifolium	-	-	3	-	-	1	.00
F	Medicago sativa	$_a$-	$_b$123	$_c$169	-	47	70	11.81
F	Polygonum douglasii (a)	-	-	5	-	-	2	.01
F	Sanguisorba minor	$_a$-	$_b$24	$_c$9	-	13	4	.06
F	Sphaeralcea coccinea	-	-	2	-	-	1	.03
F	Tragopogon dubius	$_a$-	$_a$5	$_b$23	-	3	14	.11
F	Vicia americana	$_a$-	$_a$-	$_b$173	-	-	74	1.22
Total for Forbs		16	153	456	9	64	195	13.53

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 3

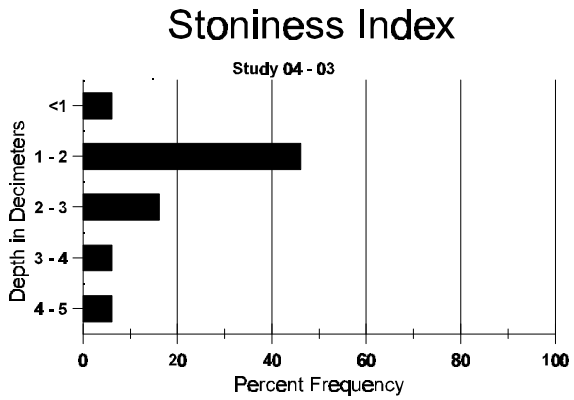
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	3	-
B	Artemisia tridentata vaseyana	9	.68
B	Chrysothamnus nauseosus albicaulis	6	.48
B	Chrysothamnus viscidiflorus viscidiflorus	66	3.00
B	Gutierrezia sarothrae	6	.01
Total for Browse		90	4.18

BASIC COVER --
Herd unit 04 , Study no: 3

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	384	3.25	10.75	53.31
Rock	205	2.25	3.75	3.11
Pavement	185	11.75	18.25	1.29
Litter	400	73.25	44.50	63.50
Cryptogams	59	.25	0	.40
Bare Ground	111	9.25	22.75	1.60

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 03

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
16.3	64.0 (16.0)	7.0	41.9	29.7	28.4	3.8	9.8	108.8	.6



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 3

Type	Quadrat Frequency '96
Sheep	26
Elk	9
Deer	11

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	2	-	-	-	-	-	-	2	-	-	-	133	18	11	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	2	1	-	-	-	-	-	-	3	-	-	-	60	22	26	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	1	-	-	-	-	-	1	-	-	1	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		133	Dec:		0%
													'90		199			67%
													'96		60			0%
Artemisia tridentata tridentata																		
M	84	20	9	-	-	-	-	-	-	-	29	-	-	-	1933	25	32	29
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		1933	Dec:		-
													'90		0			-
													'96		0			-
Artemisia tridentata vaseyana																		
S	84	19	4	-	-	-	-	-	-	-	23	-	-	-	1533			23
	90	7	-	-	2	-	-	-	-	-	9	-	-	-	600			9
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	28	13	-	-	-	-	-	-	-	41	-	-	-	2733			41
	90	17	-	-	-	-	-	-	-	-	15	-	2	-	1133			17
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	420			21
M	84	2	28	8	-	-	-	-	-	-	38	-	-	-	2533	31	31	38
	90	12	12	2	-	-	-	-	-	-	24	2	-	-	1733	26	34	26
	96	6	1	-	-	-	-	-	-	-	7	-	-	-	480	21	27	24
D	84	9	26	5	-	-	-	-	-	-	40	-	-	-	2666			40
	90	15	6	4	-	1	-	-	-	-	20	1	-	5	1733			26
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	1960			98
Total Plants/Acre (excluding Dead & Seedlings)													'84		7932	Dec:		34%
													'90		4599			38%
													'96		900			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	24	36	5
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		140			14%
Chrysothamnus viscidiflorus stenophyllus																		
M	84	31	-	-	-	-	-	-	-	-	31	-	-	-	2066	11	12	31
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	28	-	-	-	-	-	-	-	-	28	-	-	-	1866			28
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		3932	Dec:		47%
													'90		0			0%
													'96		0			0%
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	40	4	1	-	-	-	-	-	-	40	1	4	-	3000			45
	96	25	3	-	-	-	-	-	-	-	27	-	1	-	560			28
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	32	20	14	3	-	-	2	-	-	62	-	9	-	4733	9	11	71
	96	101	42	-	-	-	-	-	-	-	141	-	2	-	2860	13	19	143
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	18	5	5	-	-	-	-	-	-	20	-	7	1	1866			28
	96	4	-	-	-	-	-	-	-	-	3	-	1	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		9599			19%
													'96		3500			2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	7	10	4
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		220			-
Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	21	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-
Symphoricarpos oreophilus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	22	13	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	45	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		66			-
													'96		0			-

TREND STUDY 4-4-96 (old 6-4)

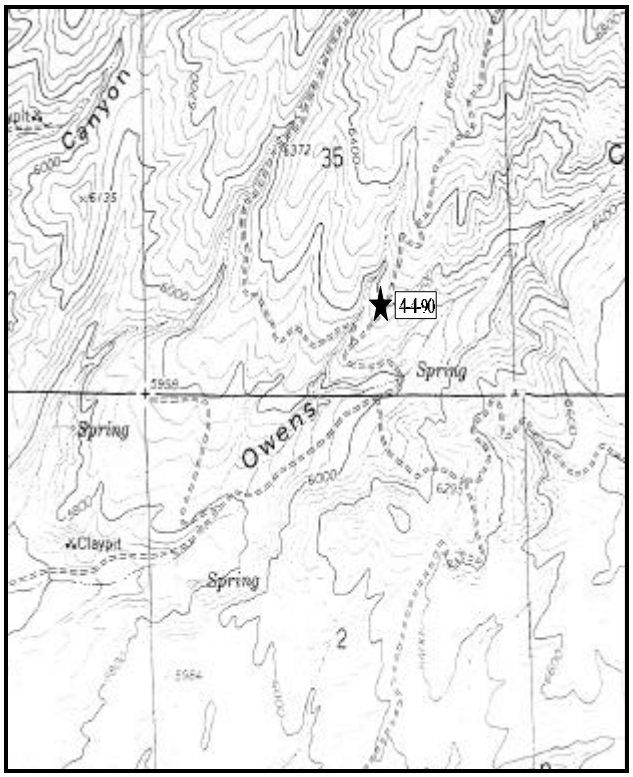
Study site name: Owen's Canyon . Range type: Sagebrush/grass .

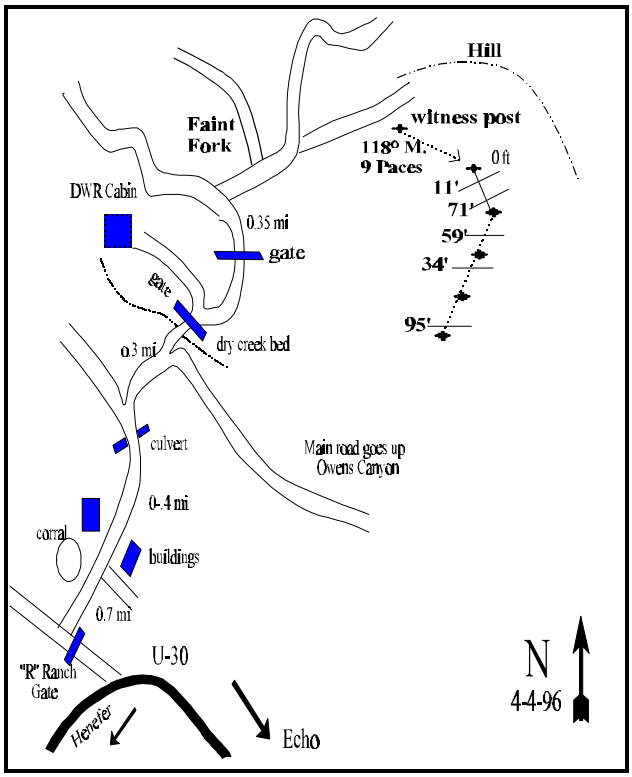
Compass bearing: frequency baseline 146 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 71ft), line 2 (59ft), line 3 (34ft), line 4 (95ft).

LOCATION DESCRIPTION

From the "R" Ranch main gate, proceed 0.70 miles to the ranch buildings and a road to the right. Continue straight 0.40 miles to a culvert, and 0.45 miles further to DWR gate. Continue on 0.25 miles, turn left, cross the wash, stay on main road (left fork leads to DWR cabin). Proceed 0.35 miles to a fork in road. Walk 12 paces up right fork, turn 90 degrees to the right and walk 4 paces to density plot one. The 0-foot baseline stake is marked by browse tag #7945. The baseline runs 146 degrees. The baseline doglegs after the 100-foot baseline stake and runs 214 degrees magnetic.





Map Name: Henefer Diagrammatic Sketch

Township 4N , Range 4E , Section 35 , UTM COOR: 4-61-459E 45-42-660N

DISCUSSION

Trend Study No. 4-4 (6-4)

The Owen's Canyon study samples a mountain big sagebrush/grass type on a steep (30%) southwest slope at 6,200 feet elevation. Located on Division of Wildlife Resources property on the north side of Owens Canyon, this area constitutes important winter range for deer. Elk make light use of the area during exceptionally heavy winters. Deer pellet groups were moderately abundant during the 1984 reading. Forage utilization was not exceptionally heavy, however, deep crusted snow in 1983-84 prevented normal use patterns. During the 1996 reading, few deer and elk pellet groups were encountered. Cattle have grazed the area some time this spring.

The soil is moderately shallow and gravelly or cobbly. Effective rooting depth is estimated at only about 10 inches with a relatively high soil temperature of 66°F at just over 9 inches in depth. Soil texture is a clay loam with a neutral pH of 6.7. Drainage is probably excessive and soil moisture may be limiting in the upper horizons during midsummer. Big sagebrush and other deep rooted shrubs do well on the site. Rooting depth is thus not an apparent problem. This soil appears to have a high erosion potential, however, a moderate cover of shrub crowns, perennial grasses, annual grasses and litter is effective in preventing all but minor soil loss.

Browse composition chiefly consists of mountain big sagebrush which accounts for 91% of the browse cover. Some of the sagebrush found on the site has growth form characteristics of basin big sagebrush (*Artemisia tridentata tridentata*) which may indicate some hybridization with mountain big sagebrush *(A. tridentata vaseyana*). Population density has remained fairly constant since 1984, ranging from about 4,000 plants/acre in 1990 to 3,420 in 1996. Currently the population is mostly mature (69%), lightly to moderately hedged, in good vigor, with a low decadency rate of 21%. Heavy utilization peaked in 1990 when 20% of the population displayed a heavy hedged growth form. Percent decadency also peaked that year at 43%. Dead plants, first sampled in 1996, are high at 1,180 plants/acre. This would suggest that many of the decadent plants sampled in 1990 died and were replaced by young plants.

Other shrubs found on the site include stickyleaf low rabbitbrush, broom snakeweed, white rubber rabbitbrush, and a few snowberry. None of these species are very abundant or appear to be increasing in density.

Herbaceous composition primarily consists of grasses. Cheatgrass and Japanese brome are common and account for 62% of the total grass cover. The most important herbaceous plants are exotic perennial grasses, crested wheatgrass and smooth brome. Several other native perennial grasses are found on the site but none are particularly abundant. Forbs consist primarily of weedy biennials and annuals. The only common perennial forbs consist of northern sweet vetch and American vetch. If the study area is on or near a range seeding, it would have to be a fairly old one because the area does not have that appearance. The abundance of species such as crested wheatgrass and smooth brome, however, is evidence of some past treatment and/or seeding.

1984 APPARENT TREND ASSESSMENT

Although soil movement is detectable, it is not serious. A vigorous grass and shrub cover in combination with gentle to moderate slope helps maintain a stable trend. Vegetative trend is also stable in spite of a somewhat artificial plant composition where the understory is primarily seeded grasses. The key species is vigorous and should maintain itself.

1990 TREND ASSESSMENT

The sagebrush population on this important winter range appears to be stable. The only indication of downward trend is the increase in percent decadency, from 17% to 43%. The number of decadent plants are matched by the numbers of seedling and young age class plants, although there are some indications of a downward trend. While the mature sagebrush have good vigor, the decadent plants display poor growth and vigor. Twenty-one percent of the available sagebrush have a heavily hedged growth form. Sagebrush canopy cover is 18%. Seedling sagebrush are common, but many are suffering from drought and competition with the dense understory of cheatgrass. Broom snakeweed is uncommon, and has actually decreased. Crested wheatgrass shows a significant increase in sum of nested frequency. There is an adequate amount of litter cover with no evidence of erosion.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly upward, but still too many annual species in the composition

1996 TREND ASSESSMENT

The soil trend is up slightly due to a decline in bare ground and an increase in litter cover. Unfortunately these improvements come from a dense stand of annual grasses. Trend for browse is stable. Density has declined slightly but heavy use and decadence have declined and vigor has improved. Seedlings and young are not abundant and likely have a difficult time competing with the extremely high densities of winter annuals. Trend for the herbaceous understory is up slightly due to a slight increase in the sum of nested frequency for perennial grasses and forbs.

TREND ASSESSMENT
soil - up slightly
browse - stable
herbaceous understory - up slightly, still dominated by annuals

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 4

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	a70	b132	b133	34	49	46	6.62
G	Agropyron dasystachyum	a-	a-	b29	-	-	10	.39
G	Agropyron intermedium	a1	ab8	b15	1	3	5	.69
G	Agropyron spicatum	-	-	2	-	-	2	.01
G	Agropyron trachycaulum	3	-	-	1	-	-	-
G	Bromus inermis	a50	b83	b99	20	26	34	3.80
G	Bromus japonicus (a)	-	-	203	-	-	65	4.48
G	Bromus tectorum (a)	-	-	321	-	-	87	15.25
G	Oryzopsis hymenoides	-	2	4	-	1	1	.03
G	Poa bulbosa	-	-	2	-	-	2	.01
G	Poa pratensis	-	2	5	-	1	3	.09

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Poa secunda	-	1	2	-	1	1	.03
G	Sitanion hystrix	$_{a}$9	$_{ab}$2	$_{b}$-	6	1	-	-
Total for Grasses		133	230	815	62	82	256	31.43
F	Alyssum alyssoides (a)	-	-	157	-	-	58	.81
F	Arabis spp.	2	13	2	1	5	2	.01
F	Aster spp.	-	-	4	-	-	1	.03
F	Astragalus spp.	-	-	2	-	-	1	.03
F	Camelina microcarpa (a)	-	-	4	-	-	1	.38
F	Cirsium spp.	-	2	8	-	2	3	.06
F	Collinsia parviflora (a)	-	-	3	-	-	1	.00
F	Cymopterus spp.	-	-	1	-	-	1	.00
F	Erigeron strigosis	-	-	5	-	-	2	.03
F	Grindelia squarrosa	8	-	-	3	-	-	-
F	Hedysarum boreale	$_{a}$-	$_{a}$-	$_{b}$40	-	-	19	.42
F	Holosteum umbellatum (a)	-	-	31	-	-	11	.36
F	Machaeranthera spp	-	-	6	-	-	3	.01
F	Oenothera caespitosa	3	-	-	1	-	-	-
F	Polygonum douglasii (a)	-	-	3	-	-	1	.00
F	Ranunculus testiculatus (a)	-	-	3	-	-	1	.00
F	Tragopogon dubius	$_{a}$6	$_{a}$6	$_{b}$20	2	3	12	.16
F	Vicia americana	$_{a}$-	$_{a}$4	$_{b}$61	-	3	28	.36
Total for Forbs		19	25	350	7	13	145	2.72

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 4

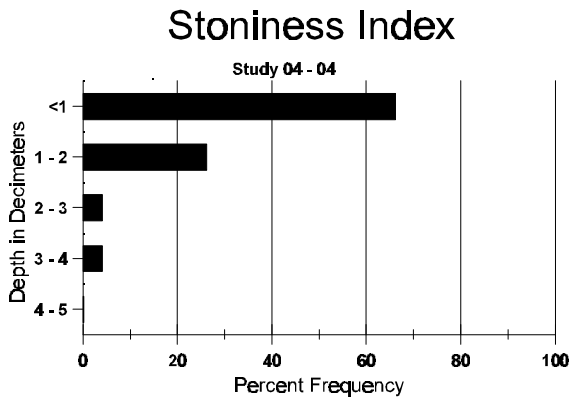
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	3	-
B	Artemisia tridentata vaseyana	82	19.85
B	Chrysothamnus nauseosus albicaulis	7	.83
B	Chrysothamnus viscidiflorus viscidiflorus	16	.97
B	Gutierrezia sarothrae	1	.07
B	Symphoricarpos oreophilus	1	-
Total for Browse		110	21.72

BASIC COVER --
Herd unit 04 , Study no: 4

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	396	.5	8.50	50.47
Rock	131	12.8	7.00	2.49
Pavement	120	25.50	11.75	2.90
Litter	400	68.8	61.50	68.31
Cryptogams	37	0	0	.95
Bare Ground	74	6.5	11.25	1.56

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 04

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.8	66.0 (9.35)	6.7	44.6	27.4	28.0	3.2	22.4	176.0	.4



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 4

Type	Quadrat Frequency '96
Rabbit	1
Elk	4
Deer	12
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40	25	20	2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		60			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	84	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	90	32	-	-	-	-	-	-	-	-	31	-	-	1	1066			32
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	84	17	13	-	-	-	-	-	-	-	30	-	-	-	1000			30
	90	12	10	4	-	-	-	-	-	-	25	-	1	-	866			26
	96	15	-	-	1	-	-	-	-	-	16	-	-	-	320			16
M	84	13	48	8	-	-	-	-	-	-	68	-	1	-	2300	23	32	69
	90	5	29	8	2	-	-	-	-	-	44	-	-	-	1466	14	17	44
	96	105	12	1	-	-	-	-	-	-	114	-	3	1	2360	26	45	118
D	84	4	11	5	-	-	-	-	-	-	18	-	2	-	666			20
	90	11	29	12	-	1	-	-	-	-	33	-	4	16	1766			53
	96	23	11	2	1	-	-	-	-	-	30	-	2	5	740			37
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1180			59
Total Plants/Acre (excluding Dead & Seedlings)													'84		3966	Dec:		17%
													'90		4098			43%
													'96		3420			22%
Chrysothamnus nauseosus albicaulis																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33	9	6	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	24	34	4
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		0%
													'90		99			67%
													'96		160			38%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	1	-	-	-	-	-	-	-	-	-	1	-	33	6	8	1
	96	15	-	-	2	-	-	-	-	-	17	-	-	-	340	14	22	17
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		100%
													'90		33			0%
													'96		420			10%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	33	-	-	-	-	-	-	-	-	33	-	-	-	1100	12	6	33
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33	5	6	1
	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160	10	12	8
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		1133	Dec:		3%
													'90		33			0%
													'96		200			0%
Symphoricarpos oreophilus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	17	16	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-

DISCUSSION

Trend Study No. 4-5 (6-5)

*** This site was not read in 1996. Text from the 1990 report is found below for your information. Maps and data tables can be found in the 1990 Utah Big Game Trend Study report.

The Owen's Canyon Bench study is located slightly lower in Owens Canyon that the previous study. Unlike study number 4-4, this area received considerable use during the 1983-84 winter. The range type is again mountain big sagebrush/grass. Range condition is rather poor and trend is questionable. The site is on a 35% southwest facing slope at approximately 5,800 feet elevation.

Soil is similar to that described for study number 4-4, a coarse, cobbly or gravelly loam of at least moderate depth. Ground cover is only fair and is less permanent than on the previous study. Canopy cover of shrubs is greatly reduced and perennial grasses are far less prevalent. Annual grasses are the most abundant understory component. Soil erosion is of sufficient significance to result in an apparent downward trend.

Mountain big sagebrush, the key species, has for some reason been badly damaged. Even though some allege that excessive deer use is responsible, the evidence is contradictory. The following facts emerge: 1) Many deer were seen wintering in 1983-84 on or near the study site; 2) deer pellet groups are numerous and three to four winter killed deer carcasses were found; 3) the number of recently dead, dying, and decadent big sagebrush is extensive and far outnumbers mature plants; 4) the areas of extreme damage are limited and tend to be very distinct with sharp demarcations between areas that exhibit little or at least much less damage; 5) exposure is the most consistent difference between damaged and undamaged areas, although most areas of extreme depletion have south or southwest aspects, not all such aspects in the immediate vicinity are similarly depleted; 6) lastly, the physical evidence of heavy use on mountain big sagebrush is lacking. Few plants (even dead) exhibit extreme levels of use, especially current use. It is difficult to attribute shrub deaths purely to browsing pressure. Extensive periods of drought, associated with winter injury are the most likely causes of sagebrush mortality on this site. The current big sagebrush population is a low density stand composed largely of seedling and young plants possessing good vigor. Whether they will be able to survive and restore a productive sagebrush stand remains to be seen. No extensive invasion of weeds or invader shrubs is yet apparent, however, little time has elapsed.

Herbaceous composition is poor. The bulk of cover on the site comes from cheatgrass brome, prickly lettuce, and other annuals. Perennial grasses and forbs are sparse and show few signs of increase. In contrast to study number 4-4, no seeded or exotic species were noted on this site.

1984 APPARENT TREND ASSESSMENT

Soil condition is marginal. Although erosion is not currently excessive, it may increase with the recent loss of shrub cover. The most likely soil trend is down. Vegetative trend must also be judged down in spite of a moderate population of seedling and young big sagebrush. Other factors are almost uniformly unfavorable.

1990 TREND ASSESSMENT

The loss of big sagebrush continues on this depleted winter range where numerous deer carcasses have been found in the past. Frequency and density of big sagebrush have declined significantly. While the already low number of mature

sagebrush was unchanged, the large decrease occurred in the number of seedling and decadent plants. Sagebrush canopy cover averages only 2%. The dominant perennial grasses, Indian ricegrass and bluebunch wheatgrass, appear to have been heavily grazed. Heavy use in association with extended drought have produced very growth. The sum of nested frequency for both grass species has declined significantly. Soil erosion is evident on the slope.

TREND ASSESSMENT
soil - down
browse - down
herbaceous understory - down

TREND STUDY 4-6-96 (old 6-6)

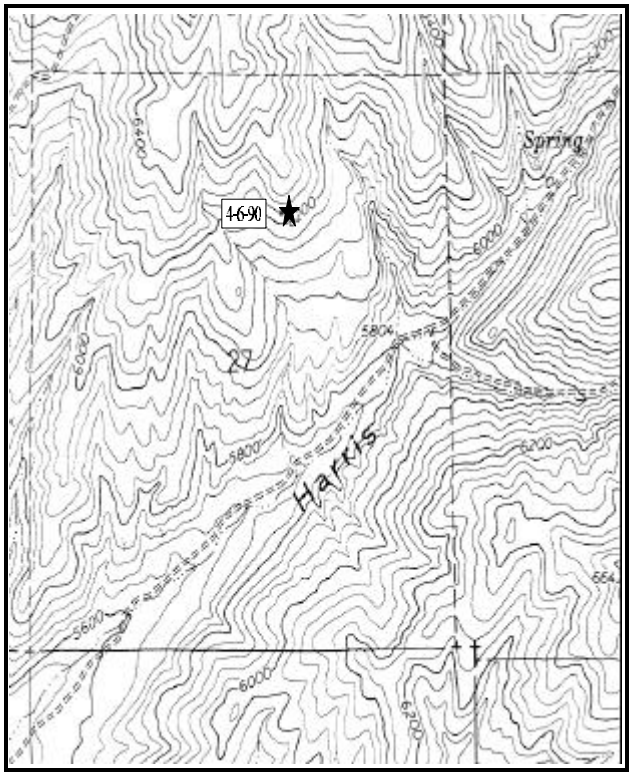
Study site name: Harris Canyon . Range type: Sagebrush/grass .

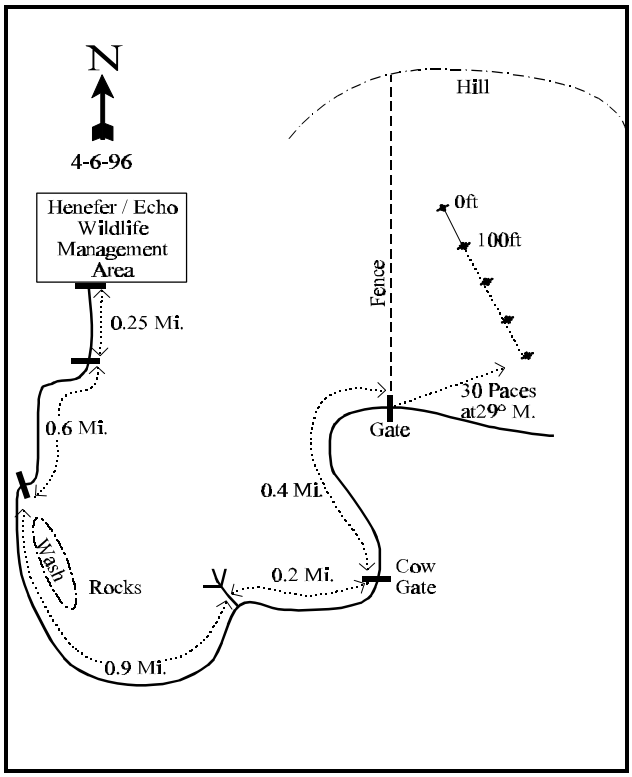
Compass bearing: frequency baseline 146 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the "R" Ranch main gate, proceed northwest for 3.55 miles (towards Croyden) to the Croyden access road. At the DWR - R Ranch property turn right. Travel 0.25 miles, turn right at the DWR fenceline and proceed 0.6 miles to another gate. Stay to the right traveling around a wash for 0.9 miles. Travel 1.2 miles to a cow gate. Continue for 0.4 miles to a fence with a gate. Stop here and park. From the gate to the 400-foot baseline stake, walk 30 paces at 29 degrees magnetic. Walk 400 feet to the north at a bearing of 342 degrees magnetic to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7975.





Map Name: Henefer Diagrammatic Sketch

Township 4N , Range 4E , Section 27 , UTM COOR: 4-59-880E 45-45-203N

DISCUSSION

Trend Study No. 4-6 (6-6)

The Harris Canyon study samples a mountain big sagebrush/grass type on a steep south facing slope (40%). Elevation is approximately 6,240 feet. Deer use has been exceptionally heavy in the past and has adversely impacted the vegetative condition and trend. Currently, frequency of deer pellet groups is moderate. Elk pellet groups are also present in relatively small numbers. Some cattle were observed near the study site during the 1996 reading.

The soil is deep in places but moderately rocky and of apparent alluvial origin. Most surface rocks are rounded and cobblestone-like. Soil texture is a clay loam with a neutral pH of 7.2. Effective rooting depth is estimated at a little over 12 inches. Due to the high rock content and south facing slope, soil temperature is relatively high at nearly 68°F at a depth of just over 12 inches. Phosphorus could also be limiting factor with a value of only 6.9 ppm. Organic matter content is relatively high at almost 7%. Color of the surface soil is reddish, indicating some iron oxide content. Surface erosion does not appear excessive.

Total browse density is well below optimum for this type of site. Although species composition includes four desirable shrubs, it also includes two aggressive invaders or increasers. The key species are mountain big sagebrush and antelope bitterbrush. Both have been heavily browsed in the past and exhibited excessive levels of decadence and inadequate reproduction. Currently, mountain big sagebrush numbers 840 plants/acre. Heavy use has declined dramatically since 1990 when 79% of the sagebrush displayed heavy use. Now only 2% show heavy hedging. Decadence has also declined from 57% in 1990 to only 9% by 1996. Vigor has improved. Antelope bitterbrush also shows some improvements but nearly half are still heavily utilized. Vigor has improved however, and decadency has declined from 60% to 5%.

White rubber rabbitbrush has increased steadily in density since 1984 when only 232 plants/acre were estimated. Currently, 1,180 plants/acre occur on the site. The majority are mature (76%) but seedlings and young plants are present in sufficient numbers to maintain or even increase the current population. Utilization of these shrubs is mostly light. Stickyleaf low rabbitbrush and broom snakeweed have also both steadily increased in density since 1984. Stickyleaf low rabbitbrush has increased from 33 plants/acre in 1984 to 1,380 by 1996. Age class analysis indicates a slowly expanding population. Broom snakeweed currently numbers 2,600 plants/acre. Seedlings and young plants are very abundant and indicate a dynamic population which may expand greatly in the coming years.

Understory composition is dominated by bluebunch wheatgrass which accounts for 54% of the grass cover. Annual grasses, Japanese brome, and cheatgrass, are also abundant and makeup 44% of the grass cover. Other perennial grasses are rare in their distributions. A fair number of forbs are also present, but only a few occur frequently. Among these are yellow salsify, Utah milkvetch, thistle, and Louisiana sagebrush. Annual forbs and grasses are common, yet not dense enough to constitute an obvious fire hazard. Cheatgrass brome, however, has that capability should range conditions continue to decline.

1984 APPARENT TREND ASSESSMENT

Soil trend is stable to slightly down. This area has a steep slope and relatively poor cover. In spite of this, evidence of rapid soil erosion is not predominant. Vegetative trend is almost certainly declining. The most abundant of two key species, mountain big sagebrush, appears to be suffering from overuse and is declining in density.

1990 TREND ASSESSMENT

The relatively low density big sagebrush stand on this heavily used winter range remains in poor condition with heavily to severely hedged growth forms and 57% decadent plants in association with drought. However, the population shows slight improvements in age class structure and density. There was no seed production in 1990, but seedling and young plants currently make up 36% of the population. The seedlings have reduced vigor due to the prolonged drought conditions. Rubber rabbitbrush and low rabbitbrush are the most common browse plants and have increased in density. The low rabbitbrush have been heavily hedged. Bitterbrush is infrequent and heavy hedging has led to a high percentage of decadent plants. Bluebunch wheatgrass is common but there is an excessive amount of bare soil.

TREND ASSESSMENT
soil - down
browse - slight improvement for two key species, mountain big sagebrush and bitterbrush
herbaceous understory - stable to slightly improving, still too many annuals

1996 TREND ASSESSMENT

Trend for soil is up due to a decline in percent bare ground from 30% to 5%. Litter cover also increased. Trend for browse is up for the two key species, mountain big sagebrush and antelope bitterbrush. Density of both species has increased. In addition, heavy use has declined, vigor improved and percent decadency declined. Trend for the herbaceous understory is down slightly for grasses but slightly up for forbs. Nested frequency of bluebunch wheatgrass declined significantly with the extended drought conditions. The increase in forb sum of nested frequency comes primarily from increases in frequency of weedy biennials such as yellow salsify, prickly lettuce, and Louisiana sage. Overall, trend for the herbaceous understory is considered slightly down.

TREND ASSESSMENT
soil - up
browse - up
herbaceous understory - slightly down

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 6

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	-	-	5	-	-	2	.03
G	Agropyron intermedium	3	2	-	1	1	-	-
G	Agropyron spicatum	ab218	a231	b182	79	86	65	11.84
G	Bromus brizaeformis (a)	-	-	4	-	-	2	.01
G	Bromus japonicus (a)	-	-	205	-	-	69	2.62
G	Bromus tectorum (a)	-	-	267	-	-	77	6.97
G	Oryzopsis hymenoides	4	16	11	2	8	4	.36
G	Poa pratensis	a17	ab5	b-	6	2	-	-
G	Poa secunda	a-	b26	a6	-	14	3	.06

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
Total for Grasses		242	280	680	88	111	222	21.92
F	Achillea millefolium	$_{a}$7	$_{b}$-	$_{ab}$6	5	-	3	.01
F	Agoseris glauca	-	1	-	-	1	-	-
F	Alyssum alyssoides (a)	-	-	245	-	-	85	1.12
F	Allium spp.	-	-	4	-	-	1	-
F	Artemisia ludoviciana	24	23	30	9	11	12	.53
F	Aster chilensis	$_{a}$15	$_{b}$2	$_{b}$1	6	1	1	.00
F	Astragalus spp.	$_{a}$31	$_{b}$-	$_{b}$7	16	-	3	.21
F	Astragalus utahensis	2	1	3	2	1	2	.03
F	Castilleja linariaefolia	-	-	4	-	-	2	.18
F	Camelina microcarpa (a)	-	-	2	-	-	1	.00
F	Cirsium spp.	23	27	16	12	11	8	.21
F	Collinsia parviflora (a)	-	-	10	-	-	4	.02
F	Cryptantha spp.	$_{a}$10	$_{b}$-	$_{b}$-	5	-	-	-
F	Cymopterus spp.	$_{a}$-	$_{b}$8	$_{ab}$3	-	5	1	.03
F	Cynoglossum officinale	-	-	2	-	-	1	.00
F	Erodium cicutarium (a)	-	-	24	-	-	11	.10
F	Hackelia patens	-	-	7	-	-	3	.04
F	Helianthus annuus (a)	-	1	-	-	1	-	-
F	Hedysarum boreale	-	7	2	-	3	1	.15
F	Holosteum umbellatum (a)	-	-	32	-	-	14	.09
F	Lactuca serriola	-	-	6	-	-	2	.01
F	Lithospermum ruderale	6	6	-	2	2	-	-
F	Oenothera caespitosa	6	-	1	3	-	1	.03
F	Penstemon spp.	5	-	-	2	-	-	-
F	Streptanthus cordatus	-	2	-	-	1	-	-
F	Tragopogon dubius	$_{a}$134	$_{b}$37	$_{a}$96	62	19	45	1.27
F	Vicia americana	$_{a}$-	$_{a}$-	$_{b}$52	-	-	22	.65
Total for Forbs		263	115	553	124	56	223	4.74

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 6

Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier utahensis	4	.41
B	Artemisia tridentata vaseyana	30	3.45
B	Chrysothamnus nauseosus albicaulis	37	1.99
B	Chrysothamnus viscidiflorus viscidiflorus	32	1.61
B	Gutierrezia sarothrae	41	1.43
B	Mahonia repens	4	.06
B	Purshia tridentata	10	.69
Total for Browse		158	9.66

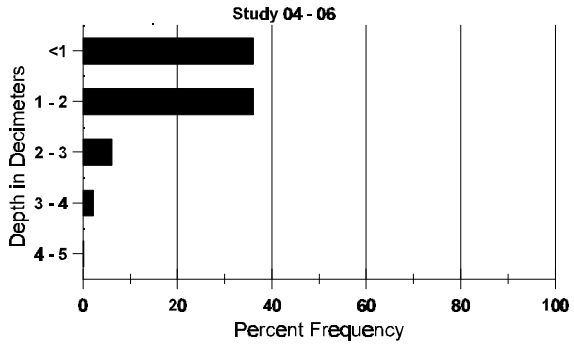
BASIC COVER --
Herd unit 04 , Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	340	2.25	10.0	40.52
Rock	241	19.00	17.0	13.25
Pavement	97	5.25	5.0	.59
Litter	359	55.00	39.0	48.43
Cryptogams	49	0	0	.33
Bare Ground	145	18.50	30.0	4.82

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 06

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.4	67.6 (12.3)	7.2	43.3	26.7	30.0	4.0	6.9	163.2	.8

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 6

Type	Quadrat Frequency '96
Elk	4
Deer	25

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	1	-	-	-	-	-	-	2	-	-	-	40	27	28	2
D	84	-	-	1	-	-	-	-	-	-	-	-	1	-	33			1
	90	-	-	1	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	1	-	1	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		100%
													'90		33			100%
													'96		80			50%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	4	-	-	-	-	-	-	-	-	2	-	1	1	133			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	90	2	-	1	-	-	-	-	-	-	3	-	-	-	100			3
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	84	-	1	1	-	-	-	-	-	-	2	-	-	-	66	6	6	2
	90	-	-	5	-	-	-	-	-	-	5	-	-	-	166	26	31	5
	96	21	6	-	1	-	-	-	-	-	28	-	-	-	560	25	44	28
D	84	-	1	11	-	-	-	-	-	-	12	-	-	-	400			12
	90	-	2	9	-	-	-	-	-	-	6	-	3	2	366			11
	96	2	1	1	-	-	-	-	-	-	2	-	-	2	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
Total Plants/Acre (excluding Dead & Seedlings)													'84		632	Dec:		63%
													'90		632			58%
													'96		840			10%
Chrysothamnus nauseosus albicaulis																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	23	-	-	-	-	-	-	-	-	23	-	-	-	766			23
	96	7	4	-	-	-	-	-	-	-	11	-	-	-	220			11
M	84	-	-	4	-	-	-	-	-	-	4	-	-	-	133	36	27	4
	90	1	1	-	-	-	-	-	-	-	2	-	-	-	66	40	52	2
	96	37	8	-	-	-	-	-	-	-	45	-	-	-	900	22	35	45
D	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	90	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'84		232	Dec:		28%
													'90		932			11%
													'96		1180			5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	4	-	-	-	-	-	-	3	-	2	-	166			5
	96	12	-	-	-	-	-	-	-	-	12	-	-	-	240			12
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	4	-	3	-	-	-	-	-	-	7	-	-	-	233	6	8	7
	96	50	3	2	2	-	-	-	-	-	57	-	-	-	1140	11	17	57
D	84	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	90	-	1	7	-	1	1	1	-	-	5	-	4	2	366			11
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		100%
													'90		765			48%
													'96		1380			0%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	199	-	-	6	-	-	-	-	-	205	-	-	-	4100			205
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	96	62	-	-	7	-	-	-	-	-	69	-	-	-	1380			69
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	29	-	-	-	-	-	-	-	-	29	-	-	-	966	7	12	29
	96	55	-	-	2	-	-	-	-	-	57	-	-	-	1140	10	13	57
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	4	-	-	-	-	-	-	-	-	-	-	-	4	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		1132			3%
													'96		2600			3%
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	33	-	-	-	-	-	-	-	-	33	-	-	-	660			33
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		660			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66	15	15	2
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	33	11	28	1
	96	-	7	8	2	-	-	-	-	-	17	-	-	-	340	16	29	17
D	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	3	-	-	-	-	-	-	-	-	1	2	100			3
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		132	Dec:		50%
													'90		166			60%
													'96		380			5%
Symphoricarpos oreophilus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	22	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

DISCUSSION

Trend Study No. 4-7 (6-7)

*** This site was not read in 1996. Text from the 1990 report is found below for your information. Maps and data tables can be found in the 1990 Utah Big Game Trend Study report.

This study samples an area typical of the critical deer winter range located immediately east and south of Croyden. Much of this area is burned mountain big sagebrush rangeland that has been seeded with crested wheatgrass. Visually, crested wheatgrass is still dominant, even though there has been some reestablishment of big sagebrush and other less desirable shrubs. The study is on a moderately steep (20%), west facing slope at 5,510 feet. The sagebrush community has an abundance of seedling and young plants. This study, when reread, should prove very instructive regarding the fate of these plants. In spite of heavy deer use, initial seedling establishment does not appear to be a problem. Reports from local personnel, however, suggest that every three to four years snow cover is poor or there is a mid-winter thaw that allows seedling and young plants to either be uprooted or browsed to the ground surface by deer. If such were true, all the reproduction from a three to four year period could be eliminated during a single winter. Regeneration of the native big sagebrush stand would thus be difficult and slow.

Soil in this area is alluvial but is deeper and finer textured than that encountered elsewhere on the unit. This soil should able moderately well drained and have moderate available water capacity. Erosion is not a problem because of the gentle slope and the stabilizing effect of the seeded grass cover. Crested wheatgrass, however, has not spread to any great extent from the original drill rows. This leaves a considerable area of exposed soil but since the rows are generally perpendicular to the slope, runoff and soil movement are minimized.

Mountain big sagebrush is the key species and management should be geared toward maintaining its abundance. Major obstacles might include periodic heavy deer use, the competitive effect of crested wheatgrass and a possible increase of invading species such as broom snakeweed and rabbitbrush. These species occur frequently and have the capability to dominate the site if big sagebrush is unable to do so.

Crested wheatgrass is the only herbaceous species of any importance. It constitutes an evenly distributed and moderately dense population that provides a considerable amount of forage in early spring and late fall as well as providing important watershed protection. It should remain fairly stable until shrub cover and height begin to increase significantly (>15%).

1984 APPARENT TREND ASSESSMENT

Soil trend is stable. Although there is not a great deal of litter, rock or erosion pavement, the contour arrangement of crested wheatgrass drill rows interrupts most runoff. Vegetative trend is improving but at a slower rate than would be expected. Continued heavy deer use may be hindering regeneration of mountain big sagebrush.

1990 TREND ASSESSMENT

As suggested in the 1984 report, the rereading of this study on burned and seeded sagebrush rangeland illustrates the destiny of a largely young sagebrush population (98% in 1984) in a crested wheatgrass stand. The age class structure of the sagebrush is markedly different. The young age class now makes up only 35% of the population, which makes for a much better balanced population. The

density of mature sagebrush increased from 766 to 4,866 plants/acre, 62% of the population. There is no evidence that use by deer is "hindering" the reestablishment of big sagebrush. A majority of the shrubs were classified as lightly hedged. Sagebrush canopy cover averages 13%. Broom snakeweed remains common, but has not increased. Meanwhile, the sum of nested frequency for crested wheatgrass notably decreased, but quadrat frequency only changed slightly indicating that density has decreased but its distribution is almost unchanged. This could be explained solely because of the extended drought. Forbs were virtually nonexistent in 1990, compared to 1984 when salsify was very prevalent. Species diversity is low. Ground cover components are unchanged and slight erosion continues.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable to slightly downward

TREND STUDY 4-8-96 (old 6-8)

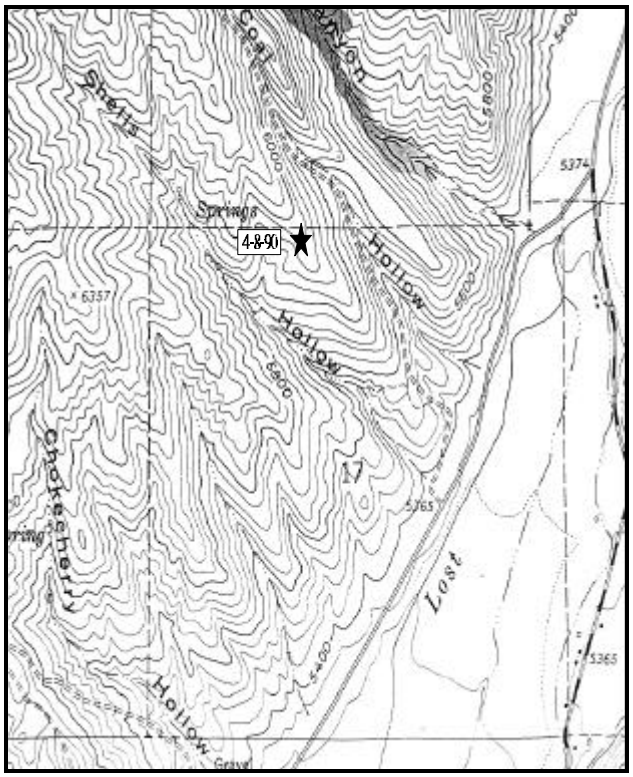
Study site name: Shell Hollow. Range type: Big sagebrush.

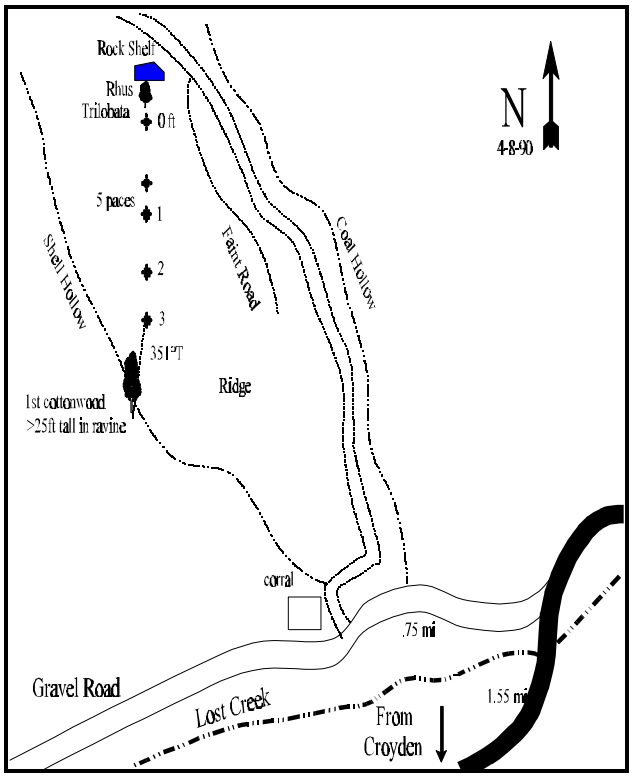
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From 6900 East and 1900 South in Croyden, proceed east 1.55 miles to a gravel road paralleling Lost Creek. Turn left here, and travel 0.75 miles to Coal Hollow Road. Just east of the road is a corral. Northwest of the corral is the ravine, Shells Hollow. Walk up Shells Hollow to the first cottonwood tree over 25 feet tall. Nearby should be a small drainage up slope to the right. From the tree take a bearing of 351 degrees true, and walk approximately 150 yards upslope to the 0-foot stake of the baseline marked by browse tag #7947. Ten feet north of the 0-foot stake is a squawbush plant, and a rocky shelf behind this. Just east of the 0-foot stake is a large rock with a perfect seat carved by the wind.





Map Name: Devil's Slide Diagrammatic Sketch

Township 4N, Range 4E, Section 17, UTM COOR: 4-56-470E 45-48-096N

DISCUSSION

Trend Study No. 4-8 (6-8)

The Shell Hollow study is located on a small ridge between Shell Hollow and Coal Hollow on the west side of Lost Creek. The area is considered critical deer winter range with a south aspect and a steep 45% slope. The study samples an impoverished and in the recent past, over grazed Wyoming big sagebrush hillside community 150 yards above shell hollow. Winter deer and spring sheep use was heavy in the past on the key species as well as understory plants. Few perennial grasses or forbs remain. Cattle were present along the creek during the 1996 reading and had already utilized the available understory forage on the site. Few deer pellet groups were encountered on the site in 1996.

The soil is moderately deep in places but the average effective rooting depth is estimated at almost 11 inches. A hard pan was encountered in some places at about 8-10 inches. Soil texture is a sandy clay loam with a slightly alkaline pH of 7.8. The soil is very gravely derived from a conglomerate parent material. Some large boulders are exposed. Soil temperatures are very high at 78.2°F due to the high rock content and steep south aspect. There is currently little bare ground exposed due to a dense stand of cheatgrass. No active gullies occur on the site but some of the cattle trails show signs of erosion.

The key browse species is Wyoming big sagebrush (with the height characteristics of basin big sagebrush) which accounts for 74% of the total shrub cover. Population density was estimated at 4,800 plants/acre in 1984 and has remained relatively stable since then. Utilization was heavy on 24% of the shrubs in 1984 but current use is light to moderate. Percent decadency has declined from a high of 54% in 1990 to 24% in 1996. Poor vigor has increased with each reading and is currently poor on nearly a third of the sagebrush. Dead plants are fairly common (about 10%).

The increaser, stickyleaf low rabbitbrush has increased in density from 1,799 plants/acre in 1984 to 5,360 by 1996. Age class structure would indicate an expanding population. Broom snakeweed was picked up for the first time in 1996. It currently numbers only 140 plants/acre.

Perennial grasses and forbs are rare. Apart from occasional individuals of the listed species, herbaceous forage production comes almost entirely (93%) from Japanese brome. This annual grass is abundant and in early spring would be the only succulent forage available. Several annual forbs are found on the site.

1984 APPARENT TREND ASSESSMENT

Soil trend is stable to slightly down. Cover, especially herbaceous cover, is poor. There is some litter but most is from dead cheatgrass and it affords little protection. Erosion is proceeding at a higher than acceptable rate. Vegetation trend is also stable to down. Although the sagebrush stand is in no immediate danger of disappearing, conditions are such that a long term decline is possible. This site has an extremely poor understory, a potential fire hazard from dead cheatgrass, and vigorous populations of invader and increaser shrubs are disturbing signs.

1990 TREND ASSESSMENT

The sagebrush on this privately owned winter range has generally good vigor and a moderately hedged growth form. Sagebrush canopy cover averages 29%. Recently, the range has been grazed by cattle. There is very little herbaceous understory vegetation, although several species of weedy forbs were encountered in 1990. The understory is in poor condition providing limited protective ground cover. There are obvious signs of soil erosion with exposed plant roots.

TREND ASSESSMENT
soil - down
browse - stable to slightly downward
herbaceous understory - slightly upward, but still in very poor condition

1996 TREND ASSESSMENT

The soil trend is up due to a dramatic decline in percent bare ground. Unfortunately, most of the improvement is due to a dense stand of Japanese brome, cheatgrass, and rattlesnake brome which constitutes a significant fire hazard. No serious erosion is currently occurring. Trend for the Wyoming big sagebrush is stable. Sagebrush density appears to have reached carrying capacity for the site. Presently canopy cover of sagebrush averages just over 22%. Utilization is light to moderate and percent decadency has dropped to 24%. The only negative aspect of the stand is the high number of shrubs displaying poor vigor (28%). The herbaceous understory is poor and dominated by annual grasses and forbs. Trend is up slightly however, due to an increase in the sum of nested frequency for perennial grasses and forbs.

TREND ASSESSMENT
soil - up
browse - stable
herbaceous understory - slightly upward, but still poor composition

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 8

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	[a]-	[a]-	[b]18	-	-	6	1.52
G	Agropyron spicatum	-	4	10	-	3	3	.18
G	Bromus brizaeformis (a)	-	-	4	-	-	2	.01
G	Bromus japonicus (a)	-	-	382	-	-	100	26.01
G	Bromus tectorum (a)	-	-	6	-	-	2	.03
G	Elymus cinereus	3	1	7	1	1	3	.06
G	Oryzopsis hymenoides	-	-	1	-	-	1	.03
G	Poa secunda	[a]-	[a]-	[b]13	-	-	6	.08
Total for Grasses		3	5	441	1	4	123	27.95
F	Achillea millefolium	-	5	3	-	2	1	.03
F	Allium acuminatum	[a]1	[a]4	[b]25	1	3	14	.07
F	Alyssum alyssoides (a)	-	-	212	-	-	78	.96
F	Aster chilensis	-	3	-	-	1	-	-

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Astragalus convallarius	-	-	6	-	-	3	.06
F	Astragalus spp.	3	-	-	1	-	-	-
F	Astragalus utahensis	-	-	2	-	-	2	.01
F	Camelina microcarpa (a)	-	-	15	-	-	6	.03
F	Cirsium spp.	8	4	15	5	3	7	.12
F	Collomia linearis (a)	-	-	8	-	-	3	.01
F	Comandra pallida	$_{a}$-	$_{a}$-	$_{b}$10	-	-	4	.07
F	Erodium cicutarium (a)	-	-	16	-	-	6	.10
F	Galium spp. (a)	-	-	3	-	-	1	.00
F	Gayophytum ramosissimum (a)	-	-	11	-	-	4	.02
F	Hackelia patens	$_{a}$-	$_{b}$15	$_{b}$14	-	8	8	.16
F	Helianthus annuus (a)	-	1	-	-	1	-	-
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{b}$9	-	-	4	.02
F	Machaeranthera canescens	-	-	1	-	-	1	.00
F	Phlox longifolia	$_{a}$-	$_{b}$117	$_{a}$4	-	52	2	.01
F	Ranunculus testiculatus (a)	-	-	53	-	-	17	.13
F	Tragopogon dubius	1	3	9	1	1	4	.02
F	Veronica biloba (a)	-	-	7	-	-	3	.04
F	Verbascum blattaria	$_{a}$-	$_{a}$-	$_{b}$31	-	-	14	.09
F	Vicia americana	$_{a}$-	$_{b}$31	$_{c}$92	-	15	46	1.06
Total for Forbs		13	183	546	8	86	228	3.06

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 8

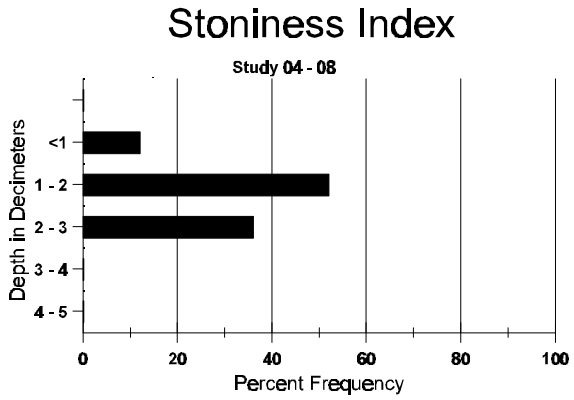
Type	Species	Strip Frequency ‘96	Average Cover % ‘96
B	Amelanchier alnifolia	1	-
B	Artemisia tridentata wyomingensis	97	22.27
B	Chrysothamnus nauseosus albicaulis	8	1.83
B	Chrysothamnus viscidiflorus viscidiflorus	76	6.00
B	Gutierrezia sarothrae	3	-
Total for Browse		185	30.11

BASIC COVER --
Herd unit 04 , Study no: 8

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	393	1.50	5.75	55.91
Rock	130	2.50	1.50	1.75
Pavement	174	10.75	13.50	1.62
Litter	394	58.00	47.75	51.50
Cryptogams	15	0	0	.06
Bare Ground	203	27.25	31.50	8.15

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 08

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.6	78.2 (11.9)	7.8	49.6	23.4	27.0	2.5	18.1	217.6	.7



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 8

Type	Quadrat Frequency '96
Deer	10

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20	23	40	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-
Artemisia tridentata wyomingensis																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	1	5	-	-	-	-	-	-	-	6	-	-	-	400			6
	90	3	-	-	-	-	-	1	-	-	4	-	-	-	266			4
	96	19	-	-	-	-	-	-	-	-	17	-	2	-	380			19
M	84	1	32	9	-	-	-	-	-	-	42	-	-	-	2800	30	34	42
	90	8	14	-	-	-	-	-	-	-	22	-	-	-	1466	29	37	22
	96	79	68	15	-	-	-	-	-	-	119	-	43	-	3240	29	48	162
D	84	-	16	8	-	-	-	-	-	-	22	-	2	-	1600			24
	90	10	20	1	-	-	-	-	-	-	20	-	1	10	2066			31
	96	17	35	5	1	-	-	-	-	-	36	-	19	3	1160			58
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23
Total Plants/Acre (excluding Dead & Seedlings)													'84		4800	Dec:		33%
													'90		3798			54%
													'96		4780			24%
Chrysothamnus nauseosus albicaulis																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66	21	27	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	8	-	-	-	-	-	-	-	-	7	-	1	-	160	29	38	8
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	2	-	-	-	-	-	-	-	2	-	-	2	266			4
	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		132	Dec:		0%
													'90		266			100%
													'96		220			18%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	24	-	-	8	-	-	-	-	-	32	-	-	-	640			32
M	84	12	12	-	-	-	-	-	-	-	19	5	-	-	1600	14	17	24
	90	15	6	1	7	1	-	-	-	-	27	-	3	-	2000	10	12	30
	96	169	2	-	57	-	-	-	-	-	216	1	11	-	4560	13	16	228
D	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	5	4	-	5	-	-	6	-	-	7	-	-	13	1333			20
	96	3	4	-	1	-	-	-	-	-	5	-	1	2	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		1799	Dec:		7%
													'90		3533			38%
													'96		5360			3%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140	11	9	7
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		140			-
Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	9	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-
Rhus radicans																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	72	128	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

TREND STUDY 4-9-96 (old 6-9)

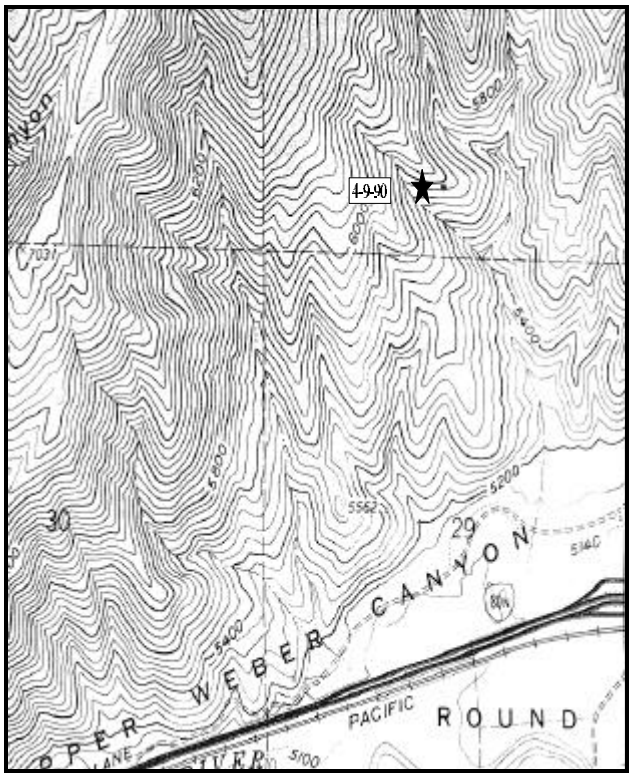
Study site name: Scott Rees Ranch. Range type: Gambel oak.

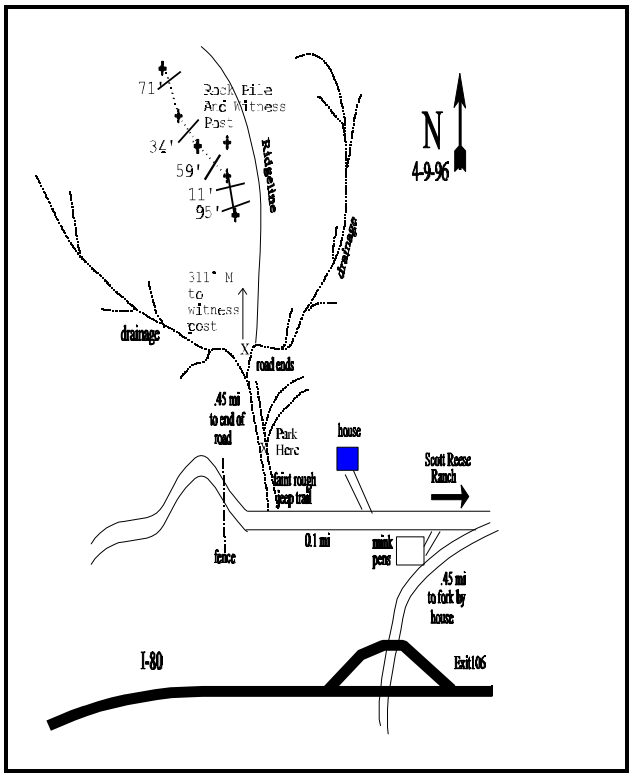
Compass bearing: frequency baseline 165 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

LOCATION DESCRIPTION

Between Morgan and Henefer on I-80, take exit #106 and go north to the Scott Rees Ranch. Turn left (west) on the road north of the mink pens. Drive on this road approximately 0.2 miles past the main house and turn right (north). Drive up a rough road 0.45 miles to the end of the road at a fork in the canyon. Walk up the left fork about ¼ mile, then climb up the slope to the right to the top of the ridge. A rock pile with a witness post sticking out of it on top of a knoll in low growing oak marks the study location. The 0-foot baseline stake is just south of the rock monument, and is marked by browse tag #7971. The first 100 feet of the baseline runs 165 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs 258 degrees magnetic. Line 3 runs 252 degrees magnetic. Line 4 runs 277 degrees magnetic.





Map Name: Morgan Diagrammatic Sketch

Township 4N, Range 3E, Section 20, UTM COOR: 4-46-659E 45-45-743N

DISCUSSION

Trend Study No. 4-9 (6-9)

The Scott Rees Ranch study samples critical deer winter range in Weber river Canyon, east of Morgan. Located north of round Valley, the study area is a steep (45%) south southwest facing slope occupied by low growing Gambel Oak interspersed by an occasional mountain big sagebrush and white rubber rabbitbrush. Deer use was moderate to heavy in 1984, but it had little significant impact on vigor or reproduction of oak. The low growth habit of oak on this site may limit it's availability when snow becomes deep and crusted. Numerous winter killed deer were observed during the 1984 reading within the immediate study area. Currently, pellet group frequency of deer and elk are moderately low. This study area, although owned by the DWR, reportedly is grazed by trespass sheep almost every year. Sheep sign was also noted in 1996.

The soil is shallow and very rocky on the surface and throughout the profile. Effective rooting depth is estimated at only a little over 8 inches. Soil texture is a clay loam with a neutral pH of 6.9. Due to the high rock cover and the steep southwest slope, soil temperature is high, averaging 74°F at 8 inches in depth. The study area has three principal cover components; aerial vegetative crowns, surface rock and litter. Where low growing oak occurs, litter cover is also good and little erosion originates from these sties. Current erosion is confined primarily to oak interspaces.

Browse composition consists almost entirely of low growing Gambel oak. On this site, average height of mature oak is only about 24 inches. In spite of low stature and past rather heavy use, the oak has a high level of vigor and an abundance of young sprouts. This species may even be spreading outward to lessen the extent and number of oak interspaces. Soil characteristics are probably the principal factor limiting height of oak. Root sprouting is certainly not inhibited. Density of stems/acre has declined considerably since 1990, likely due to the larger sample used in 1996. Currently use is moderate, vigor normal, and percent decadence low at only 7%.

Other shrubs occur rarely and include broom snakeweed, white rubber rabbitbrush, Saskatoon service berry, and mountain big sagebrush. The latter two have sustained exceptionally heavy use and are mostly decadent plants.

The herbaceous understory contains only three perennial grasses of which bluebunch wheatgrass is the only abundant species. Annual grasses consisting of rattlesnake brome, Japanese brome, cheatgrass, and rattail fescue dominate the grass component by providing 76% of the total grass cover. Among perennial forbs, Louisiana sagebrush, thistle, low fleabane, and yellow salsify are the most common.

1984 APPARENT TREND ASSESSMENT

Soil trend is stable or slightly down. Slope steepness is such that an outstanding cover is required to prevent soil movement. Study site cover is only fair. Vegetative trend appears quite stable. The only possible change in the immediate future may be an expansion of Gambel oak. Herbaceous production is unlikely to improve.

1990 TREND ASSESSMENT

This site remains dominated by Gambel oak, with a lack of other browse on the slopes. The low-growing oak is moderately hedged. A majority of the plants display reduced vigor and decadence due to heavy insect infestation. Cheatgrass and bluebunch wheatgrass are the common understory plants. The shallow, rocky soil has adequate protection to prevent erosion on the study site. Slopes with less vegetation are subject to disturbance and excessive soil movement.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly improving in many values, except there is still too much annual cheatgrass

1996 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground. Trend for oak is stable. The change in density is likely due to the much larger sample used in 1996. It appears however that young plants have declined in density since 1984. Utilization is mostly moderate and vigor has improved since 1990. Trend for the herbaceous understory is down for perennial grasses but improved for forbs. Overall trend is considered slightly down due to a significant decline in the sum of nested frequency for bluebunch wheatgrass. The improvement in forb nested frequency comes primarily from low value weedy forbs.

TREND ASSESSMENT
soil - up slightly
browse - stable
herbaceous understory - slightly down, still too many annuals

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 9

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	ab201	a227	b168	77	85	62	7.03
G	Bromus brizaeformis (a)	-	-	102	-	-	41	.83
G	Bromus japonicus (a)	-	-	120	-	-	43	2.13
G	Bromus tectorum (a)	-	-	347	-	-	94	21.03
G	Festuca myuros (a)	-	-	15	-	-	6	.37
G	Poa pratensis	a24	b-	a19	10	-	8	.38
G	Poa secunda	a7	b31	a19	4	17	8	.09
Total for Grasses		232	258	790	91	102	262	31.87
F	Achillea millefolium	a6	a2	b20	2	1	9	.26
F	Agoseris glauca	a-	ab3	b9	-	1	4	.02
F	Artemisia ludoviciana	a109	b38	b64	46	20	32	2.07
F	Astragalus utahensis	2	-	6	1	-	2	.06
F	Balsamorhiza sagittata	8	5	4	5	2	1	.25
F	Calochortus nuttallii	4	-	1	2	-	1	.00
F	Cirsium spp.	19	27	34	13	18	18	1.17

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Collomia linearis (a)	-	-	14	-	-	6	.03
F	Comandra pallida	$_{a}$55	$_{b}$3	$_{b}$9	22	1	5	.07
F	Cryptantha spp.	-	3	-	-	1	-	-
F	Delphinium bicolor	-	-	4	-	-	2	.06
F	Erodium cicutarium (a)	-	-	7	-	-	3	.06
F	Erigeron pumilus	$_{a}$13	$_{a}$6	$_{b}$70	6	5	32	1.95
F	Galium aparine (a)	-	-	11	-	-	5	.05
F	Gayophytum ramosissimum (a)	-	-	48	-	-	21	.22
F	Hackelia patens	3	-	-	1	-	-	-
F	Helianthella uniflora	1	-	-	1	-	-	-
F	Holosteum umbellatum (a)	-	-	28	-	-	12	.08
F	Lappula occidentalis (a)	-	-	2	-	-	2	.01
F	Lactuca serriola	$_{a}$-	$_{ab}$3	$_{b}$8	-	2	4	.04
F	Machaeranthera spp	-	-	1	-	-	1	.00
F	Penstemon spp.	-	-	3	-	-	2	.03
F	Tragopogon dubius	$_{a}$18	$_{b}$74	$_{c}$116	8	41	54	1.51
F	Zigadenus paniculatus	-	2	-	-	1	-	-
Total for Forbs		238	166	459	107	93	216	8.00

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 9

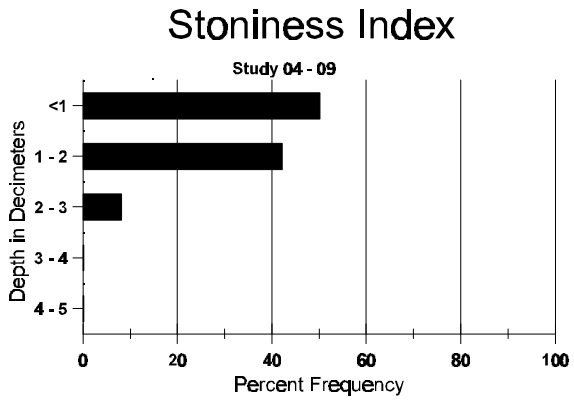
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	1	-
B	Artemisia tridentata vaseyana	11	.53
B	Gutierrezia sarothrae	17	.67
B	Purshia tridentata	1	.15
B	Quercus gambelii	91	27.84
Total for Browse		121	29.19

BASIC COVER --
Herd unit 04 , Study no: 9

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	387	2.25	2.75	56.99
Rock	231	31.25	30.75	15.05
Pavement	14	1.50	.75	.10
Litter	397	52.50	59.75	64.02
Cryptogams	37	2.25	0	.26
Bare Ground	41	10.25	6.00	.32

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 09

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.4	74.2 (7.9)	6.9	38.6	34.1	27.4	2.9	22.5	217.6	.6



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 9

Type	Quadrat Frequency '96
Sheep	4
Elk	4
Deer	11

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	1	-	-	-	-	1	-	-	-	66	28	33	1
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20	52	18	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		66			-
													'96		20			-
Artemisia tridentata vaseyana																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	6	-	-	-	-	-	-	-	7	-	-	-	140	22	27	7
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	1	2	-	-	-	-	-	-	4	-	-	-	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	320			16
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		220			36%
Cercocarpus ledifolius																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19	49	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-
Chrysothamnus nauseosus albicaulis																		
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	31	31	1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	35	41	1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		66			-
													'96		0			-
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	12	7	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	48	-	-	-	-	-	-	-	-	48	-	-	-	960	15	20	48
D	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		132	Dec:		50%
													'90		0			0%
													'96		960			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	37	54	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	1	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		20			100%
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	31	-	-	-	-	-	-	-	-	31	-	-	-	620			31
Y	84	148	-	33	-	-	-	-	-	-	181	-	-	-	12066			181
	90	68	61	3	1	9	-	-	-	-	65	77	-	-	9466			142
	96	70	18	-	1	-	-	-	-	-	89	-	-	-	1780			89
M	84	46	9	124	-	-	-	-	-	-	179	-	-	-	11933	21	11	179
	90	1	40	-	-	-	-	-	-	-	-	41	-	-	2733	21	22	41
	96	36	291	13	-	-	-	-	-	-	340	-	-	-	6800	24	31	340
D	84	3	23	27	-	-	-	-	-	-	53	-	-	-	3533			53
	90	18	39	-	-	-	-	-	-	-	12	30	1	14	3800			57
	96	1	19	13	-	-	-	-	-	-	33	-	-	-	660			33
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23
Total Plants/Acre (excluding Dead & Seedlings)													'84		27532	Dec:		13%
													'90		15999			24%
													'96		9240			7%

DISCUSSION

Trend Study No. 4-10 (6-10)

*** This site was not read in 1996. Text from the 1990 report is retained below for your information. Maps and data tables from previous readings can be found in the 1990 Utah Big Game Range Trend Studies report.

The Big Hollow study is on depleted mountain big sagebrush/grass range located just east of Stoddard near the mouth of Big Hollow. This area is representative of much of the critical winter range between Morgan and Lower Weber Canyon. Although at least half of this range has already been converted to a grass/forb type, the remainder, occurring as irregularly distributed patches, still has remnant mountain big sagebrush populations. The study site, located on a steep (50%) southwest slope, is one such area. Elevation is approximately 5,280 feet. Since all of this winter range is privately owned, it received considerable livestock (sheep and horse) use in addition to heavy deer winter use. Pressure on the limited browse resource is excessive. In 1984, three winter killed deer were found on the study site.

The SCS characterizes soil on this site as "Durfee Stony Loam. This is a very deep and well drained soil formed from sandstone and quartzite. The Durfee soil has surface horizons that average 16 inches in thickness but which also have about 65% rock fragment content. The subsoil extends to well below 60 inches and is even rockier. Soil reaction is acidic, permeability is slow, available water capacity is moderate and erosion hazard is high (Carley et al. 1980). The study area has a good litter cover but a rather poor cover of desirable forbs, shrubs or grasses. Perennial weeds, biennials and annuals make up the principal vegetative cover elements. The erosion rate is moderate.

The key browse species is identified as mountain big sagebrush, even though a few individuals have morphological characters more typical of basin big sagebrush. Ultraviolet light tests, however, consistently indicate subspecies vaseyana. Whatever its identity, the big sagebrush population is a sparse one that has less than ideal vigor and has a decadent appearance. Use tends to be excessive and contributes to reduced vigor in conjunction with extended drought. The incidence of reproduction is perhaps slightly greater than the density plot data suggests, but appears to be inadequate to assure long term stand preservation.

Herbaceous composition is depleted of desirable perennial plants. Only bluebunch wheatgrass can be found in more than nominal numbers. The most abundant species are common ragweed, cheatgrass brome, yellow salsify, and thistle. This area appears to be set up perfectly for a very hot destructive fire!

1984 APPARENT TREND ASSESSMENT

Soil trend is stable to slightly down. Current erosion is not heavy, but the steep slope and rather poor quality vegetative cover increase high erosion risks. A fire could completely denude the area of browse. Vegetative trend is down because of poor condition and inadequate reproduction of the key browse species and a depleted herbaceous component of mostly weeds.

1990 TREND ASSESSMENT

Since this study was established in 1984, the private land has been sold and subdivided. The study site itself is now located near a newly constructed house in a small pasture grazed by horses and sheep. Although it can no longer be considered deer winter range, it is representative of conditions and developments on much of the lower elevation range in the Henefer area. The big sagebrush on the site is unchanged but age classifications reveal a stand that is moderately

hedged and 73% decadent with very little reproduction. Desirable herbaceous perennials have been further depleted by year-long livestock grazing. The sum of nested frequency for bluebunch wheatgrass declined greatly. The percentage of litter cover greatly decreased with extended drought, leaving more rock and bare soil exposed.

TREND ASSESSMENT
soil - down
browse - down
herbaceous understory - down

DISCUSSION

Trend Study No. 4-11 (7-3)

*** This site was not read in 1996. Text from the 1990 report remains for your information. Maps and data tables from previous readings can be found in the 1990 Utah Big Game Range Trend Studies report.

The Causey Dam study (now located in herd unit no. 4) is located on mixed shrub slopes above the north end of Causey Reservoir. The Forest Service manages the perimeter of the reservoir for recreation where domestic livestock grazing is prohibited. The DWR owns several hundred acres of the surrounding land. The site is near the upper limits of normal winter range at an elevation of 5,800 feet, this west facing 60% slope can develop deep snow cover. Deer use may be limited by the amount of snow, but elk and moose also winter in the area.

The stony silt loam soil is shallow and contains a high percentage of rock fragments. The surface layer is dark brown and loosely compacted. Rocks and pavement are easily moved, yet they are not concentrated on the surface. A fairly uniform ground cover of vegetation and litter provides basic soil protection. The hazard of erosion is high on exposed areas of soil.

The vegetative community is dominated by a variety of browse species. Seven valuable forage species were sampled on the study site. The largest and most discernible species is curlleaf mountain mahogany. These very palatable plants have been heavily hedged, but are now mostly unavailable due to their height. No young curlleaf mountain mahogany appear present. In terms of numbers, Gambel oak and mountain snowberry are the codominant species. Both appear to have large, expanding populations. Density of the oak is high at 14,267 plants/acre. The available oak has been moderately hedged, but the snowberry is only lightly used. Some of these plants display poor vigor due to an infestation of tent caterpillars. Present at lower densities are mountain big sagebrush, Utah serviceberry, black chokecherry, and creeping barberry. Wild rose occurs infrequently. Big sagebrush and serviceberry are important for they produce a large amount of the available, palatable forage. Both have moderate to heavily hedged forms with a fairly high percentage of decadent plants in their populations.

Grasses are moderately abundant. The important species are slender and western wheatgrass, muttongrass, and Kentucky bluegrass. The plants are vigorous and unutilized, but are being shaded out by thickening oak. Forbs are diverse, but density is low. Many valuable forage and watershed protecting species were found. The more common ones are tapertip hawksbeard, western yarrow, lambstongue groundsel, false solomon-seal, arrowleaf balsamroot, and wild geranium.

1985 APPARENT TREND ASSESSMENT

The soil trend is stable due to the dense vegetative and litter cover. Density of the Gambel oak is increasing and inhibiting regeneration of the more desirable species. The expanding oak brush and increasing unavailability of curlleaf mountain mahogany indicate a downward vegetative trend in terms of big game winter range. Diversity of browse and herbaceous species will continue to decline as the oak expands.

1990 TREND ASSESSMENT

Oak and snowberry remain the most numerous browse species on the mountain brush site even though both have decreased densities. Oak showed only a slight decreased density even with a large number of young plants counted. The average size (crown diameter) is nearly twice as large in 1990. Cover from oak has

increased. Snowberry and big sagebrush also declined in frequency and density. Other browse species maintained low frequency, yet fairly stable populations. Curlleaf mountain mahogany remains largely unavailable because of height. A high frequency and diversity of perennial grasses and forbs persists in the understory. Soil erosion is minimal.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

TREND STUDY 4-12-96 (old 7-7)

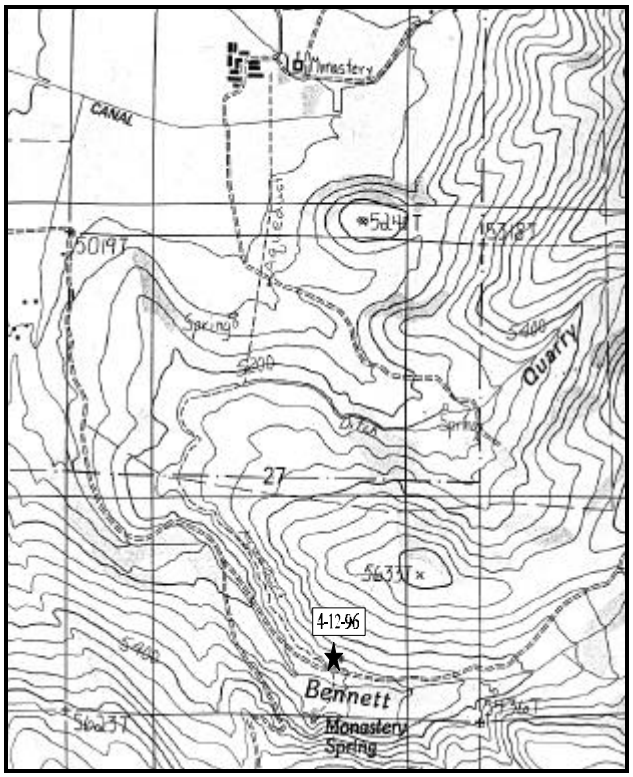
Study site name: Bennett Creek. Range type: Low sagebrush.

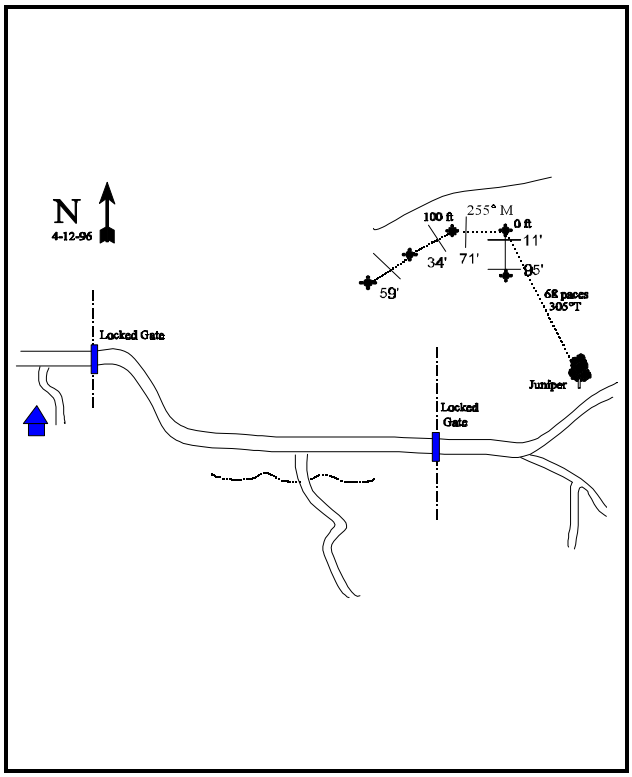
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (59ft).

LOCATION DESCRIPTION

Two keys and permission to cross private land are necessary to access this study site. Brother Nicolas at the monastery can direct you to bypass the first locked gate which is theirs. The second locked gate is owned by Basin Land and Livestock but it was not locked (Steve Hansen in Park City is managing the land). If it is locked the site is a short walk east up the road. At the corner of 1300 South and 8900 East southeast of Huntsville, drive down 8900 East (with a dead end sign) 1.2 miles to a locked gate (monastery). Go through the gate 1 mile to a fork which goes to Sheep Herd Creek. Bear left, go 0.8 miles to another locked gate (Basin Land and Livestock). Past the gate, continue 0.4 miles to a fork. Bear left and go 0.15 miles to a lone juniper which marks the study site. The large lone juniper is 75 feet north of the road. From the juniper, walk 68 paces bearing 305°T to the 0-foot baseline stake, a short fencepost with a white top. The other stakes are 2½ foot tall green fenceposts. The 100-foot baseline runs 180 degrees. The 200-foot baseline runs 255 degrees magnetic. The 300 and 400-foot baseline runs 215 degrees magnetic.





Map Name: Durst Mountain 1:24,000 (Morgan 1:62,500) Diagrammatic Sketch

Township 6N, Range 2E, Section 26, UTM COOR: 4-41-849E 45-64-136N

DISCUSSIONS

Trend Study No. 4-12 (7-7)

The Bennett Creek study was a new trend study put in place in 1990. It samples deer and elk winter range on the south side of Ogden Valley. Most of the area is private land making access to the isolated state section difficult. The range has been heavily grazed by domestic sheep in the past. Sign of big game was more moderate in 1990, with evidence of sage grouse and a recently transplanted moose observed. During the 1996 reading, no elk and little deer sign was observed. Sheep and cattle sign was encountered. A pair of Sandhill cranes were observed near the site in 1996.

The study is on the south-facing side of a low ridge above Bennett Creek. The slope is 18% with an elevation of 5,700 feet. Soil on the ridge is shallow and very rocky. Effective rooting depth (see methods) was estimated at only about 5 inches due to the rockiness of the soil. Soil texture is a clay loam with a neutral pH of 7.2. Due to the high rock content and south facing slope, soil temperatures are high averaging over 72°F at about 5 inches in depth. Vegetative cover combined with rock and pavement cover adequately protect the soil from erosion.

A low, spreading sagebrush dominates the study site. The low sagebrush (*Artemisia arbuscula*) has a compact growth form and appeared moderately hedged in 1990, with some heavy use on the mature plants (32% were classified in form class 3). Seedling and young sagebrush were very common and vigor good on all age classes that year. Sagebrush canopy cover averaged 23%. A spotty fire appears to have burned through the site prior to the 1996 reading. This along with the much larger sample used in 1996 are mostly the reason for the significant decline in sagebrush density (11,265 plants/acre to 3,700) for very few dead plants or burned stems were found to explain the decrease. Currently the sagebrush stand is mostly young (61%) and lightly hedged. Vigor is normal on most plants but poor on 19% of the population which appear chlorotic. The only other shrub found on the site consisted of one broom snakeweed.

Past heavy grazing has eliminated valuable perennial grasses and forbs. The depleted understory is almost exclusively bulbous bluegrass, Sandberg bluegrass, Japanese brome, and cheatgrass. There are occasional remnant bluebunch wheatgrass plants. Forbs are abundant yet dominated by annuals and weedy biennials, primarily curlycup gumweed and yellow salsify which account for 77% of the total forb cover.

1990 APPARENT TREND ASSESSMENT

Adequate ground cover translates to a stable soil trend. The soil would have a high hazard of erosion if vegetative cover was removed. There are active gullies in the valley below the site. The site displays a lack of diversity in the depleted understory, but the browse stand is stable. The community is very susceptible to wildfire with the dense understory of weedy annuals.

1996 TREND ASSESSMENT

The soil trend is stable. Percent bare ground has declined to less than 1%, while litter cover has declined from 59% to 14%. Vegetation and rock cover adequately protect the soil from erosion. The browse trend is down due to a decline in density caused by a burn over some of the area. Seedlings and young plants are still found in good numbers, making it appear that the population will rebound. Trend for the herbaceous understory is stable for grasses but up for forbs. Nested frequency of bulbous bluegrass increased significantly, although sum of nested frequency for the more preferred Sandberg bluegrass declined

significantly. Overall, sum of nested frequency for perennial grasses increased slightly. Sum of nested frequency of perennial forbs increased dramatically from 70 to 511. However, this increase came primarily from curlycup gumweed and yellow salsify. The former species is a very undesirable species. Trend for the herbaceous understory is considered slightly down due to the significant increases in low value weedy forbs.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - down slightly, very poor condition because of excessive amounts of annuals

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 12

Type	Species	Nested Frequency '90	Nested Frequency '96	Quadrat Frequency '90	Quadrat Frequency '96	Average Cover % '96
G	Agropyron spicatum	9	*30	4	13	.22
G	Bromus japonicus (a)	-	307	-	94	3.51
G	Bromus tectorum (a)	-	201	-	67	2.47
G	Melica bulbosa	-	2	-	1	.00
G	Poa bulbosa	326	*367	98	97	35.12
G	Poa secunda	72	60	32	23	.53
Total for Grasses		407	967	134	295	41.87
F	Achillea millefolium	-	1	-	1	.15
F	Agoseris glauca	-	*23	-	13	.09
F	Ambrosia psilostachya	-	3	-	1	.03
F	Artemisia ludoviciana	-	*12	-	5	.36
F	Cirsium spp.	-	*9	-	6	.09
F	Collomia linearis (a)	-	2	-	2	.01
F	Collinsia parviflora (a)	-	16	-	7	.06
F	Erodium cicutarium (a)	-	207	-	74	2.72
F	Erigeron divergens	-	*13	-	8	.26
F	Grindelia squarrosa	28	*269	14	91	12.66
F	Helianthus annuus (a)	14	7	8	6	.03
F	Lactuca serriola	8	*26	4	15	.10
F	Lomatium dissectum	-	3	-	1	.00
F	Machaeranthera canescens	-	*23	-	10	.05
F	Polygonum douglasii (a)	-	6	-	2	.01
F	Taraxacum officinale	-	*15	-	8	.09
F	Tragopogon dubius	20	*102	10	52	1.04
F	Unknown forb-annual	-	30	-	12	.06
F	Viola spp.	-	5	-	2	.01
Total for Forbs		70	772	36	316	17.84

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 12

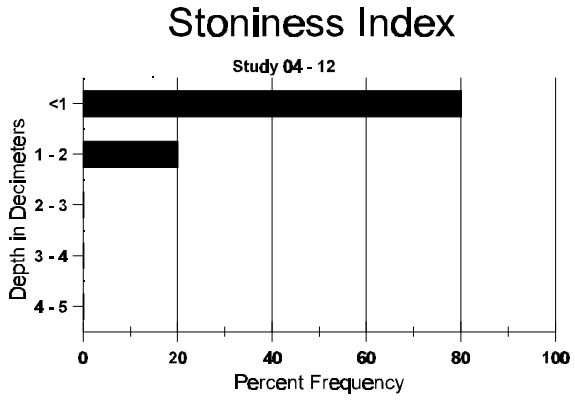
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia arbuscula	65	2.81
B	Gutierrezia sarothrae	1	.15
Total for Browse		66	2.96

BASIC COVER --
Herd unit 04 , Study no: 12

Cover Type	Nested Frequency '96	Average Cover % '90	'96
Vegetation	391	5.50	61.56
Rock	283	16.75	21.93
Pavement	174	9.75	1.97
Litter	362	59.25	14.06
Cryptogams	12	.50	.06
Bare Ground	173	8.25	.96

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 12

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
4.5	72.4 (5.5)	6.6	41.7	34.0	24.3	3.1	30.6	208.0	.6



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 12

Type	Quadrat Frequency '96
Sheep	2
Rabbit	1
Deer	1
Cattle	5

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 12

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia arbuscula																		
S	90	63	-	-	-	-	-	-	-	-	63	-	-	-	4200			63
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	90	48	10	-	-	-	-	-	-	-	57	-	1	-	3866			58
	96	112	-	-	-	-	-	-	-	-	92	-	20	-	2240			112
M	90	16	42	22	-	-	-	-	-	-	74	4	2	-	5333	12	21	80
	96	72	-	-	-	-	-	-	-	-	58	-	14	-	1440	11	15	72
D	90	11	6	14	-	-	-	-	-	-	19	2	8	2	2066			31
	96	1	-	-	-	-	-	-	-	-	-	-	1	-	20			1
X	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)													'90		11265	Dec:		18%
													'96		3700			1%
Artemisia tridentata vaseyana																		
M	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	20	30	1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'90		66	Dec:		-
													'96		0			-
Gutierrezia sarothrae																		
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	11	16	1
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		20			-

TREND STUDY 4-13-96 (old 5-13)

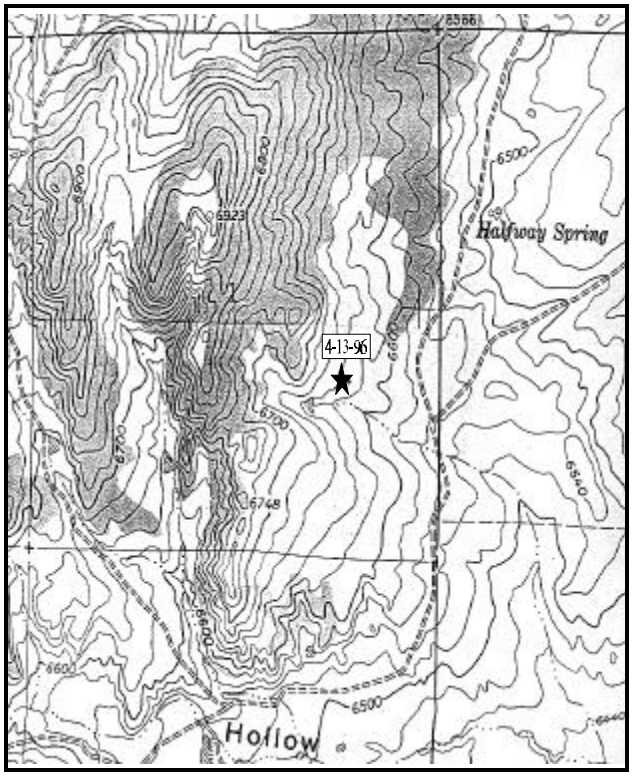
Study site name: Wheatgrass Hollow. Range type: Big sagebrush.

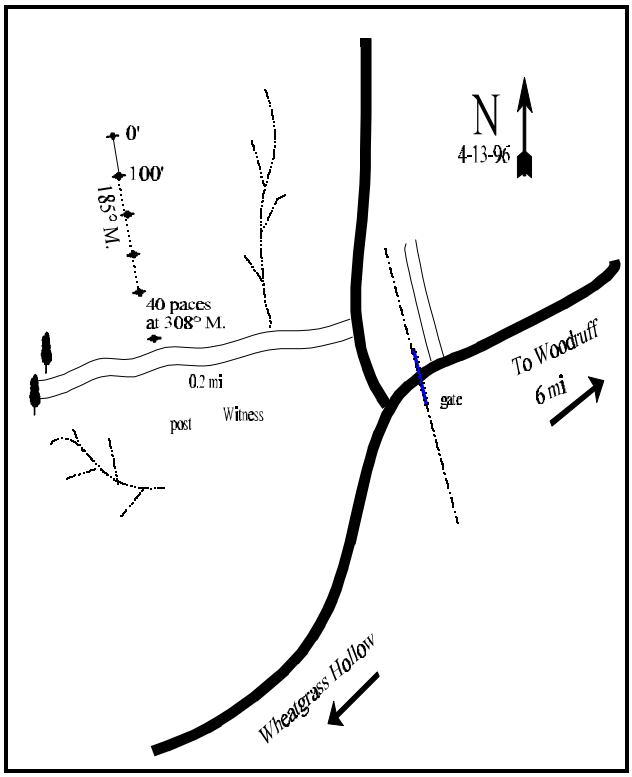
Compass bearing: frequency baseline 135 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Where Highway U-16 bends to the east on the south side of Woodruff, continue straight on Deseret Road (South Main). Go 2.5 miles and turn right (west) onto the Wheatgrass Road. Go 3.25 miles, crossing several cattleguards, to a fourth cattleguard. Continue past the cattleguard to a fork. Go north 0.05 miles to a fork with a faint road on the left. Go 0.2 miles west on the faint road to a witness post. From the witness post, walk 40 paces at 308 degrees magnetic to the 400-foot baseline stake. The 0-foot baseline stake is located 400 feet to north at a bearing of 315 degrees magnetic.





Map Name: Neponset Reservoir NW Diagrammatic Sketch

Township 8N, Range 6E, Section 1, UTM COOR: 4-82-183E 45-89-255N

DISCUSSION

Trend Study No. 4-13 (5-13)

No trend studies had previously been established in the area southwest of Woodruff. The new Wheatgrass Hollow study (now located in herd unit no. 4) was put in place in 1990. It samples BLM winter range in an area with predominately private land. The range type is Wyoming big sagebrush with scattered juniper and pinyon and a sparse understory. The woodland is moderately dense on the ridge above the site. The site has a southeast aspect and 13% slope with an elevation of 6,650 feet. Deer use the area moderately heavy in most winters. Pellet group frequency was moderately high for deer in 1996 (38%) with few found for elk and cattle.

The fine-textured soil is moderately shallow and compacted. Effective rooting depth (see methods) is estimated at just over 10 inches. Soil texture is a sandy clay loam with a neutral pH (7.2). Phosphorus could be a limiting factor with a value of only 10.3 ppm. Pavement is a significant ground cover component. Other indicators of soil erosion include small shallow gullies and plant pedestaling. There is good ground cover under the shrubs, but the shrub interspaces are largely bare.

Wyoming big sagebrush is the dominant shrub. It has a moderately high density with canopy cover averaging 23% (1996). Forage production per plant was low in 1990, partially due to the dense stand but also to past heavy use and a high percentage of decadent plants. Also, 25% of the sagebrush had reduced vigor due to insect damage. During the 1996 reading, utilization of the sagebrush has moderated. Vigor is improved on most plants, yet 19% of the decadent shrubs were classified as dying. A large number of dead plants were counted in 1996 (1,180), however seedlings and young plants are numerous and more than adequate to maintain the current population.

A few shadscale, narrowleaf low rabbitbrush, greasewood, and prickly pear also occupy the site. Scattered junipers had an estimated density of 32 trees/acre in 1990, increasing to 47 trees/acre in 1996. Some of these trees have been heavily hedged (highlined) where available.

The native grass understory is comprised mainly of Sandberg bluegrass, bluebunch wheatgrass, and bottlebrush squirreltail. Spring forb forage is lacking. The most numerous species consists of longleaf and hoods phlox.

1990 APPARENT TREND ASSESSMENT

The long-term vegetative trend for this site is stable. The amount and diversity of forage produced is below optimum. The soil has previously suffered the effects of severe erosion, but currently is relatively stable.

1996 TREND ASSESSMENT

The soil trend appears stable with similar amounts of protective ground cover compared to 1990. Trend for Wyoming big sagebrush is also stable. Density is slightly lower but vigor is improved and percent decadency has declined from 54% to 24%. Trend for the herbaceous understory is stable but depleted. Sum of nested frequency for bluebunch wheatgrass declined significantly while frequency for Sandberg bluegrass increased significantly. Bluebunch wheatgrass is more preferred but the decline probable does not warrant a declining trend designation for it only contributes 3% of the grass cover.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable but depleted

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 13

Type	Species	Nested Frequency '90	'96	Quadrat Frequency '90	'96	Average Cover % '96
G	Agropyron spicatum	71	*15	35	8	.26
G	Bromus tectorum (a)	-	27	-	10	.05
G	Carex spp.	1	-	1	-	-
G	Oryzopsis hymenoides	7	8	4	4	.22
G	Poa secunda	307	310	99	97	8.73
G	Sitanion hystrix	23	*38	10	20	.39
G	Stipa comata	16	15	7	7	.54
Total for Grasses		425	413	156	146	10.21
F	Agoseris glauca	-	1	-	1	.00
F	Antennaria spp.	17	24	7	12	.38
F	Arabis spp.	4	3	2	1	.00
F	Asclepias speciosa	-	4	-	1	.03
F	Astragalus spatulatus	-	5	-	3	.06
F	Astragalus utahensis	-	3	-	1	.00
F	Cryptantha spp.	-	1	-	1	.03
F	Erigeron pumilus	13	10	9	4	.02
F	Orobanche spp.	-	3	-	1	.00
F	Phlox hoodii	90	*119	40	51	1.39
F	Phlox longifolia	43	50	20	19	.12
Total for Forbs		167	223	78	95	2.05

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 13

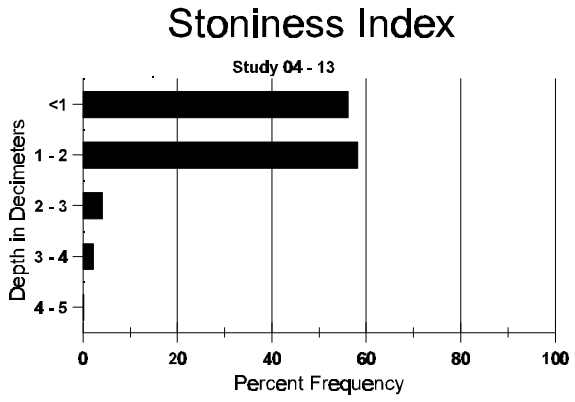
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata wyomingensis	99	23.40
B	Atriplex confertifolia	3	-
B	Chrysothamnus viscidiflorus stenophyllus	15	.09
B	Juniperus osteosperma	1	.00
B	Opuntia fragilis	18	.04
B	Sarcobatus vermiculatus	1	-
Total for Browse		137	23.54

BASIC COVER --
Herd unit 04 , Study no: 13

Cover Type	Nested Frequency '96	Average Cover % '90	'96
Vegetation	331	8.00	34.17
Rock	170	5.50	3.24
Pavement	300	27.00	17.76
Litter	382	34.50	25.90
Cryptogams	226	8.50	8.83
Bare Ground	296	16.50	15.49

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 13

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.4	58.6 (11.5)	7.2	49.0	22.0	29.0	4.5	10.3	204.8	.7



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 13

Type	Quadrat Frequency '96
Rabbit	10
Elk	4
Deer	38
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 13

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	90	2	-	-	2	-	-	-	-	-	4	-	-	-	266			4
	96	56	-	-	-	-	-	-	-	-	56	-	-	-	1120			56
Y	90	21	2	1	1	-	-	-	-	-	23	2	-	-	1666			25
	96	23	8	-	1	-	-	-	-	-	32	-	-	-	640			32
M	90	11	5	3	1	-	-	-	-	-	13	1	6	-	1333	19	23	20
	96	57	117	14	-	4	-	-	-	-	190	2	-	-	3840	14	33	192
D	90	22	17	15	-	-	-	-	-	-	18	23	10	3	3600			54
	96	15	46	10	-	2	-	-	-	-	59	-	-	14	1460			73
X	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1180			59
Total Plants/Acre (excluding Dead & Seedlings)													'90		6599	Dec:		55%
													'96		5940			25%
Atriplex confertifolia																		
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	11	10	3
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		60			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
S	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	3	-	-	-	-	-	3	-	-	-	60			3
M	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	6	8	1
	96	17	-	-	-	-	-	-	-	-	17	-	-	-	340	10	16	17
D	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'90		66	Dec:		0%
													'96		460			13%
Juniperus osteosperma																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		20			-
Opuntia fragilis																		
S	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200	3	2	3
	96	27	-	-	-	-	-	-	-	-	27	-	-	-	540	4	13	27
Total Plants/Acre (excluding Dead & Seedlings)													'90		333	Dec:		-
													'96		540			-
Sarcobatus vermiculatus																		
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	24	18	1
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		20			-

TREND STUDY 4-14-96 (old 5-4)

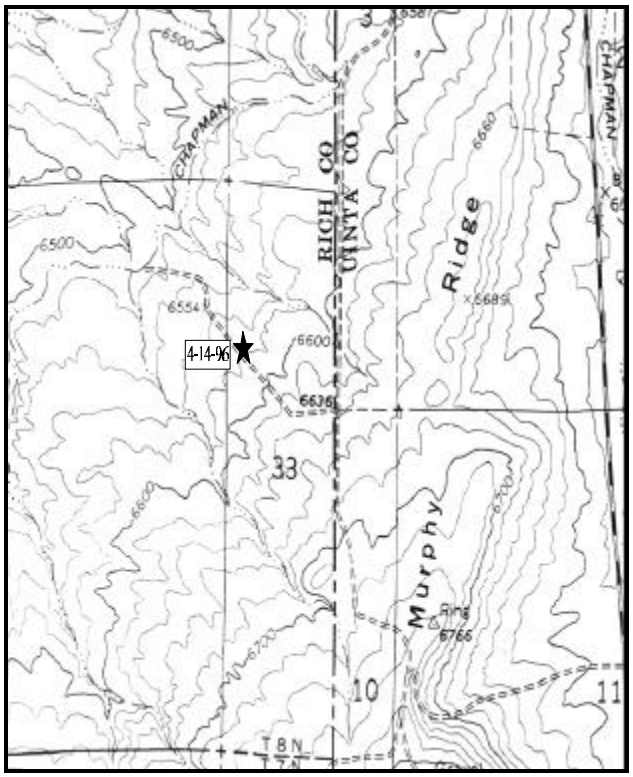
Study site name: Chapman Canal. Range type: Sagebrush/grass.

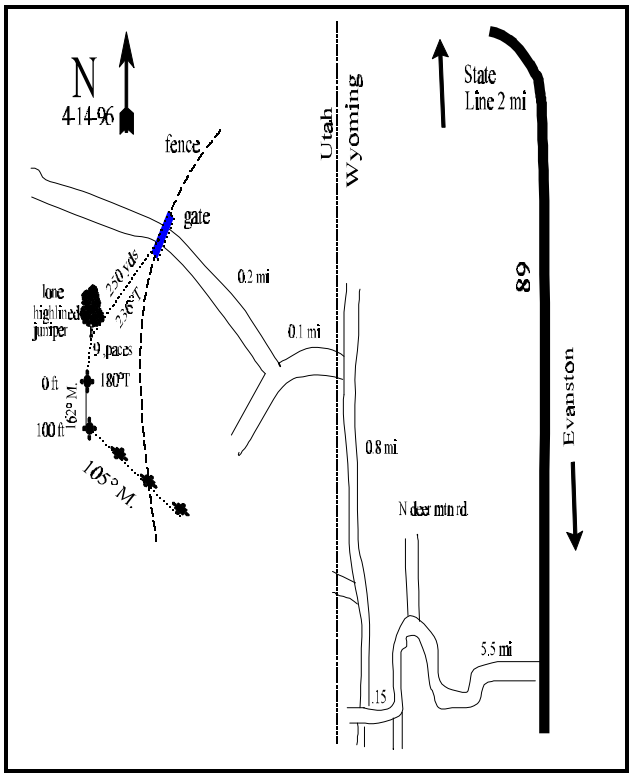
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (71ft), line 3 (59ft), line 4 (34ft).

LOCATION DESCRIPTION

From the state line on southbound Highway 16-89, proceed 2.5 miles towards Evanston and turn right onto Deer Mountain Road. Proceed west for 0.55 miles, and turn left at the fork. Proceed 0.15 miles south and turn right. Travel 0.6 miles north along the state line fence, turn left at the fork and proceed west 0.1 miles. Turn right at the fork, proceed northwest for 0.25 miles and stop at the fence. From the gate walk approximately 130 paces at 218 degrees magnetic to a lone highlined juniper. This is the only juniper present in the area. From the tree walk 9 paces at 180 degrees true to the 0-foot stake of the baseline, marked with browse tag #7939. The baseline doglegs after 100 feet and runs 105 degrees magnetic.





Map Name: Neponset Reservoir NE Diagrammatic Sketch

Township 8N, Range 8E, Section 32, UTM COOR: 4-95-613E 45-81-918N

DISCUSSION

Trend Study No. 4-14 (5-4)

The Chapman Canal study (now in herd unit no. 4) samples an area that, from a cursory observation, one might conclude that it would have little value as big game winter range. Located close to the Wyoming state line in the midst of an extensive big sagebrush-grass type that extends for miles before any cover from trees or terrain is discernible, the area certainly would not appear important. Appearances can be deceiving, however, because large numbers of deer, elk, antelope, sage grouse, horses, and cattle all utilize the area. Of particular interest was a brood of Hungarian partridge observed at the time of study establishment in 1984. In addition, five winter killed deer carcasses were encountered that same year. Currently, deer appear to be utilizing the area the most with a pellet-group frequency of 24% and elk at only 5%. The site varies from nearly level to perhaps a 10% west facing slope. Elevation is 6,560 feet.

Soil is "Duckree Gravelly Loam," a category typified by moderately deep, well drained, rapidly permeable soils, formed in alluvium from quartzite, chert, and sandstone. This soil is strongly calcareous and alkaline at all depths. Available water capacity is low and the erosion hazard is moderate (Campbell and Lacey 1982). Soil at the site has an estimated effective rooting depth (see methods) of a little over 10 inches. Soil texture is a clay loam with a moderately alkaline pH of 8.0. Phosphorus could be a limiting factor at only 5.5 PPM. Organic matter is also relatively low at only 1.9%. Ground cover is poor and comes primarily from the shrub crowns. Most shrub interspaces are barren and some soil compaction from trampling is evident. Sheet and gully erosion is noticeable throughout the area, but is not excessive.

The key browse species is Wyoming big sagebrush which contributes the most browse cover (70%). Wyoming big sagebrush was generally low in stature and heavily browsed in 1984. Vigor was good and although there was noticeable decadence among larger plants, there appeared to be adequate reproduction. By 1990 the population remained comparable, although utilization was more moderate and vigor improved. The population declined by 1996, it appears primarily due to the reduction in the number of young plants from 2,133 to only 60. But, one in five plants are dead in the population. Density of mature plants remains similar to 1984 estimates. Some of the decrease in numbers is due to the extended drought, yet the larger sample size taken in 1996 gives a greatly improved estimate of browse populations. Utilization is currently light to moderate and vigor generally good.

Narrowleaf low rabbitbrush is currently more numerous that Wyoming big sagebrush but it only accounts for 26% of the total browse cover. Its population has remained fairly stable since 1984.

The herbaceous understory is characterized by adequate diversity among grasses, but few quality forbs. The most common grass is Sandberg bluegrass which accounts for 67% of the total grass cover. Thickspike wheatgrass is also fairly common. By far the most abundant forbs include hoods phlox and longleaf phlox, two low value perennial forbs.

1984 APPARENT TREND ASSESSMENT

Trend appears basically stable. Some erosion is occurring but is limited by the gentle terrain. There is, however, an active gully in the area which indicates the potential for erosion. Vegetative trend indicators suggest that the key species, Wyoming big sagebrush, "turns over" rather quickly but is stable insofar as population maintenance is concerned.

1990 TREND ASSESSMENT

At the Chapman Canal site, as suggested in 1984, the Wyoming big sagebrush population is dynamic in terms of age class structure, but fairly stable concerning total density. The sagebrush has a moderately to heavily hedged growth form. Sagebrush canopy cover averaged about 21%. Thickspike wheatgrass and Sandberg bluegrass are very abundant and lightly used. Thickspike wheatgrass increased slightly in sum of nested frequency, while Sandberg bluegrass declined slightly. Even with the fair understory, shrub interspaces are bare and there is 41% bare soil, actually lower than in 1984. Soil movement is excessive for the gentle terrain.

TREND ASSESSMENT
soil - down
browse - stable
herbaceous understory - stable

1996 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics are similar compared to 1990 estimates. Erosion is occurring but not at a high level due to the gentle terrain. Trend for browse is down, for the density of Wyoming big sagebrush declined 46%, primarily due to a drop in the number of young plants. Density of mature plants remained similar to 1984 estimates. But, the percentage of decadent plants classified as dying has increased from 9% to 28%. Yet at this time, use is more moderate and percent decadence has declined from 43% to 31%. Trend for the herbaceous understory is up slightly due to an increase in the sum nested frequency for perennial grasses and forbs. Thickspike wheatgrass declined significantly in nested frequency, while Sandberg bluegrass and bottlebrush squirreltail increased significantly. The increase in forb sum of nested frequency came largely from significant increases in hoods phlox and longleaf phlox.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - slightly up but lacking in quantity and quality

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 14

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	-	-	-	-	-	-	.00
G	Agropyron dasystachyum	206	220	202	72	85	71	1.81
G	Agropyron spicatum	a30	b13	c-	14	7	-	-
G	Oryzopsis hymenoides	a4	a11	b27	2	4	12	.21
G	Poa secunda	ab205	a178	b234	82	71	89	4.33
G	Sitanion hystrix	a15	b1	ab13	7	1	4	.07
G	Stipa comata	-	3	-	-	2	-	-
Total for Grasses		460	426	476	177	170	176	6.43
F	Alyssum alyssoides (a)	-	-	19	-	-	9	.04
F	Antennaria rosea	a38	a38	b9	15	16	4	.24

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Arabis drummondi	-	-	2	-	-	2	.01
F	Arenaria spp.	3	-	-	2	-	-	-
F	Astragalus convallarius	-	5	-	-	2	-	-
F	Astragalus moencopensis	7	7	3	2	3	1	.00
F	Astragalus utahensis	-	1	-	-	1	-	-
F	Cryptantha spp.	11	14	4	7	7	2	.06
F	Cymopterus spp.	-	-	3	-	-	2	.01
F	Erigeron pumilus	-	5	7	-	2	3	.01
F	Haplopappus acaulis	1	4	3	1	2	1	.03
F	Phlox hoodii	$_{a}$8	$_{b}$106	$_{c}$145	3	44	60	3.79
F	Phlox longifolia	$_{a}$16	$_{a}$6	$_{b}$56	6	3	26	.28
F	Ranunculus testiculatus (a)	-	-	8	-	-	5	.02
F	Trifolium spp.	5	7	-	3	3	-	-
F	Unknown forb-perennial	-	2	-	-	1	-	-
Total for Forbs		89	195	259	39	84	115	4.51

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 04 , Study no: 14

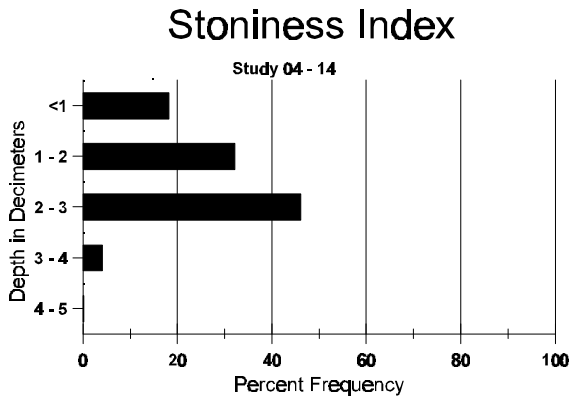
Type	Species	Strip Frequency ‘96	Average Cover % ‘96
B	Artemisia tridentata wyomingensis	88	14.79
B	Atriplex tridentata	7	.53
B	Ceratoides lanata	8	.21
B	Chrysothamnus viscidiflorus stenophyllus	82	5.54
B	Opuntia fragilis	13	.21
B	Tetradymia canescens	1	-
Total for Browse		199	21.29

BASIC COVER --
Herd unit 04 , Study no: 14

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	335	2.00	8.50	28.93
Rock	25	0	.25	.07
Pavement	119	0	.75	.63
Litter	387	43.25	31.00	27.83
Cryptogams	244	10.00	18.25	12.77
Bare Ground	344	44.75	41.25	40.43

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 14

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.7	61.0 (9.4)	8.0	44.8	26.0	29.3	1.9	5.5	67.2	.7



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 14

Type	Quadrat Frequency '96
Rabbit	9
Elk	5
Deer	24
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 14

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	84	13	1	-	-	-	-	-	-	-	14	-	-	-	933			14
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	11	11	-	-	-	-	-	-	-	22	-	-	-	1466			22
	90	18	13	1	-	-	-	-	-	-	30	2	-	-	2133			32
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	15	17	-	-	-	-	-	-	31	-	1	-	2133	13	19	32
	90	7	14	6	-	-	-	-	-	-	27	-	-	-	1800	15	18	27
	96	93	31	-	-	-	-	-	-	-	123	-	-	1	2480	18	34	124
D	84	-	4	44	-	-	-	-	-	-	30	1	14	3	3200			48
	90	10	24	9	1	-	-	-	-	-	31	9	-	4	2933			44
	96	26	29	3	-	-	-	-	-	-	42	-	-	16	1160			58
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	760			38
Total Plants/Acre (excluding Dead & Seedlings)													'84		6799	Dec:		47%
													'90		6866			43%
													'96		3700			31%
Atriplex tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	30	-	-	-	-	-	-	-	-	30	-	-	-	600	4	9	30
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		600			-
Ceratoides lanata																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	8	2	-	1	-	-	-	-	-	11	-	-	-	220	5	7	11
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		300			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Chrysothamnus viscidiflorus stenophyllus																		
Y	84	11	-	-	-	-	-	-	-	-	11	-	-	-	733			11
	90	10	3	-	-	-	-	-	-	-	12	-	1	-	866			13
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	47	-	-	-	-	-	-	-	-	47	-	-	-	3133	10	11	47
	90	13	18	2	4	-	-	1	-	-	37	1	-	-	2533	5	7	38
	96	147	2	-	11	-	-	-	-	-	156	-	-	4	3200	10	17	160
D	84	1	4	-	-	-	-	-	-	-	5	-	-	-	333			5
	90	7	9	1	1	-	-	-	-	-	13	4	1	-	1200			18
	96	43	-	-	7	-	-	-	-	-	45	-	-	5	1000			50
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		4199	Dec:		8%
													'90		4599			26%
													'96		4260			23%
Opuntia fragilis																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	4	-	-	-	-	-	-	-	-	4	-	-	-	266	4	9	4
	90	2	-	-	-	-	-	-	-	-	-	-	2	-	133	5	3	2
	96	22	-	-	-	-	-	-	-	-	22	-	-	-	440	4	15	22
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		0%
													'90		466			0%
													'96		480			8%
Tetradymia canescens																		
M	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133	7	14	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	7	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		133	Dec:		0%
													'90		0			0%
													'96		20			100%

TREND STUDY 4-15-96 (old 5-14)

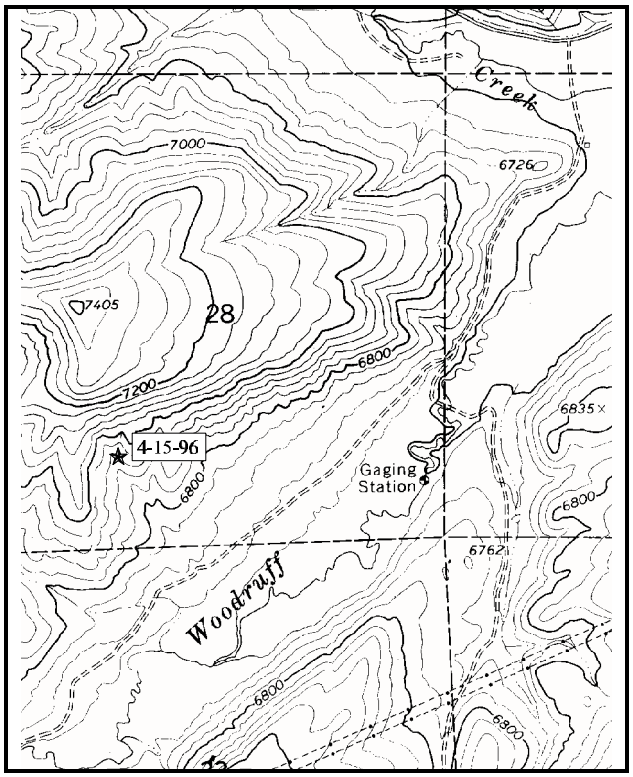
Study site name: Woodruff Creek South . Range type: Wyoming big sagebrush .

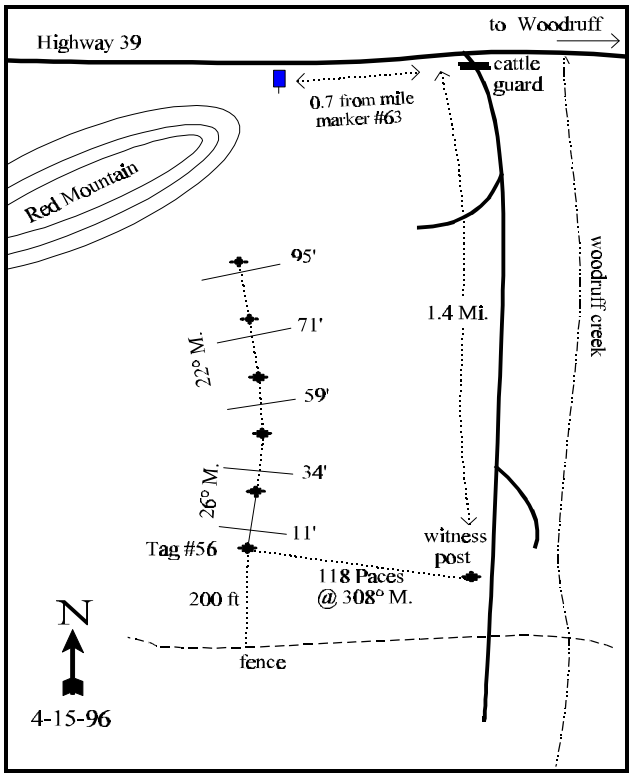
Compass bearing: frequency baseline 26 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Travel south on highway 39 and turn right (west) 0.7 miles past mile marker #63. Travel west for 1.4 miles to a witness post on the right hand side of the road. From the witness post, walk 118 paces at 308 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline stake is marked with a browse tag # 56. There is a fence 200 feet to the west from the 0-foot baseline stake. The baseline runs in a direction of 26 degrees magnetic. The baseline doglegs at the 300-foot baseline stake and runs in a direction of 22 degrees magnetic.





Map Name: Meachum Ridge Diagrammatic Sketch

Township 9N , Range 6E , Section 28 , UTM COOR: 4-76-769E 45-92-275N

DISCUSSION

Trend Study No. 4-15

The Woodruff Creek South site is a new study established in 1996. It is placed down stream from Woodruff reservoir and about 1/3 of a mile north of Woodruff creek. The site samples a Wyoming big sagebrush site with a juniper overstory which receives heavy winter deer use. Slope varies from 10% to 20% with an elevation of about 6,700 feet. Five winter killed deer were found on the site. They appear to have been dead for a few years and probably died during the particularly harsh winter of 1992-93. Deer pellet groups are fairly numerous with a quadrat frequency of 28% and elk with a frequency of 7%. Cattle have utilized the site earlier this season, but are currently grazing just west of the site on another pasture.

The soil is moderately deep but gravely. Effective rooting depth (see methods) is estimated at a little over 12 inches. Soil texture is a sandy clay loam with a neutral pH of 6.8. Infiltration is likely rapid and water holding capacity poor. Pea sized gravel covers bare areas where there is no vegetative ground cover. At about 6 inches deep, a layer of larger gravel can be detected. The soil doesn't have much structure and is dry down to about 1½ feet. There is not a lot of unprotected bare ground on the site due to the abundant herbaceous ground cover. Unfortunately most of that cover comes from cheatgrass. Erosion is not a serious problem and there are no active gullies in the area.

The site supports a moderately dense stand of Wyoming big sagebrush with an estimated density of 3,300 plants/acre. Most of the sagebrush are losing their leaves due the excessively dry conditions during late August. Seed production appears good with mostly light utilization. Seedlings are abundant with an additional 18% of the population classified as young plants. Decadent plants account for 33% of the population. Dead plants are also numerous, numbering 840 plants/acre (1:4 dead to live plant ratio), indicating a fairly rapid turnover on the site.

Other shrubs encountered include narrowleaf low rabbitbrush, prickly pear, and a few gray horsebrush. A few snowberry and winterfat plants were also seen on the site but not sampled. Juniper trees are scattered through the area. Most of the mature trees are highlined. There are quite a few young trees in the 3 to 4 foot class. Point quarter data estimated 85 trees/acre with an average diameter of 4 inches. Overhead canopy cover averages 11%.

The herbaceous understory consists of patches of thick cheatgrass. In other areas where cheatgrass is not as abundant, Sandberg bluegrass and bluebunch wheatgrass are common. Cheatgrass accounts for 63% of the total grass cover on the site. Sandberg bluegrass and bluebunch wheatgrass combine to produce 30% of the grass cover. Also fairly abundant is Indian ricegrass. Several other perennial grasses are found on the site in small numbers. Forbs are almost absent, combining to produce less than ½ of 1% cover.

1996 APPARENT TREND ASSESSMENT

The soil trend appears stable due to the gentle terrain and the sandy nature of the soil. Herbaceous cover is also abundant yet composed mostly of cheatgrass. The browse trend also appears stable. Seedlings are abundant and young sagebrush account for 18% of the population. Utilization is mostly light and vigor normal. The herbaceous understory contains several desirable perennial grasses but only Sandberg bluegrass is very abundant. Cheatgrass currently makes up 63% of the grass cover. Forbs are nearly nonexistent. Trend appears stable, but with a poor composition (too much cheatgrass) and almost nonexistent for forb species.

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 15

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron smithii	37	14	.29
G	Agropyron spicatum	52	15	1.37
G	Bromus tectorum (a)	354	87	15.76
G	Elymus cinereus	4	2	.06
G	Koeleria cristata	2	1	.00
G	Oryzopsis hymenoides	36	20	.81
G	Poa fendleriana	9	5	.22
G	Poa pratensis	1	1	.03
G	Poa secunda	257	76	6.25
G	Sitanion hystrix	22	11	.23
G	Stipa comata	2	2	.03
Total for Grasses		776	234	25.07
F	Arabis drummondi	12	6	.03
F	Astragalus convallarius	2	1	.01
F	Astragalus spp.	2	1	.03
F	Astragalus utahensis	5	2	.03
F	Chaenactis douglasii	1	1	.00
F	Cryptantha spp.	-	-	.03
F	Descurainia pinnata	6	3	.04
F	Orobanche spp.	5	2	.01
F	Phlox hoodii	6	4	.04
F	Phlox longifolia	3	1	.00
Total for Forbs		42	21	0.24

BROWSE TRENDS --
Herd unit 04 , Study no: 15

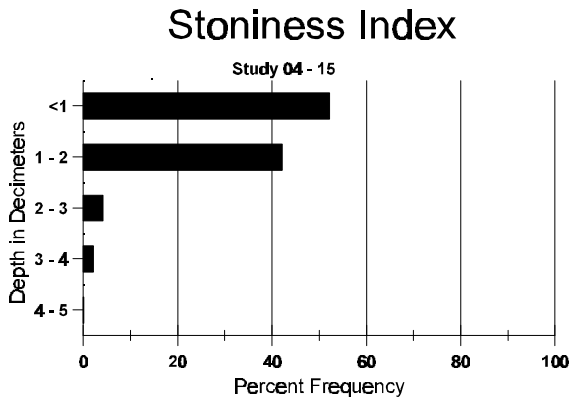
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata wyomingensis	83	10.83
B	Chrysothamnus viscidiflorus stenophyllus	58	2.68
B	Juniperus osteosperma	7	6.98
B	Opuntia fragilis	13	.16
B	Tetradymia canescens	3	.01
Total for Browse		164	20.67

BASIC COVER --
Herd unit 04 , Study no: 15

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	444	44.31
Rock	187	3.07
Pavement	266	10.89
Litter	494	46.23
Cryptogams	89	2.21
Bare Ground	219	7.96

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 15

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.3	61.0 (12.4)	6.8	53.7	19.3	27.0	2.8	20.9	204.8	.7



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 15

Type	Quadrat Frequency '96
Rabbit	13
Horse	1
Elk	7
Deer	28
Cattle	6

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 15

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	96	55	-	-	-	-	-	-	-	-	55	-	-	-	1100			55
Y	96	29	1	-	-	-	-	-	-	-	30	-	-	-	600			30
M	96	65	15	-	-	-	-	-	-	-	80	-	-	-	1600	18	36	80
D	96	38	15	1	1	-	-	-	-	-	46	-	-	9	1100			55
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	840			42
Total Plants/Acre (excluding Dead & Seedlings) '96															3300	Dec:		33%
Chrysothamnus viscidiflorus stenophyllus																		
S	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	96	111	-	-	-	-	-	-	-	-	111	-	-	-	2220	13	20	111
D	96	7	-	-	-	-	-	-	-	-	5	-	-	2	140			7
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															2540	Dec:		6%
Juniperus osteosperma																		
M	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140	-	-	7
Total Plants/Acre (excluding Dead & Seedlings) '96															140	Dec:		-
Opuntia fragilis																		
Y	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280	4	15	14
D	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															420	Dec:		5%
Tetradymia canescens																		
M	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	12	23	4
Total Plants/Acre (excluding Dead & Seedlings) '96															80	Dec:		-

TREND STUDY 4-16-96 (old 6-16)

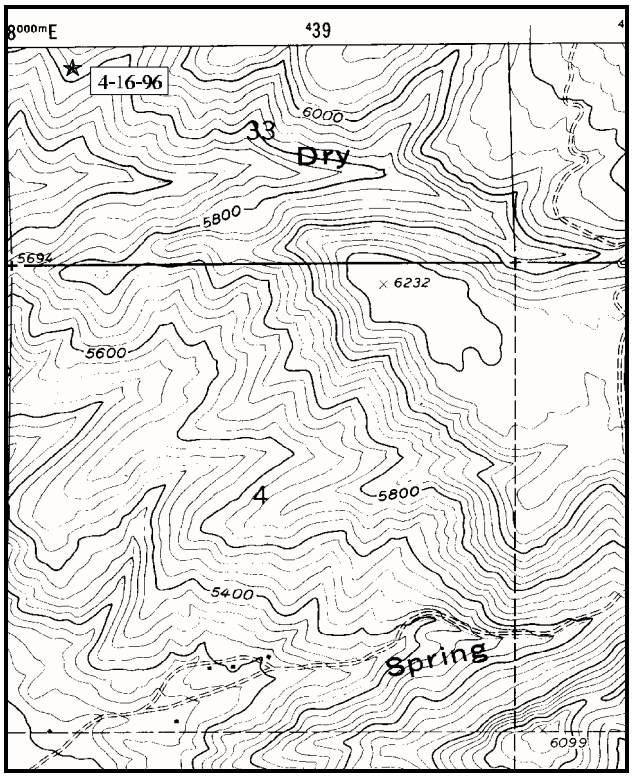
Study site name: Dry Hollow. Range type: Mountain Brush.

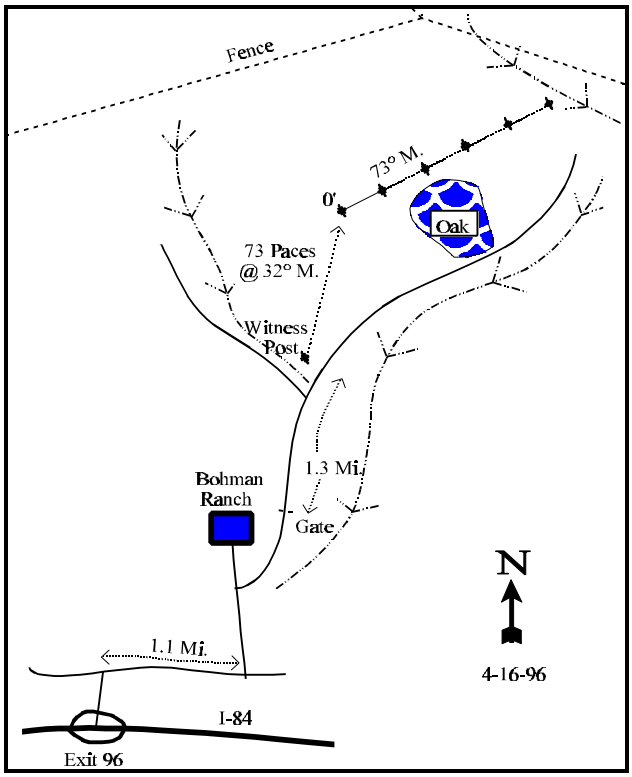
Compass bearing: frequency baseline 73 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From I-84, take exit 96 and travel north to a "T" in the road. Turn right and travel 1.1 miles. Take a left toward Bohman Ranch. Just before Bohman Ranch turn right and proceed toward a gate. From the gate, travel 1.3 miles to a witness post. From the witness post walk 73 paces at 32 degrees magnetic to the 0 foot baseline stake. The baseline runs 73 degrees magnetic.





Map Name: Morgan Diagrammatic Sketch

Township 5N, Range 2E, Section 33, UTM COOR: 4-38-262E 45-52-547N

DISCUSSION

Trend Study No. 4-16

The Dry Hollow site is new, which was established in 1996 on private land owned by Frank Bohman. It is located about 1 mile east of the Bohman Ranch in Dry Hollow. The site is on a south facing hillside about 300 feet above the hollow within a sagebrush/grass type. Slope ranges from 9% to 20%. Aspect is southwest with an elevation of 5,440. Deer and elk use this area during the winter but pellet groups were not particularly abundant this season. One large 4 point antler drop was found on the site. Cattle have been on the site this season, with this particular pasture being deferred in 1997.

The soil is shallow and rocky on the surface and throughout the profile along the first 100 feet of the baseline. Effective rooting depth (see methods) here is only 6 inches. Soil depth is deeper along the rest of the baseline with smaller gravel sized rock on the surface and within the profile. Effective rooting depth along the rest of the baseline averages 15 inches. Average for the whole site is almost 14 inches. The soil is very dark and hard with good structure. It has a clay loam texture with a neutral pH of 7.3. Due to the rock and gravel on the surface and in the profile in association with the sloping south aspect, soil temperature is very high averaging 76°F at a depth of 16 inches. This relatively high soil temperature gives winter annuals an advantage to dominate this site. Erosion is not currently a problem due to the abundant protective ground cover.

Browse on the site consists of a combination of low sagebrush (*Artemisia arbuscula)* and mountain big sagebrush (*A. tridentata vaseyana*). Low sagebrush grows primarily along the first part of the base line where rooting depth is restricted. Other browse encountered on the site include bitterbrush, woods rose, Gambel oak, snowberry, and some chokecherry. Oak clones are growing near the site but were not sampled. Utilization of the sagebrush is generally light but some of the mountain big sagebrush show moderately high utilization. Poor vigor is apparent on mountain big sagebrush along belt 2 which is near the more shallow soil where low sagebrush dominates.

Understory vegetation, like many south slopes in this area, is composed mostly of weedy perennial forbs and annual grasses. Japanese brome and cheatgrass account for 84% of the grass cover. The only perennial grasses found on the site consist of an occasional bluebunch wheatgrass plant and a slightly larger number of Sandberg bluegrass. Forbs are abundant but composed mostly of annual and weedy biennial and perennial species. The most abundant species include Louisiana sagebrush, branchy ground smoke, prickly lettuce, and yellow salsify.

1996 APPARENT TREND ASSESSMENT

Soil trend appears stable due to the abundant protective ground cover and little exposed bare ground. Trend for browse appears stable with light to moderate utilization, generally good vigor, adequate numbers of young plants, and low decadency rates. The herbaceous understory is poor and contains few valuable species, mostly weeds and annuals.

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 16

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron spicatum	5	3	.04
G	Bromus brizaeformis (a)	2	1	.00
G	Bromus japonicus (a)	349	85	11.68
G	Bromus tectorum (a)	221	56	5.80
G	Poa secunda	26	12	.45
Total for Grasses		603	157	17.99
F	Achillea millefolium	22	12	.25
F	Agoseris heterophylla	64	24	.44
F	Alyssum alyssoides (a)	68	22	.31
F	Allium spp.	9	4	.02
F	Ambrosia psilostachya	13	5	.11
F	Artemisia ludoviciana	63	25	1.37
F	Aster spp.	33	10	.87
F	Balsamorhiza sagittata	3	1	.36
F	Camelina microcarpa (a)	14	6	.03
F	Cirsium spp.	4	2	.03
F	Collomia linearis (a)	3	1	.00
F	Erodium cicutarium (a)	76	26	.43
F	Galium spp.	4	2	.01
F	Gayophytum ramosissimum	167	63	1.10
F	Grindelia squarrosa	5	3	.21
F	Helianthus spp.	18	7	.22
F	Holosteum umbellatum (a)	70	25	.12
F	Lappula occidentalis (a)	15	6	.08
F	Lactuca serriola	146	61	.88
F	Madia glomerata (a)	12	5	.02
F	Phlox longifolia	21	8	.09
F	Polygonum douglasii (a)	37	16	.08
F	Ranunculus testiculatus (a)	28	11	.05
F	Sisymbrium altissimum (a)	3	1	.15
F	Taraxacum officinale	2	1	.00
F	Tragopogon dubius	270	78	5.87
F	Verbascum blattaria	5	1	.00
F	Vicia americana	21	11	.08
Total for Forbs		1196	437	13.25

BROWSE TRENDS --
Herd unit 04 , Study no: 16

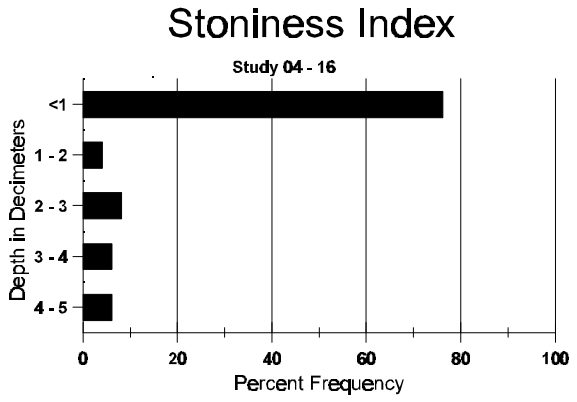
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	1	-
B	Artemisia arbuscula	12	3.07
B	Artemisia tridentata vaseyana	45	8.64
B	Chrysothamnus nauseosus consimilis	4	1.08
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Gutierrezia sarothrae	15	.25
B	Mahonia repens	5	.45
B	Purshia tridentata	1	.03
B	Rosa woodsii	4	.30
B	Symphoricarpos oreophilus	3	1.82
Total for Browse		91	15.65

BASIC COVER --
Herd unit 04 , Study no: 16

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	486	54.15
Rock	222	5.23
Pavement	256	2.20
Litter	499	64.69
Cryptogams	20	.06
Bare Ground	201	4.60

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.5	76.0 (16.1)	7.3	38.7	28.0	33.3	3.4	18.8	214.4	.8



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 16

Type	Quadrat Frequency '96
Rabbit	2
Elk	1
Deer	9
Cattle	4

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 16

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	23	28	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Artemisia arbuscula																		
Y	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	96	23	10	-	-	-	-	-	-	-	33	-	-	-	660	11	27	33
D	96	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															760	Dec:		8%
Artemisia tridentata vaseyana																		
Y	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	96	41	33	-	-	-	-	-	-	-	54	-	20	-	1480	24	40	74
D	96	-	5	-	-	-	-	-	-	-	4	-	1	-	100			5
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
Total Plants/Acre (excluding Dead & Seedlings) '96															1740	Dec:		6%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus consimilis																		
M	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	30	50	2
D	96	1	-	-	1	-	-	-	-	-	1	-	-	1	40			2
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															80	Dec:		50%
Chrysothamnus viscidiflorus viscidiflorus																		
M	96	1	-	-	-	-	-	-	-	-	-	-	1	-	20	16	26	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Gutierrezia sarothrae																		
Y	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	96	28	-	-	1	-	-	-	-	-	29	-	-	-	580	10	11	29
Total Plants/Acre (excluding Dead & Seedlings) '96															640	Dec:		-
Mahonia repens																		
Y	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	96	72	-	-	-	-	-	-	-	-	72	-	-	-	1440	3	6	72
Total Plants/Acre (excluding Dead & Seedlings) '96															1620	Dec:		-
Prunus spp.																		
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	20	0
Total Plants/Acre (excluding Dead & Seedlings) '96															0	Dec:		-
Purshia tridentata																		
M	96	-	-	-	-	1	-	-	-	-	1	-	-	-	20	17	61	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Rosa woodsii																		
S	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	15	24	15
D	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															540	Dec:		4%
Symphoricarpos oreophilus																		
M	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	29	50	3
Total Plants/Acre (excluding Dead & Seedlings) '96															60	Dec:		-

TREND STUDY 4-17-96 (old 6-15)

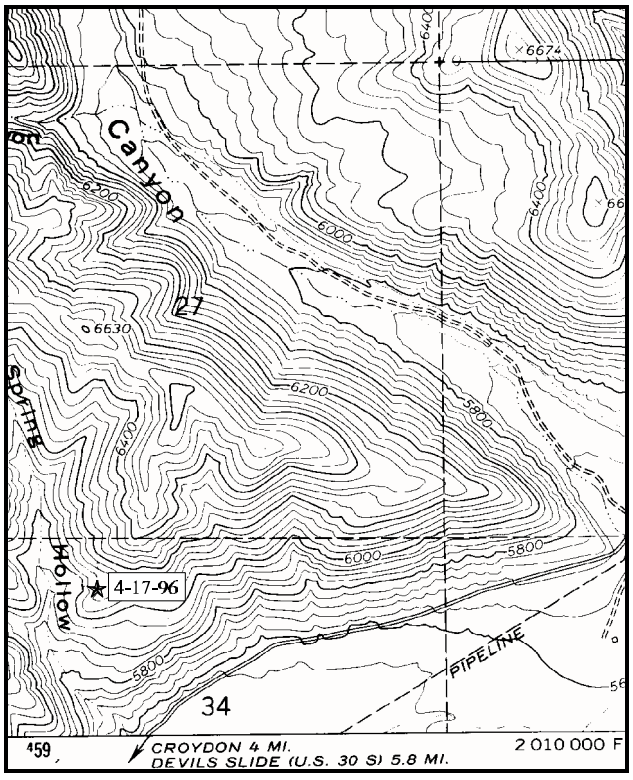
Study site name: Above Toon Ranch . Range type: Mountain big sagebrush .

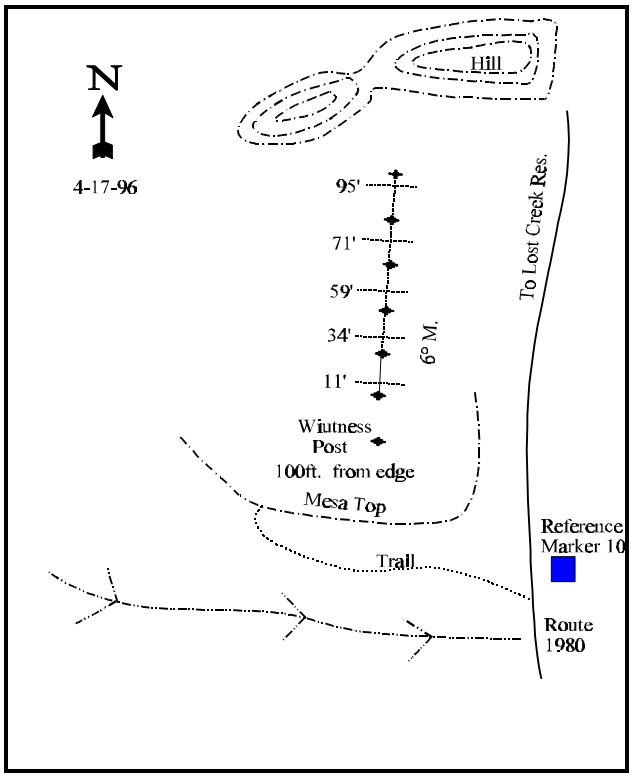
Compass bearing: frequency baseline 6 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Drive up the main road towards Lost Creek Reservoir. Stop at the reference marker 10 route 1980. Walk up the trail on the west side of the road until you reach the mesa top. A witness post will be visible about 100 feet from the edge of the mesa. From the witness post walk 100 feet to the north to the 0-foot baseline stake. The baseline runs in a direction of 6 degrees magnetic.





Map Name: Lost Creek Dam Diagrammatic Sketch

Township 5N , Range 4E , Section 34 , UTM COOR: 4-59-253E 45-53-017N

DISCUSSION

Trend Study No. 4-17

The above Toon Ranch study is a new site put in place in 1996. It samples a gently sloping bench above the Lost Creek Valley which is a natural place for deer to congregate during the winter. The site supports a dense stand of mountain big sagebrush with a mostly cheatgrass understory. Slope on the site is about 19% with a south aspect. Elevation is approximately 6,120 feet. Deer pellet groups are abundant, quadrat frequency of 29%. Some elk and sheep sign was also found. The land owner grazes sheep on the site during the fall and winter. The site is isolated from the road and some of the sagebrush is tall enough to provide some cover.

The soil is moderately deep with a small amount of rock on the surface and in the profile. A hard clay layer was encountered at about 10 inches, which restricted effective soil depth measurements. As a result effective rooting depth (see methods) is estimated at just a little over 11 inches. Soil texture is a loam with a slightly acid pH of 6.5. There is little bare ground on the site (1%) due to the abundant cheatgrass. As a result, erosion is not a problem here.

The site supports a dense stand of mostly mature and vigorous mountain big sagebrush in association with some rabbitbrush. Density of sagebrush is estimated at nearly 3,000 plants/acre. Mature plants are large averaging nearly 3 feet in height. Canopy cover of the sagebrush averages 28%. Utilization is mostly light. There are a considerable number of dead plants, but this appears to be natural turnover as decadency is low at only 10% and the stand appears to have reached its maximum density. Seedlings and young appear adequate to maintain the stand. Stickyleaf low rabbitbrush is more abundant than sagebrush, but these shrubs are much smaller and contribute to only 11% of the total browse cover. Age class distribution indicates a stable population.

The herbaceous understory is dominated by cheatgrass which accounts for 91% of the total grass cover and 70% of the total herbaceous cover. It is dense enough to pose a serious fire hazard. Three other species of perennial grass occur on the site with moderate abundance. These include, bluebunch wheatgrass, Great Basin wildrye, and Sandberg bluegrass. Forbs are very diverse, yet the only abundant species include western yarrow and American vetch. The majority of the other species encountered are annuals.

1996 APPARENT TREND ASSESSMENT

The soil trend appears stable due to the small amount of unprotected bare ground (1%) and the gentle terrain. The browse trend also appears stable. Use is mostly light and vigor generally good. The dense mountain big sagebrush appears to have reached its maximum density, but some further crown development may still occur. This would come at the loss of understory species however. High intensity fall grazing with sheep could benefit the understory. The herbaceous understory is depleted. Cheatgrass currently dominates by producing 91% of the total grass cover.

HERBACEOUS TRENDS --
Herd unit 04 , Study no: 17

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron spicatum	33	16	.87
G	Bromus japonicus (a)	8	4	.04
G	Bromus tectorum (a)	452	99	31.50
G	Elymus cinereus	5	3	.82
G	Poa secunda	68	23	1.46
Total for Grasses		566	145	34.70
F	Achillea millefolium	100	30	4.02
F	Agoseris heterophylla	22	13	.09
F	Alyssum alyssoides (a)	131	47	1.25
F	Allium spp.	12	6	.03
F	Artemisia ludoviciana	1	1	.63
F	Aster chilensis	77	29	.66
F	Camelina microcarpa (a)	68	27	.26
F	Cirsium spp.	12	6	.03
F	Collomia linearis (a)	12	5	.02
F	Collinsia parviflora (a)	24	12	.06
F	Cryptantha spp.	14	5	.07
F	Descurainia pinnata	6	3	.02
F	Draba spp. (a)	18	7	.06
F	Galium spp.	5	3	.01
F	Holosteum umbellatum (a)	61	23	.33
F	Lappula occidentalis (a)	5	2	.01
F	Lactuca serriola	1	1	.00
F	Machaeranthera spp	4	2	.01
F	Polygonum douglasii (a)	9	2	.01
F	Sisymbrium altissimum (a)	6	5	.02
F	Veronica biloba (a)	2	1	.03
F	Vicia americana	289	93	2.44
Total for Forbs		879	323	10.11

BROWSE TRENDS --
Herd unit 04 , Study no: 17

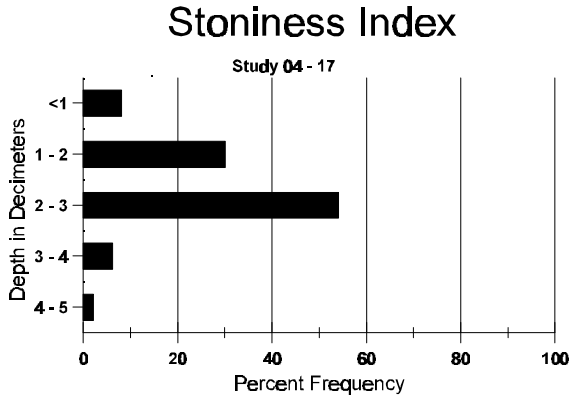
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	86	27.64
B	Chrysothamnus viscidiflorus viscidiflorus	69	3.37
Total for Browse		155	31.01

BASIC COVER --
Herd unit 04 , Study no: 17

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	486	64.87
Rock	37	.22
Pavement	40	.20
Litter	499	75.83
Cryptogams	47	.52
Bare Ground	69	1.00

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 17

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.2	58.4 (12.7)	6.5	41.3	32.7	27.0	3.4	30.9	153.6	.5



PELLET GROUP FREQUENCY --
Herd unit 04 , Study no: 17

Type	Quadrat Frequency '96
Sheep	3
Rabbit	2
Elk	4
Deer	29

BROWSE CHARACTERISTICS --
Herd unit 04 , Study no: 17

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	96	9	1	-	-	-	-	-	-	-	9	-	1	-	200			10
M	96	111	8	-	-	-	-	-	-	-	111	-	8	-	2380	34	52	119
D	96	15	-	-	-	-	-	-	-	-	10	-	1	4	300			15
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1040			52
Total Plants/Acre (excluding Dead & Seedlings) '96															2880	Dec:		10%
Chrysothamnus viscidiflorus viscidiflorus																		
S	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	96	13	-	-	3	-	-	-	-	-	16	-	-	-	320			16
M	96	111	-	-	35	-	-	-	-	-	146	-	-	-	2920	13	21	146
D	96	4	-	-	-	-	-	-	-	-	3	-	-	1	80			4
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings) '96															3320	Dec:		2%

SUMMARY

HERD UNIT 4 - Morgan - Rich

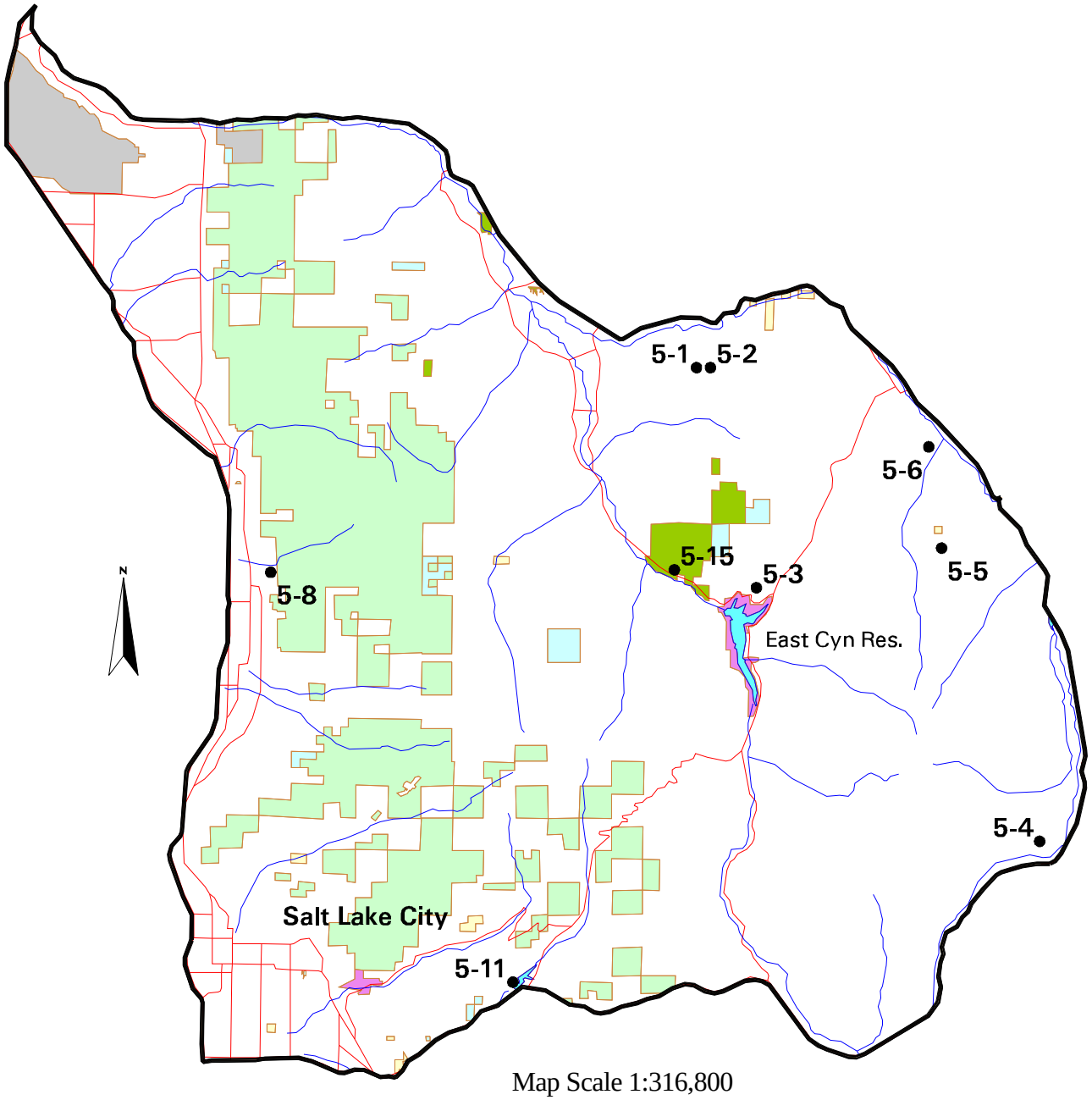
Eight study sites read in 1996 were rereads from sites established in 1984. Two additional sites, Bennett Creek (#4-12) and Wheatgrass Hollow (#4-13), were established in 1990 and reread in 1996. Three new sites located at Woodruff Creek South (#4-15), Dry Hollow (#4-16) and Above Toon Ranch (#4-17) were added in 1996. Four sites established in 1984 including, Owen's Canyon (#4-4), Croyden Access Road (#4-7), Big Hollow (#4-10) and Causey Dam (#4-11) were not read in 1996 and will be discontinued from the trend study list.

All sites read in 1996 show stable to improving soil trends and all accept Bennett Creek and Chapman Canal, show stable to improving browse trends. The main unit wide problem is the poor condition and composition of the herbaceous understories. Most of the sites have understories dominated by annual grasses and weedy forbs. Due to the rocky nature of many of the sites in association with south aspects, soil temperatures are relatively high which gives winter annuals a competitive advantage against native grasses often under spring grazing regimes. A summary table follows with 1990 and 1996 trends summarized.

TREND SUMMARY, UNIT - 4 - MORGAN-RICH

Site	1990			1996		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
4-1 Heiner's Creek	slightly down	slightly down	slightly down	up slightly	up slightly	up
4-2 Echo Canyon	up	down	stable	stable	up	up but poor
4-3 Tank Canyon	stable	down	up	up	stable	up slightly
4-4 Owen's Canyon	stable	stable	up slightly but poor	up slightly	stable	up slightly but poor
4-5 Owen's Canyon Bench	down	down	down	Not read in 1996		
4-6 Harris Canyon	down	up slightly	up slightly	up	up	down slightly
4-7 Croyden Access Road	stable	stable	stable	Not read in 1996		
4-8 Shell Hollow	down	down slightly	up slightly but poor	up	stable	up slightly but poor
4-9 Scott Rees Ranch	stable	stable	up slightly	up slightly	stable	down slightly
4-10 Big Hollow	down	down	down	Not read in 1996		
4-11 Causey Dam	stable	stable	stable	Not read in 1996		
4-12 Bennett Creek	Established in 1990			stable	down	down slightly and poor
4-13 Wheatgrass Hollow	Established in 1990			stable	stable	stable but depleted
4-14 Chapman Canal	down	stable	stable	stable	down	up slightly but poor
4-15 Woodruff Creek South	New site established in 1996			stable	stable	stable but poor forbs
4-16 Dry Hollow	New site established in 1996			stable	stable	stable but poor
4-17 Above Toon Ranch	New site established in 1996			stable	stable	stable but poor

East Canyon Management Unit



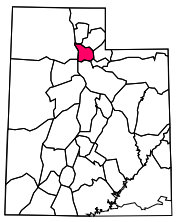
Map Scale 1:316,800

1 inch = 5 miles

Legend

- Forest Service
- Bureau of Land Management
- State of Utah
- Private Land
- Military Reservation
- State Wildlife Ref.
- State Park
- Water Body
- Transect Location
- Road
- Water Course

Unit Location



UDAF GIS May, 2000

HERD UNIT - 5 - EAST CANYON

Boundary Description

Morgan, Summit, Salt Lake, and Davis counties - Boundary begins at the junction of I-80 and I-84 (Echo Junction); southwest on I-80 to I-15 to its junction with I-84 near Ogden; east on I-84 to Echo Junction and I-80 and beginning point.

Introduction

The East Canyon deer herd unit is located mostly on the east side of the Wasatch Mountains. Topography varies across the unit from fairly deep canyons and steep slopes in the western portion to more gentle open slopes and fewer cliffs in the east. Most of the unit is drained by the Weber River. Several creeks along the north and east edges of the unit drain directly into the river. East Canyon Creek flows into the Weber River unit. A large impoundment on East Canyon Creek is located approximately in the center of the unit. The highest elevations are along the western boundary on peaks of the Wasatch Range which reach above 9,500 feet. The lowest point is 4,800 feet in the northwest corner where the Weber River flows out of the unit.

The upper limits of normal winter range are generally considered to be about 7,000 feet. Winter range is found in the major drainages and around East Canyon Reservoir. All of the valleys have been developed for agriculture and housing. The major canyons; Weber, East and Main Canyons, contain housing developments and high-use roads. The northern, eastern, and southern boundaries are formed by Interstate 80. Other narrower and higher elevation canyons have seasonal roads. The area is highly developed because a majority of the unit is private land. Eighty-three percent of the winter range, and 76% of the summer range is under private ownership. Not only is acreage of winter range limited, but the quality is compromised by development and roads. Many deer that summer on the unit migrate over to the Davis County herd unit on the Wasatch Face to winter. Winter migration onto the unit is minimal.

Most of the winter range is encompassed by sagebrush range types. In the original inventory in 1972, King and Olson described almost three-quarters of the winter range as a mixture of black sagebrush on the ridgetops and big sagebrush down the slopes with the deeper soils. This type has a good mix of browse species and can provide substantial forage for wintering deer. The browse type, 20% of the range, is composed mainly of big sagebrush and Gambel oak. Other range types are agricultural land and burns.

Recently, increased numbers of people and deer have lead to conflicts and degradation of the winter range. Heavy deer and livestock use has resulted in apparent downward trends on much of the range. Soil erosion, removal of perennial herbaceous cover, and heavy use of browse species are the major problems. Highway mortality occurs, but is not as high here as on surrounding units. Harvesting depredating deer is difficult because of access restrictions to private land. Reducing the deer herd to within the carrying capacity of the winter range must be done with the cooperation and support of local interest groups since a majority of the land is privately-owned.

The management objective is to maintain a wintering target deer herd population of approximately 8,500 deer. Of interest is a regression of the buck harvest since 1950, it shows that harvests started at about 717 to 2,033 in 1990. This comes very close to the proposed management objective. However, it may be necessary to harvest additional antlerless animals to balance the herd, reduce deer numbers and allow the range to recover. Production on the herd unit is apparently high, averaging 89 fawns per 100 does in preseason classification counts for the period 1974-1984 (Jense et al. 1985). The number of regular

season hunters has continued to decline from a high of 7,109 in 1981. Concurrently, the number of bucks harvested in 1984 (960) was the lowest number since the early 1970's.

The East Canyon deer herd unit, like the neighboring Lost Creek unit, is dominated by management concerns related to the fact that a majority of the unit is under private ownership. The concerns listed in the 1984 trend study report (Giunta et al 1986) remain today, especially relating to access, range management, and rehabilitation and development on the privately owned winter range. The DWR recently purchased winter range in the Redrock Canyon area. The unit remains on the top priority list of units requiring winter habitat acquisition.

All of the valleys in the unit have been developed for agriculture, human habitation, and related highways and fences. Sagebrush range types dominate on the winter range, but there are also important areas of oakbrush and mixed mountain brush.

TREND STUDY 5-1-96 (old 8-1)

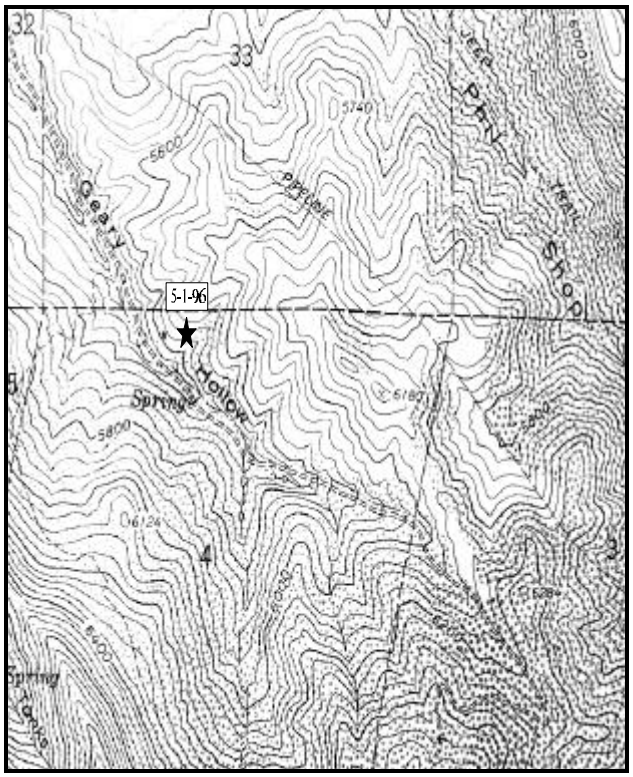
Study site name: Geary Hollow. Range type: Mixed mountain brush.

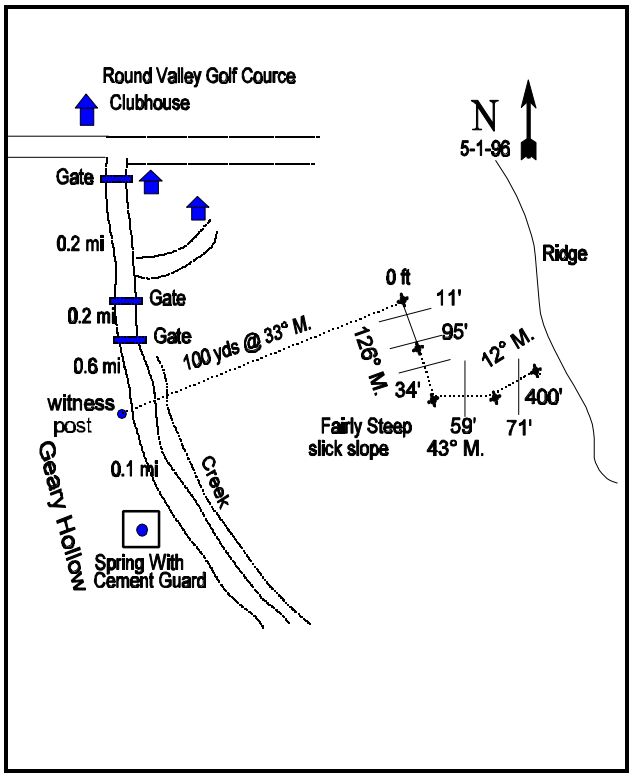
Compass bearing: frequency baseline 126 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Morgan, travel to Round Valley Golf Course, passing Como Springs. Take the first right past the clubhouse and go through a gate. Proceed up Geary Hollow 0.2 miles to another gate. Proceed through gate, and travel 0.2 miles to another gate. Proceed 0.6 miles to 5-foot high green steel stake witness post on the right hand side of road. From the witness post walk 100 yards at 33 degrees magnetic to the 0-foot stake of the baseline. No mention of a browse tag on field narrative. The baseline stake runs 126 degrees magnetic for 200 feet. At the 200-foot baseline stake line three of the baseline doglegs and runs in a direction of 43 degrees magnetic. Line four doglegs and runs in a direction of 12 degrees magnetic.





Map Name: Devil's Slide Diagrammatic Sketch

Township 3N, Range 3E, Section 4, UTM COOR: 4-48-129E 45-42-134N

DISCUSSION

Trend Study No. 5-1 (8-1)

The Geary Hollow study is on a steep (50-55%) south southwest facing slope within Geary Hollow at an elevation of 5,500 feet. Although purportedly a critical deer winter range, the study area seems most heavily impacted by domestic sheep which were reported on the site in 1984. Deer pellet groups were occasionally observed. This side of the canyon is quite different than the opposite side. This side is dry with mountain big sagebrush and oak dominating. The opposite side supports a more dense mixed mountain brush community. Water is available about 100 yards downslope from the study.

Soil is "Henhoit Gravelly Loam," a very deep and well-drained soil derived from sandstone-quartzite conglomerate. This soil has a reddish brown color and textural analysis indicates a sandy clay loam with a slightly alkaline pH. Rock and pavement surface cover averages 16%, but increases to 60% or more in the subsoil. Henhoit soil, apart from rocks, becomes more clay-like with increasing depth. Permeability is moderately slow and available water capacity is moderate. The erosion hazard is high (Carley et al. 1980). The study site is steep and rocky but has good vegetative and litter cover values. Percent bare ground cover has slowly declined to about 2% since the initial reading in 1984 of almost 9%. Erosion is most common on sheep trails but is not presently a serious problem.

Browse composition includes several species typically found on mixed mountain brush sites. Most abundant and productive are Gambel oak and mountain big sagebrush. These are the key management species. Mountain big sagebrush currently forms a relatively limited population with an estimated density of 1,660 plants/acre. This population has remained fairly constant over the years. Age structure reveals that the population is becoming increasingly decadent with no seedlings encountered in any year. This is not surprising when one notes how dominant that cheatgrass is in the understory with no safe sites for seedlings to become established. Height and crown measurements have increased to 36 inches and 50 inches respectively. Gambel oak is a vigorous but a somewhat low-growing population that sustains moderate use. Oak does not appear to be expanding with higher decadency and reduced vigor noted since 1990. With the increased sample size used in 1996, line 4 did not sample any oakbrush so the density between years will be somewhat lower. Broom snakeweed density has an estimated density of 2,220 plants/acre in 1996 with a mostly mature age structure. Other shrubs include Saskatoon serviceberry, mountain snowberry, stickyleaf low rabbitbrush, white rubber rabbitbrush, and an occasional antelope bitterbrush.

Understory plants are primarily grasses and secondarily forbs. Perennial grasses consist of a low density stand of bluebunch wheatgrass, Sandberg bluegrass, muttongrass, and Indian ricegrass. Sum of nested frequency for bluebunch wheatgrass has significantly increased since 1990. Cheatgrass and Japanese brome are very dense and completely cover the interspaces between shrubs. Among forbs, yellow salsify and Louisiana sage are the most abundant perennial species. Many annual species are present with pale alyssum being the most abundant.

1984 TREND ASSESSMENT

Soil trend is stable. Although the area is steep, rocky, and potentially erodible, the current rate of soil loss is within acceptable limits. Vegetative trend is down slightly because of the apparent decline of mountain big sagebrush and a rather poor quality understory. Any loss of plant diversity should be considered a negative factor.

1990 TREND ASSESSMENT

This lightly used winter range displays a stable, moderately dense stand of mountain big sagebrush in association with a low-growing population of Gambel oak. The oak has decreased in density (40%) and in frequency since 1984. Fewer, but larger, oak of all age classes were counted in 1990. The oak are more lightly to moderately hedged in 1990, but half of the plants have reduced vigor due largely to insect infestation. Cheatgrass remains prominent, but the limited perennial herbaceous species have increased slightly. Soil erosion still occurs in limited areas.

TREND ASSESSMENT
soil - stable
browse - stable, thinning of oak and increase in sagebrush
herbaceous understory - improving, but still too many weedy species

1996 TREND ASSESSMENT

The soil trend is stable at this time with abundant vegetative and litter cover. Percent bare ground cover declined slightly and there is no erosion apparent. The mountain big sagebrush density has remain relatively constant over all years but percent decadency has increased. Gambel oakbrush does not appear to be expanding at this time. Broom snakeweed has increased in density since the initial reading in 1984 but now appears to be stabilized at 2,220 plants/acre. Browse trend is stable. With a significant increase in bluebunch wheatgrass the herbaceous trend is slightly upward, but cheatgrass and Japanese brome still dominate the site by providing 96% of the grass cover and will likely do so for quite some time. Forb cover is sparse and adds very little to the herbaceous understory.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly upward, but very poor composition with too many annuals

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 1

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	[a]12	[a]20	[b]74	6	11	33	1.20
G	Bromus brizaeformis (a)	-	-	17	-	-	6	.08
G	Bromus japonicus (a)	-	-	265	-	-	83	8.22
G	Bromus tectorum (a)	-	-	365	-	-	98	29.79
G	Oryzopsis hymenoides	-	-	8	-	-	3	.39
G	Poa fendleriana	-	-	3	-	-	1	.00
G	Poa secunda	[a]-	[b]11	[b]30	-	5	11	.13
Total for Grasses		12	31	762	6	16	235	39.82
F	Achillea millefolium	1	1	-	1	1	-	-
F	Agoseris glauca	-	3	8	-	1	3	.04
F	Alyssum alyssoides (a)	-	-	96	-	-	36	.43

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Artemisia ludoviciana	$_{a}$90	$_{b}$30	$_{b}$19	36	15	9	.48
F	Astragalus spp.	8	-	1	3	-	1	.00
F	Balsamorhiza sagittata	-	3	-	-	1	-	-
F	Camelina microcarpa (a)	-	-	2	-	-	1	.01
F	Castilleja spp.	-	-	4	-	-	2	.03
F	Cirsium spp.	$_{a}$1	$_{b}$12	$_{a}$2	1	9	1	.01
F	Collomia linearis (a)	-	-	9	-	-	4	.02
F	Cryptantha spp.	2	-	-	1	-	-	-
F	Erodium cicutarium (a)	-	-	7	-	-	4	.04
F	Galium aparine (a)	-	-	14	-	-	6	.03
F	Hackelia patens	$_{a}$-	$_{ab}$3	$_{b}$5	-	1	4	.19
F	Holosteum umbellatum (a)	-	-	39	-	-	16	.08
F	Lathyrus brachycalyx	$_{a}$-	$_{a}$1	$_{b}$12	-	1	7	.11
F	Lappula occidentalis (a)	-	-	1	-	-	1	.00
F	Lactuca serriola	$_{a}$-	$_{a}$3	$_{b}$28	-	1	14	.09
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{b}$13	-	-	6	.03
F	Sisymbrium altissimum (a)	-	-	4	-	-	2	.06
F	Tragopogon dubius	75	100	94	32	45	42	1.52
F	Veronica biloba (a)	-	-	5	-	-	2	.01
F	Zigadenus paniculatus	-	1	-	-	1	-	-
Total for Forbs		177	157	363	74	76	161	3.23

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 1

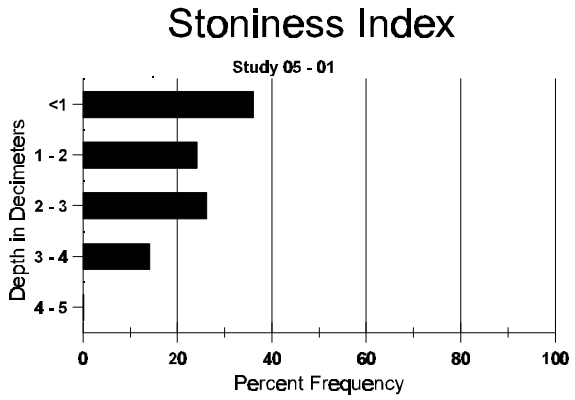
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	5	.96
B	Artemisia tridentata vaseyana	50	10.23
B	Chrysothamnus nauseosus albicaulis	2	.38
B	Chrysothamnus viscidiflorus viscidiflorus	4	.18
B	Gutierrezia sarothrae	37	1.69
B	Quercus gambelii	43	9.25
B	Symphoricarpos oreophilus	8	2.91
Total for Browse		149	25.60

BASIC COVER --
Herd unit 05 , Study no: 1

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	387	1.50	6.75	63.76
Rock	239	19.50	20.75	14.53
Pavement	71	4.75	7.75	1.61
Litter	398	65.75	58.25	60.35
Cryptogams	3	0	0	.00
Bare Ground	70	8.50	6.50	1.63

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.0	75.4 (10.9)	7.6	45.7	21.0	33.3	2.6	13.0	124.8	.6



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 1

Type	Quadrat Frequency '96
Deer	5

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	2	-	-	-	-	-	-	2	-	-	-	133	10	7	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	2	-	-	1	-	-	-	4	-	-	-	80	22	38	4
D	84	-	-	4	-	-	-	-	-	-	-	-	4	-	266			4
	90	-	1	2	-	-	1	-	-	-	-	-	-	4	266			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		399	Dec:		67%
													'90		266			100%
													'96		100			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata vaseyana																		
Y	84	-	7	-	-	-	-	-	-	-	7	-	-	-	466			7
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	96	9	2	-	-	-	-	-	-	-	11	-	-	-	220			11
M	84	-	5	6	-	-	-	-	-	-	11	-	-	-	733	18	15	11
	90	14	5	-	-	-	-	-	-	-	19	-	-	-	1266	24	26	19
	96	29	19	7	2	-	-	-	-	-	57	-	-	-	1140	36	50	57
D	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	1	1	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	5	4	2	4	-	-	-	-	-	9	-	2	4	300			15
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
Total Plants/Acre (excluding Dead & Seedlings)													'84		1332	Dec:		10%
													'90		1665			8%
													'96		1660			18%
Chrysothamnus nauseosus albicaulis																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	20	17	2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		40			-
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	-	-	1	-	-	-	-	-	6	-	-	-	120	10	20	6
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		140			14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	2	2	-	-	-	-	-	-	-	4	-	-	-	266			4
	90	29	-	-	-	-	-	-	-	-	29	-	-	-	1933			29
	96	11	-	-	2	-	-	-	-	-	13	-	-	-	260			13
M	84	6	-	-	-	-	-	-	-	-	6	-	-	-	400	15	12	6
	90	24	-	-	-	-	-	-	-	-	24	-	-	-	1600	9	10	24
	96	93	-	-	5	-	-	-	-	-	98	-	-	-	1960	12	11	98
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	1	-	-	1	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		666	Dec:		0%
													'90		3666			4%
													'96		2220			0%
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	-	34	-	-	-	-	-	-	-	34	-	-	-	2266			34
	90	33	25	2	8	-	-	-	-	-	44	19	4	1	4533			68
	96	28	2	3	-	-	-	-	-	-	33	-	-	-	660			33
M	84	4	84	35	1	-	-	-	-	-	124	-	-	-	8266	23	9	124
	90	4	3	-	-	-	-	-	-	-	1	6	-	-	466	32	23	7
	96	25	73	8	-	2	-	-	-	-	108	-	-	-	2160	26	50	108
D	84	-	1	12	-	-	-	-	-	-	13	-	-	-	866			13
	90	9	16	3	-	-	-	-	-	-	7	13	2	6	1866			28
	96	1	-	7	-	-	-	-	-	-	7	-	-	1	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'84		11398	Dec:		8%
													'90		6865			27%
													'96		2980			5%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Symphoricarpos oreophilus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	2	-	-	-	-	-	5	-	-	-	100			5
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	1	-	-	-	-	-	-	-	-	-	1	66	22	23	1
	96	8	1	-	1	-	-	-	-	-	10	-	-	-	200	21	49	10
D	84	-	-	2	-	-	-	-	-	-	-	-	2	-	133			2
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		133	Dec:		100%
													'90		132			50%
													'96		300			0%

TREND STUDY 5-2-96 (old 8-4)

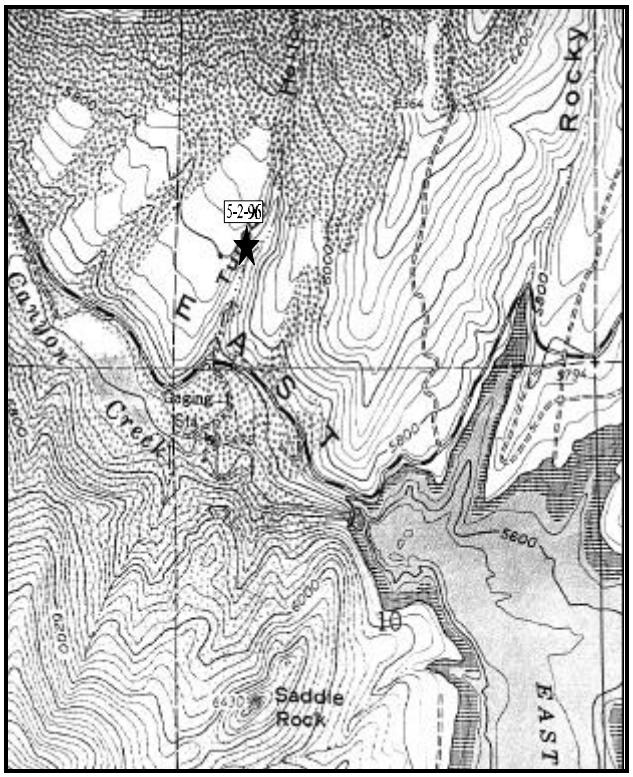
Study site name: Tuscon Hollow . Range type: Mixed mountain brush .

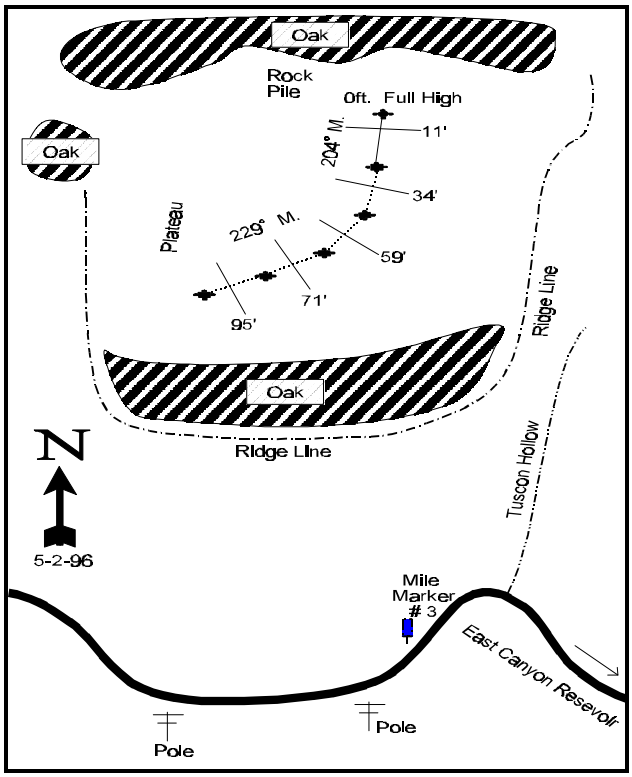
Compass bearing: frequency baseline 204 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the dam at East Canyon Reservoir, proceed 0.2 miles northwest past Tuscon Hollow, and stop near mile marker 3. Walk up the slop (to the northeast) to the plateau. Walk through the oak stand bordering the ridgeline continuing northeast. Look for an oblong stand of oak on the left. Continue toward to larger stand of oak on the right and ahead. Walk around the left side of the oak to a rock monument. Walk 6.5 paces at 129 degrees magnetic to the 0-foot stake of the baseline marked by browse tag #7973. The baseline runs 208 degrees magnetic. At the 200-foot baseline stake the baseline doglegs and runs 229 degrees magnetic.





Map Name: East Canyon Reservoir Diagrammatic Sketch

Township 2N , Range 3E , Section 3 , UTM COOR: 4-48-821E 45-30-887N

DISCUSSION

Trend Study No. 5-2 (8-4)

The Tuscon Hollow study was originally placed in a thick patch of Gambel oak. Because there was very little utilization apparent in the dense oak, the site was moved just south of the original study. The site now samples a Basin big sagebrush/grass opening about 25 to 30 acres in size. Aspect on the site is south with a slope of 3%. In 1990, three winter-killed deer were found in the immediate vicinity as well as several antler drops. Pellet groups are scattered throughout for elk and deer. There were more pellet groups for deer than elk. There was light to moderate hedging of most browse species.

Soil is 'Manila Loam," a classification that occurs only on localized mountain slopes. Soil textural analysis indicates a clay loam soil with a slightly acidic pH. This soil has limited crop and pasture capability and is highly susceptible to "slippage." It is moderately deep with a reddish-brown color. Few rocks were encountered in the soil profile and the effective rooting depth (see methods) is estimated at almost 13 inches. Water permeability is slow and available water capacity is high, as is the erosion hazard. The site has a good vegetative and litter cover that precludes most erosion.

Basin big sagebrush has an estimated density of 1,400 plants/acre. Seventy-six percent of the plants were classified as mature with a decadency rate of 18%. No seedlings were classified. Average plant height was 26 inches with a crown width of 35 inches. Stickyleaf low rabbitbrush has an estimated density of 2,000 plants/acre that are nearly the same size as the basin big sagebrush. Almost all plants were classified as mature and some utilization was apparent. The shrub species with the highest density was Oregon grape with an estimated density of 8,680 plants/acre. These plants are very small measuring only 5 inches in height with a 6 inch crown. This is a mostly mature population with no utilization visible. Antelope bitterbrush, Saskatoon serviceberry, and chokecherry are scattered throughout the site and exhibit moderate to heavy hedging. Other browse includes white rubber rabbitbrush, blueberry elder, and snowberry.

Herbaceous understory is moderately productive with good diversity. However, cheatgrass dominates the understory, making up 42% of the herbaceous cover, followed by Japanese brome. The abundance of these two species could suppresses browse seedling establishment. Some perennial grasses are present, these include Sandberg bluegrass, Kentucky bluegrass, bluebunch wheatgrass, and Great Basin wildrye.

Forbs are diverse with 26 species encountered in 1996. Some of the larger forbs include silvery lupine, oneflower helianthella, and Pacific aster. Other forbs are in relatively low numbers and add little to overall herbaceous understory cover.

1996 APPARENT TREND ASSESSMENT

The soil trend appears stable with abundant vegetative and litter cover. Bare ground cover is estimated at below 4%. Erosion was not evident in 1996. Browse species do not appear to be expanding at this time with most exhibiting mature stable populations. The abundant annual grasses will out-compete browse seedlings for early season soil moisture most years, not allowing them to become easily established. Some browse show heavy utilization, but these are the species that occur in low densities. Herbaceous understory is dominated by annual species, primarily cheatgrass and Japanese brome, which contributes to 54% of the herbaceous cover. Removing these species from the understory would be difficult. There are some perennial grasses present that are more desirable, but they only contribute 13% of the total herbaceous cover.

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 2

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron spicatum	33	12	1.09
G	Bromus japonicus (a)	344	85	14.94
G	Bromus tectorum (a)	216	53	4.38
G	Elymus cinereus	2	2	.01
G	Poa pratensis	19	7	.25
G	Poa secunda	141	50	3.16
Total for Grasses		755	209	23.84
F	Achillea millefolium	49	17	1.00
F	Alyssum alyssoides (a)	17	7	.08
F	Aster chilensis	27	11	2.05
F	Astragalus convallarius	3	3	.05
F	Balsamorhiza macrophylla	11	3	.91
F	Camelina microcarpa (a)	3	2	.01
F	Cirsium spp.	24	12	.33
F	Collomia linearis (a)	5	1	.00
F	Comandra pallida	17	9	.21
F	Crepis acuminata	6	2	.06
F	Cynoglossum officinale	4	3	.21
F	Descurainia pinnata	28	12	.59
F	Draba spp. (a)	2	1	.00
F	Galium spp.	23	10	.17
F	Gayophytum ramosissimum	57	23	.55
F	Helianthella uniflora	12	5	1.76
F	Holosteum umbellatum (a)	18	5	.40
F	Lappula occidentalis (a)	5	2	.15
F	Lactuca serriola	29	12	.13
F	Lithospermum ruderale	-	-	.03
F	Lomatium spp.	8	3	.04
F	Lupinus argenteus	28	13	1.93
F	Machaeranthera canescens	12	5	.05
F	Polygonum douglasii (a)	51	24	.19
F	Sisymbrium altissimum (a)	13	6	.27
F	Tragopogon dubius	41	23	.55
F	Vicia americana	21	11	.10
Total for Forbs		514	225	11.92

BROWSE TRENDS --
Herd unit 05 , Study no: 2

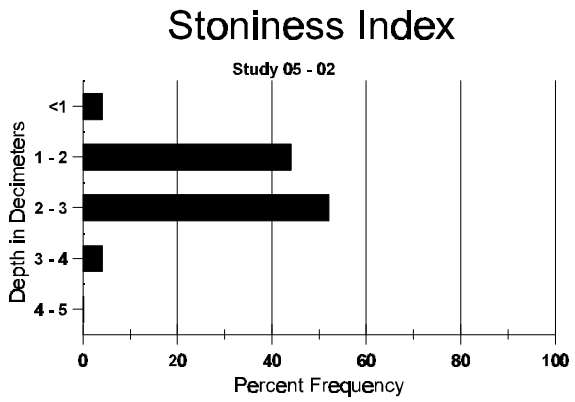
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	2	.18
B	Artemisia tridentata tridentata	46	6.76
B	Chrysothamnus nauseosus albicaulis	2	.38
B	Chrysothamnus viscidiflorus viscidiflorus	43	6.92
B	Mahonia repens	41	2.50
B	Purshia tridentata	8	4.13
B	Symphoricarpos oreophilus	6	1.06
Total for Browse		148	21.95

BASIC COVER --
Herd unit 05 , Study no: 2

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	481	57.73
Rock	62	1.45
Pavement	74	.71
Litter	499	68.56
Cryptogams	3	.01
Bare Ground	133	3.37

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 02

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.5	66.8 (14.7)	6.5	33.9	37.1	29.0	4.2	29.8	304.0	.6



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 2

Type	Quadrat Frequency '96
Rabbit	6
Elk	5
Deer	17

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	96	-	1	1	-	-	-	-	-	-	2	-	-	-	40	27	29	2
Total Plants/Acre (excluding Dead & Seedlings) '96															40	Dec:		-
Artemisia tridentata tridentata																		
Y	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	96	39	13	-	1	-	-	-	-	-	52	-	1	-	1060	26	35	53
D	96	4	9	-	-	-	-	-	-	-	8	-	-	5	260			13
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	860			43
Total Plants/Acre (excluding Dead & Seedlings) '96															1400	Dec:		19%
Chrysothamnus nauseosus albicaulis																		
Y	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	96	2	-	-	-	-	-	-	-	-	1	-	1	-	40	53	68	2
Total Plants/Acre (excluding Dead & Seedlings) '96															60	Dec:		-
Chrysothamnus viscidiflorus viscidiflorus																		
Y	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	96	93	1	-	3	-	-	-	-	-	75	-	-	-	1940	20	37	97
D	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings) '96															2000	Dec:		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	12	9	0
Total Plants/Acre (excluding Dead & Seedlings) '96															0	Dec:		-
Mahonia repens																		
S	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	96	51	-	-	17	-	-	-	-	-	68	-	-	-	1360			68
M	96	295	-	-	71	-	-	-	-	-	366	-	-	-	7320	5	6	366
Total Plants/Acre (excluding Dead & Seedlings) '96															8680	Dec:		-
Prunus virginiana																		
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	15	0
Total Plants/Acre (excluding Dead & Seedlings) '96															0	Dec:		-
Purshia tridentata																		
M	96	-	-	2	-	-	8	-	-	-	10	-	-	-	200	38	63	10
Total Plants/Acre (excluding Dead & Seedlings) '96															200	Dec:		-
Sambucus cerulea																		
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	93	81	0
Total Plants/Acre (excluding Dead & Seedlings) '96															0	Dec:		-
Symphoricarpos oreophilus																		
Y	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	96	8	-	2	-	-	-	-	-	-	10	-	-	-	200	21	30	10
Total Plants/Acre (excluding Dead & Seedlings) '96															240	Dec:		-

TREND STUDY 5-3-96 (Old 8-5)

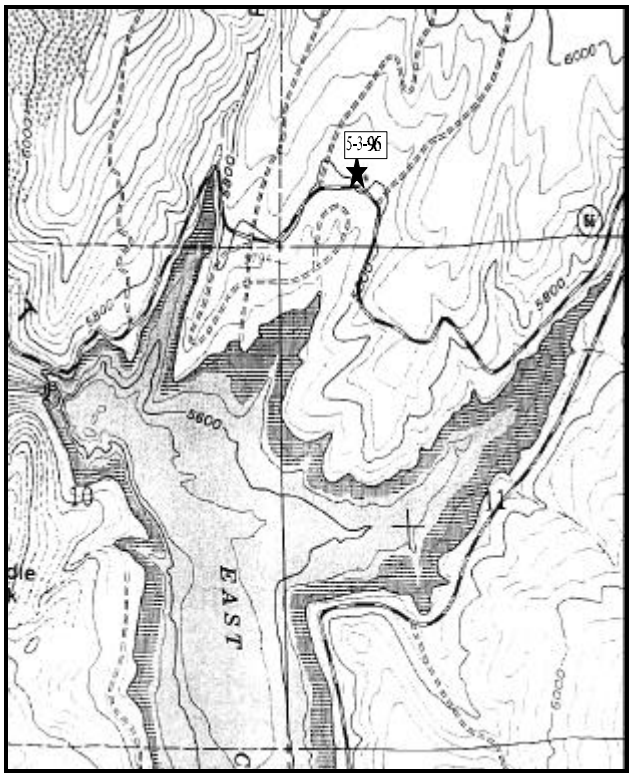
Study site name: East Canyon Reservoir. Range type: Big sagebrush.

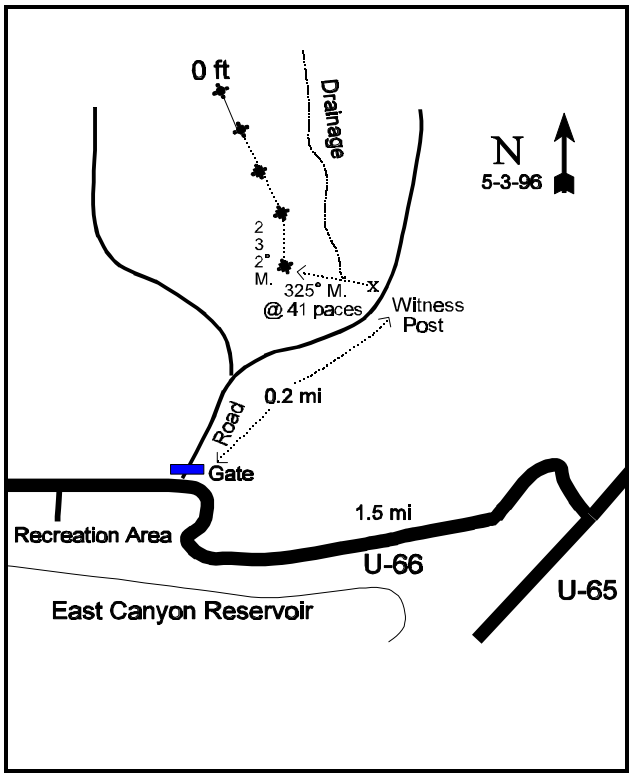
Compass bearing: frequency baseline 186 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Begin to note mileage at the junction of U-65 and U-66. Proceed towards Porterville on U-66 1.15 miles to a gate on the right. There should be a picnic/campground area on left side of road. Proceed through gate on foot (gate locked), travel 0.20 miles to the witness post on the left hand side of the road. From the witness post the 400-foot baseline stake is 41 paces at 325 degrees magnetic. The 0-foot baseline stake is 400 feet to the northwest. The 0-foot stake of the baseline is marked by browse tab #7968. The baseline runs 186 degrees. The baseline doglegs at the 300-foot baseline stake and runs 232 degrees magnetic.





Map Name: East Canyon Reservoir Diagrammatic Sketch

Township 2N, Range 3E, Section 2, UTM COOR: 4-51-096E 45-31-241N

DISCUSSION

Trend Study No. 5-3 (8-5)

The East Canyon Reservoir study is located immediately north of East Canyon Reservoir. Slope varies from 30-40% with an east, southeast aspect and elevation of approximately 5,800 feet. Deer pellet groups are abundant and the level of hedging on the key browse species is moderate to heavy. The presence of three winter-killed deer in 1990, provides some evidence of the areas attraction to deer. The range type is mountain big sagebrush-grass in association with a substantial amount of antelope bitterbrush. These two shrubs comprise the key management species.

Soil classification for this site is similar to that described for study number 5-2. "Manila Loam" is a soil with excellent potential for growth and forage production. It's disadvantages are a rather high potential for erosion and subsurface slippage. Although only slowly permeable to water, the Manila soil volume shrinks and swells greatly in response to setting or drying (Carley et al. 1980). Soil textural analysis indicates a loamy soil with a slightly acidic pH. Effective rooting depth (see methods) was 11 inches with an average temperature of 69°F at this depth. Litter and vegetation cover are abundant and are responsible for preventing serious erosion in the shrub interspaces. Bare ground cover has declined since 1990, from 14% to just over 4% in 1996.

Mountain big sagebrush and antelope bitterbrush are the key browse species. Mountain big sagebrush is moderately hedged with good vigor and less percent decadency than reported in 1984 and 1990. Few seedlings were encountered in 1996, probably due to the dense cheatgrass and bulbous bluegrass cover. The dead to live ratio for mountain big sagebrush is 1:3, which means that 26% are dead. This is a relatively high percentage even for sagebrush. Antelope bitterbrush had a slightly lower density then estimated in 1990 with 120 plants/acre. All plants encountered exhibited heavy utilization, but no plants were classified as decadent in 1996. Oregon grape was encountered for the first time in 1996. This is due to the greatly increased sample size used which more accurately reflects the browse densities. Most plants were classified as mature, with some young and seedlings included. Other browse species occurring in low densities include prickly pear, white rubber rabbitbrush, stickyleaf low rabbitbrush, Saskatoon serviceberry, and Wood’s rose.

Sum of nested frequency for perennial grasses and forbs has increased since 1990, though many of the dominate species are undesirable. Grass cover is dominated by annual and weedy species including cheatgrass and bulbous bluegrass. Bluebunch wheatgrass has significantly increased since 1990. Other perennial species include Great Basin wildrye, Sandberg bluegrass, intermediate wheatgrass, and Kentucky bluegrass. Forbs are very diverse with few species commonly occurring. Many species are small annuals that add very little to the herbaceous cover. Yellow salsify showed some utilization in 1996. Forb composition includes few desirable species, certainly far less that what this site is capable of.

1984 TREND ASSESSMENT

Soil trend is stable, even though there is limited erosion in some of the shrub interspaces. The degree of soil loss, however, is not great enough to explain or have a significant bearing on current vegetative conditions. Vegetative trend is down because of an apparent decline in the key browse species and a rather poor understory which shows no sign of improvement.

1990 TREND ASSESSMENT

Compared to the heavily hedged, declining condition of the key browse species

reported for this site in 1984, there have been no significant changes in the frequency or density of big sagebrush or bitterbrush. Although the percentage of decadent plants, especially sagebrush, is still high, it is lower than in 1984. Bitterbrush retains a heavily hedged growth form, but the sagebrush are more moderately browsed. Young plants make up a healthy percentage of both populations. Sagebrush canopy cover averages 11%. Distribution of perennial grasses was very patchy in 1984. Although annual species remain prevalent, the frequency of perennial grasses, mostly Sandberg bluegrass, increased significantly. There is thick vegetative and litter cover provided by the herbaceous understory. Soil erosion is minimal.

TREND ASSESSMENT
soil - stable
browse - stable, with signs of seedling establishment for sagebrush and bitterbrush
herbaceous understory - stable, increases for some perennial grasses

1996 TREND ASSESSMENT

Soil trend is slightly upward with a decrease in percent bare ground cover since 1990. Vegetative and litter cover are abundant and help reduce erosion potential. Density of the key browse species, mountain big sagebrush and antelope bitterbrush, have stayed relatively the same over the years. Utilization has remained nearly the same while percent decadency has decreased. This leads to a slightly upward browse trend. Although sum of nested frequency for grasses and forbs has increased since 1990, most species present are undesirable. Cheatgrass and bulbous bluegrass are the dominate herbaceous species at this time and will likely continue to be in the future.

TREND ASSESSMENT
soil - slightly upward
browse - slightly upward
herbaceous understory - stable, but poor because of the predominance of weedy species

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 3

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron intermedium	7	10	9	2	3	3	.18
G	Agropyron spicatum	a3	a18	b48	1	8	17	2.04
G	Bromus japonicus (a)	-	-	41	-	-	19	.39
G	Bromus tectorum (a)	-	-	283	-	-	83	7.92
G	Carex spp.	-	-	3	-	-	1	.03
G	Elymus cinereus	-	-	29	-	-	10	2.53
G	Poa bulbosa	a-	b41	c149	-	17	45	7.90
G	Poa pratensis	a19	b3	b6	7	2	3	.04
G	Poa secunda	a21	b59	a27	8	23	11	.58
G	Vulpia octoflora (a)	-	-	6	-	-	2	.53
Total for Grasses		50	131	601	18	53	194	22.17

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Achillea millefolium	$_{a}$26	$_{a}$35	$_{b}$62	9	15	28	1.19
F	Alyssum alyssoides (a)	-	-	4	-	-	2	.01
F	Allium spp.	-	-	1	-	-	1	.00
F	Arabis spp.	-	-	4	-	-	2	.03
F	Artemisia ludoviciana	$_{a}$51	$_{a}$45	$_{b}$17	17	17	6	.51
F	Aster chilensis	$_{a}$38	$_{a}$36	$_{b}$89	14	14	35	3.00
F	Astragalus spp.	$_{ab}$5	$_{a}$-	$_{b}$12	2	-	7	.52
F	Cirsium spp.	17	27	41	11	14	18	1.10
F	Collomia linearis (a)	-	-	12	-	-	6	.03
F	Collinsia parviflora (a)	-	-	3	-	-	1	.00
F	Cruciferae	-	4	-	-	2	-	-
F	Erodium cicutarium (a)	-	-	22	-	-	8	.16
F	Erigeron pumilus	$_{a}$54	$_{a}$51	$_{b}$125	25	24	53	3.91
F	Gayophytum ramosissimum (a)	-	-	43	-	-	20	.15
F	Haplopappus carthamoides	-	-	1	-	-	1	.00
F	Hedysarum boreale	-	-	2	-	-	1	.15
F	Holosteum umbellatum (a)	-	-	9	-	-	5	.02
F	Lappula occidentalis (a)	-	-	6	-	-	2	.03
F	Lactuca serriola	-	1	1	-	1	1	.00
F	Lithospermum ruderale	24	31	16	13	17	12	1.06
F	Lomatium spp.	-	-	2	-	-	1	.00
F	Lupinus argenteus	$_{a}$-	$_{a}$-	$_{b}$11	-	-	5	.10
F	Oenothera caespitosa	3	2	3	2	2	1	.15
F	Polygonum douglasii (a)	-	-	35	-	-	17	.08
F	Sphaeralcea coccinea	16	13	15	6	5	8	.55
F	Taraxacum officinale	-	-	2	-	-	1	.00
F	Tragopogon dubius	19	18	19	8	9	11	.25
F	Viguiera multiflora	$_{a}$-	$_{b}$17	$_{ab}$7	-	8	3	.04
Total for Forbs		253	280	564	107	128	256	13.13

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 3

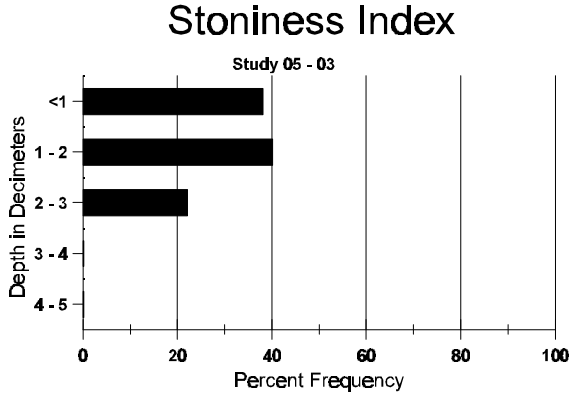
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	64	14.37
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	12	.33
B	Mahonia repens	22	.83
B	Opuntia spp.	6	.03
B	Purshia tridentata	4	2.40
Total for Browse		109	17.98

BASIC COVER --
Herd unit 05 , Study no: 3

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	373	3.50	6.00	50.76
Rock	148	5.25	6.75	5.53
Pavement	120	.50	2.00	1.27
Litter	398	79.50	71.00	61.27
Cryptogams	11	.50	0	.13
Bare Ground	138	10.75	14.25	4.19

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 03

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.8	69.2 (11.4)	6.3	48.7	28.0	23.3	2.4	20.6	163.2	.4



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 3

Type	Quadrat Frequency '96
Elk	5
Deer	32

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	37	60	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	12	-	-	-	-	-	-	-	-	12	-	-	-	400			12
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	2	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	13	1	-	-	-	-	-	-	-	14	-	-	-	280			14
M	84	-	11	6	-	-	-	-	-	-	17	-	-	-	566	25	24	17
	90	5	11	-	-	-	-	-	-	-	16	-	-	-	533	29	38	16
	96	39	19	1	1	-	-	1	-	-	58	-	3	-	1220	30	45	61
D	84	-	11	29	-	1	-	-	-	-	39	-	-	2	1366			41
	90	9	12	13	-	-	-	-	-	-	26	-	-	8	1133			34
	96	8	10	1	1	-	-	-	-	-	15	-	1	4	400			20
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	660			33
Total Plants/Acre (excluding Dead & Seedlings)													'84		1998	Dec:		68%
													'90		1732			65%
													'96		1900			21%
Chrysothamnus nauseosus albicaulis																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	33	26	28	1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		100%
													'90		33			0%
													'96		20			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	1	-	-	-	-	-	-	-	-	-	1	-	33	14	15	1
	96	14	-	-	1	-	-	-	-	-	14	-	1	-	300	15	27	15
D	84	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)														'84	33	Dec:		100%
														'90	33			-
														'96	320			-
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	32	-	-	-	-	-	-	-	-	32	-	-	-	640			32
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	107	-	-	9	-	-	-	-	-	116	-	-	-	2320	5	6	116
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	2960			-
Opuntia spp.																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66	10	13	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	13	-	-	-	-	-	-	-	-	12	-	1	-	260	5	15	13
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)														'84	66	Dec:		0%
														'90	66			100%
														'96	380			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	2	-	1	-	-	-	-	3	-	-	-	100			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	1	1	-	-	-	-	-	-	2	-	-	-	66	20	9	2
	90	-	1	2	-	-	-	-	-	-	3	-	-	-	100	35	47	3
	96	-	-	1	-	-	5	-	-	-	6	-	-	-	120	35	80	6
D	84	-	-	4	-	-	-	-	-	-	4	-	-	-	133			4
	90	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		199	Dec:		67%
													'90		266			25%
													'96		120			0%
Rosa woodsii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	17	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

TREND STUDY 5-4-96 (old 8-6)

Study site name: Wanship. Range type: Sagebrush/grass.

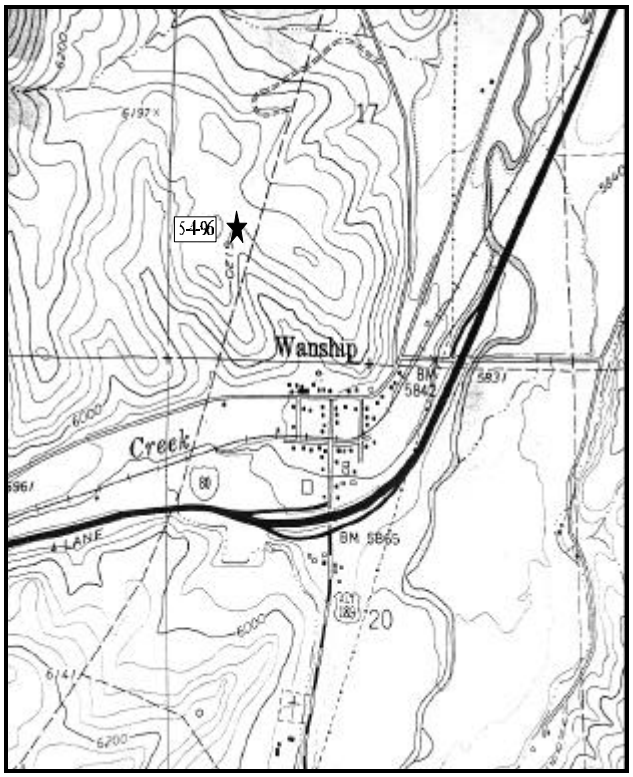
Compass bearing: frequency baseline 161 degrees magnetic.

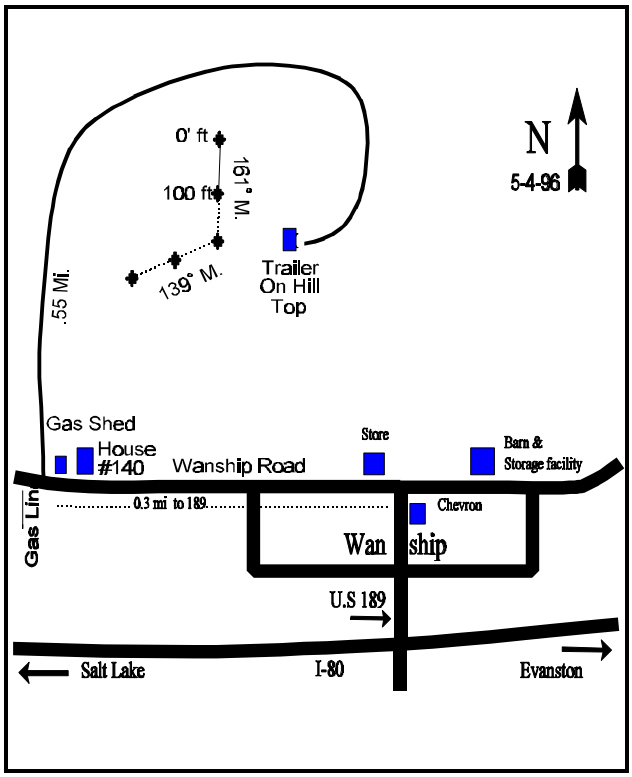
Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the I-80 overpass in Wanship, proceed north on 189 to the "T" junction in town with Buck's Chevron on the right. Look for a dirt road just west of a barn across the street from the gas station. Proceed up this road 0.40 miles to a fork. From the fork take a bearing of 235 degrees true and walk 36 paces to baseline. The 0-foot stake of the baseline is marked by browse tag #7955. The baseline runs 161 degrees magnetic. The baseline doglegs at the 200-foot baseline stake and runs 193 degrees magnetic.

New roads and closed roads were encountered in 1996. Site can now be reached from the Wanship Road by going north and east 0.55 miles to an intersection, the continuing 0.1 miles to the fork described above.





Map Name: Wanship Diagrammatic Sketch

Township 1N, Range 5E, Section 17, UTM COOR: 4-65-119E 45-18-689N

DISCUSSION

Trend Study No. 5-4 (8-6)

The Wanship study samples a large block of mountain big sagebrush/grass that extends north of Wanship and west of the Weber River. Slope is approximately 3% with a west southwest aspect. Sometime after the site was read in 1990, a fire burned the area, after which it was seeded. This is an area that customarily winters several hundred deer. Deer use during the winter of 1983-84 was light because of deep crusted snow and that the deer were fed a pelleted ration at feed stations located along the frontage road near Wanship. The numerous deer pellet groups encountered in 1996 indicate deer still use the area. Some livestock sign was apparent but likely from the previous fall. Gopher activity was also noted in 1996. During the 1996 reading, a trailer was observed parked about 300 feet from the study. The land was for sale and may be subdivided in the near future.

Soil textural analysis indicates a loam-clay loam soil with a relatively high soil temperature of 78°F at 8 inches. The soil appears deep but rocky on the surface. Color is a dark reddish-gray resulting from what apparently is basalt parent material. There is not much bare ground cover due to the abundant vegetative and litter cover. Erosion is not severe because of the gentle terrain and soil permeability.

The key browse species is mountain big sagebrush. The burned stumps encountered in 1996 were classified as dead. The population now has an almost entirely young age structure with only a few mature plants encountered. The mature plants that were encountered measured a height and crown of 9 inches. Mountain big sagebrush shows no utilization, as one would expect, the rate of decadency has declined from 61% in 1990 to 0% in 1996. The population density is nearly equal to that of the past at an estimated 2,880 plants/acre. Antelope bitterbrush density was low in the past and was eliminated by the fire with no plants encountered in 1996. Prostrate summer cypress was included in the seed mixture and has established extremely well. Estimated density is 11,980 plants/acre with 72% classified as mature and 28% classified as young. Mature plants measured 7 inches in height and 11 inches in width. Utilization is mostly light, although some plants exhibited moderate use. Some white rubber rabbitbrush and stickyleaf low rabbitbrush are returning, but are currently in low abundance. Other species encountered include Saskatoon serviceberry, broom snakeweed, pricklypear cactus, and gray horsebrush.

The seeded herbaceous understory has established extremely well. Some annual weeds are present, but exhibit a stunted growth form this season. Crested wheatgrass, intermediate wheatgrass, and orchard grass are vigorous and will provide competition for the annual cheatgrass. Sandberg bluegrass nested frequency has significantly decreased after the fire, while bluebunch wheatgrass is still present and changed very little. Other grasses include sheep fescue, bulbous bluegrass, and bottlebrush squirreltail.

Alfalfa and small burnet occurred only occasionally, yet they were very robust and vigorous. Many annual forbs were encountered with most being very small in stature and may decline over time with the competition of perennial species. This soil likely becomes very dry in the upper horizons which may be limiting to shallow rooted plants.

1984 TREND ASSESSMENT

The overall impression one gets of this area is stability. This is a good winter range site that shows relatively little erosion in sprite of a rather thin ground cover. Mountain big sagebrush dominates the site and will no doubt, continue to do so.

1990 TREND ASSESSMENT

The increased decadence and significantly lower frequency and density of mountain big sagebrush and bitterbrush indicate a declining vegetative trend for this heavily used winter range. Virtually all the bitterbrush and 27% of the sagebrush have a heavily hedged growth form. Vigor is poor on many of the shrubs. There is limited reproduction. There are large bare areas in the understory, and less cheatgrass than observed on similar sites. The frequency of bluebunch wheatgrass is almost unchanged. The ground cover calculations indicate a decrease in the amount of litter cover and a slight increase in bare soil.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - slightly downward, still too many weedy species

1996 TREND ASSESSMENT

Soil trend is slightly upward with a decrease in bare ground cover and an increase in litter cover. The gentle terrain combined with vegetative and litter will currently prohibit erosion. The fire that burned this site was beneficial to the mountain big sagebrush population. Percent decadency has decreased with nearly the same density as reported in the past. It is unclear at this point if the mountain big sagebrush was seeded or if came from the existing seed bank. Prostrate summer cypress is the most abundant browse with some moderate use apparent. Increaser or invader browse species are in low abundance and do not appear to be expanding at this time. Browse trend is up. Both seeded grasses and forbs are abundant and vigorous providing some competition for annual, weedy plants. Cheatgrass is still abundant but with a stunted growth form this season. Herbaceous trend is up due to the vigorous seeded species present.

TREND ASSESSMENT
soil - slightly upward
browse - up
herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 4

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	$_{a}$-	$_{a}$-	$_{b}$103	-	-	47	5.33
G	Agropyron intermedium	$_{a}$-	$_{a}$-	$_{b}$24	-	-	18	1.51
G	Agropyron spicatum	25	27	35	14	14	16	1.13
G	Bromus tectorum (a)	-	-	315	-	-	92	6.34
G	Dactylis glomerata	$_{a}$-	$_{a}$-	$_{b}$11	-	-	6	.21
G	Festuca ovina	-	-	2	-	-	1	.00
G	Poa bulbosa	-	-	1	-	-	1	.03
G	Poa secunda	$_{a}$187	$_{b}$307	$_{c}$92	77	97	36	2.00
G	Sitanion hystrix	$_{a}$15	$_{a}$21	$_{b}$1	10	12	1	.00
Total for Grasses		227	355	584	101	123	218	16.58
F	Allium acuminatum	$_{a}$18	$_{ab}$5	$_{b}$-	6	2	-	-
F	Alyssum alyssoides (a)	-	-	188	-	-	60	1.45
F	Antennaria rosea	6	5	-	3	4	-	-
F	Arabis spp.	-	3	-	-	1	-	-
F	Astragalus cibarius	-	-	1	-	-	1	.00
F	Astragalus utahensis	7	1	11	4	1	4	.21
F	Cirsium spp.	-	-	3	-	-	1	.00
F	Collomia linearis (a)	-	-	1	-	-	1	.00
F	Collinsia parviflora (a)	-	-	3	-	-	3	.01
F	Crepis acuminata	-	2	-	-	2	-	-
F	Cryptantha spp.	6	-	-	2	-	-	-
F	Cymopterus longipes	$_{a}$-	$_{b}$10	$_{c}$54	-	4	30	.49
F	Erigeron pumilus	2	3	1	2	1	1	.03
F	Gayophytum ramosissimum (a)	-	-	14	-	-	7	.03
F	Holosteum umbellatum (a)	-	-	213	-	-	69	1.45
F	Medicago sativa	$_{a}$-	$_{a}$-	$_{b}$18	-	-	8	.82
F	Penstemon spp.	3	-	-	2	-	-	-
F	Phlox longifolia	$_{a}$-	$_{a}$-	$_{b}$25	-	-	9	.29
F	Polygonum douglasii (a)	-	-	3	-	-	1	.00
F	Ranunculus testiculatus (a)	-	-	263	-	-	86	2.44
F	Sanguisorba minor	$_{a}$-	$_{a}$-	$_{b}$16	-	-	8	1.29
F	Schoencrambe linifolia	-	-	3	-	-	1	.03
F	Sisymbrium altissimum (a)	-	-	1	-	-	1	.03
F	Tragopogon dubius	4	-	3	2	-	1	.03
Total for Forbs		46	29	821	21	15	292	8.65

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 4

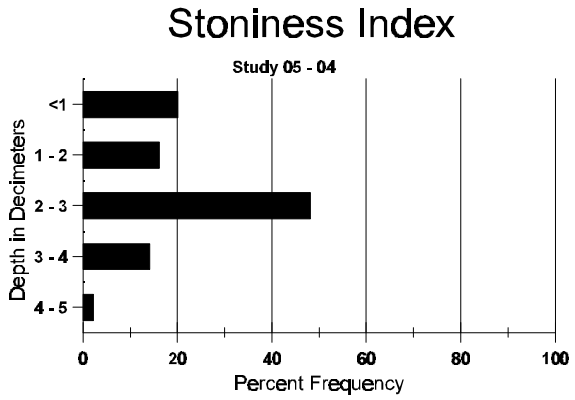
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	58	1.08
B	Chrysothamnus nauseosus albicaulis	3	-
B	Chrysothamnus viscidiflorus viscidiflorus	27	2.05
B	Gutierrezia sarothrae	1	-
B	Kochia prostrata	95	7.61
B	Opuntia spp.	3	.15
B	Tetradymia canescens	1	-
Total for Browse		188	10.89

BASIC COVER --
Herd unit 05 , Study no: 4

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	392	3.00	15.75	37.70
Rock	248	9.00	9.00	11.57
Pavement	218	16.25	14.75	3.39
Litter	397	64.00	41.00	44.87
Cryptogams	52	.25	5.25	.47
Bare Ground	280	7.50	14.25	11.60

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 04

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.2	78.0 (8.3)	6.6	44.9	28.7	23.4	2.7	15.4	185.6	.5



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 4

Type	Quadrat Frequency '96
Sheep	2
Rabbit	10
Elk	3
Deer	36
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	28	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	24	1	-	-	-	-	-	-	-	25	-	-	-	833			25
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	3	6	-	-	-	-	-	-	-	9	-	-	-	300			9
	90	5	2	-	-	-	-	-	-	-	6	1	-	-	233			7
	96	141	-	-	-	-	-	-	-	-	141	-	-	-	2820			141
M	84	-	17	27	-	-	-	-	-	-	44	-	-	-	1466	33	43	44
	90	3	18	7	-	-	-	-	-	-	21	3	2	2	933	26	36	28
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	9	9	3
D	84	-	15	38	-	-	-	-	-	-	42	-	3	8	1766			53
	90	10	29	16	2	-	-	-	-	-	32	6	4	15	1900			57
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
Total Plants/Acre (excluding Dead & Seedlings)													'84		3532	Dec:		50%
													'90		3066			62%
													'96		2880			0%
Chrysothamnus nauseosus albicaulis																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	13	14	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		60			-
Chrysothamnus viscidiflorus stenophyllus																		
Y	84	10	-	-	-	-	-	-	-	-	10	-	-	-	333			10
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	8	-	-	-	-	-	-	-	-	8	-	-	-	266	13	12	8
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		599	Dec:		-
													'90		0			-
													'96		0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	14	5	1	3	-	-	-	-	-	9	-	14	-	766	11	12	23
	96	41	-	-	-	-	-	-	-	-	41	-	-	-	820	12	22	41
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	7	-	-	1	-	-	-	-	-	3	-	2	3	266			8
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		1065			25%
													'96		820			0%
Gutierrezia sarothrae																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	11	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-
Kochia prostrata																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	161	4	-	-	-	-	-	-	-	165	-	-	-	3300			165
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	376	50	-	6	-	-	-	-	-	432	-	-	-	8640	7	11	432
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	1	-	1	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		11980			0%
Opuntia fragilis																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		-
													'90		0			-
													'96		0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	5	-	-	-	-	-	-	-	-	5	-	-	-	166	3	10	5
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	4	8	4
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	4	-	-	-	-	-	-	-	-	-	-	-	4	133			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		365			36%
													'96		120			0%
Purshia tridentata																		
M	84	-	-	4	-	-	-	-	-	-	4	-	-	-	133	29	40	4
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		133	Dec:		0%
													'90		33			100%
													'96		0			0%
Tetradymia canescens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	11	18	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-

TREND STUDY 5-5-96 (old 8-7)

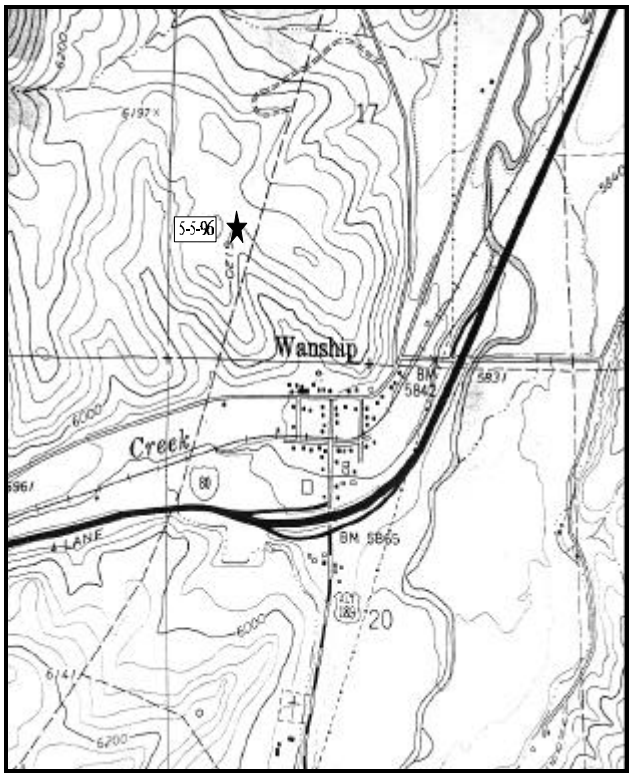
Study site name: Upper Franklin Canyon . Range type: Mixed mountain brush .

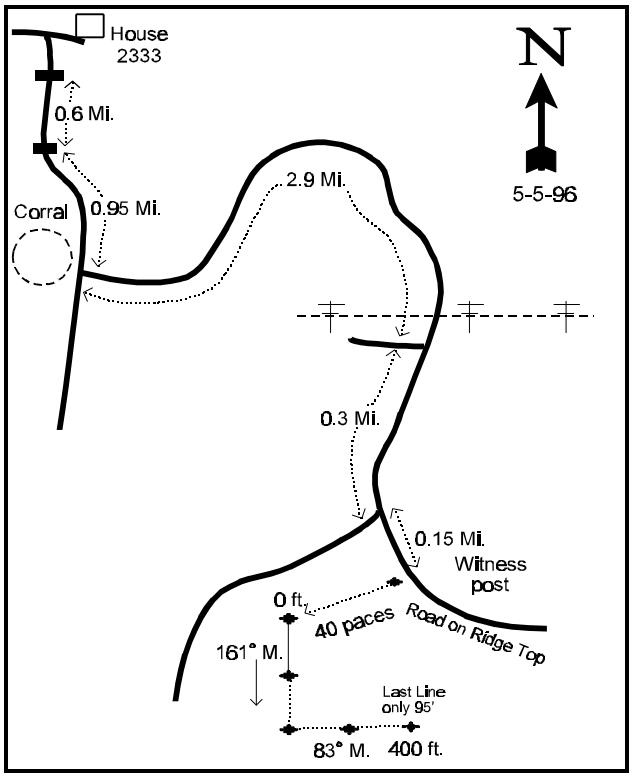
Compass bearing: frequency baseline 161 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Main Street and south Henefer Road, proceed 2.1 miles southeast on Cemetery Road to a cattle guard at the entrance to Franklin Canyon. A house (number 2333) is nearby. Proceed south 0.6 miles up Franklin Canyon to a cattleguard. Continue south for 0.95 miles to a large corral, and turn left onto a small dirt road. Proceed 2.9 miles (staying on main road) to a fork in the road. Stay straight (left) and proceed 0.3 miles to another fork. Take a left and proceed on this ridge top road for 0.15 miles to a witness post on the right hand side of the road. From the witness post walk 40 paces in a south west direction to the 0-foot baseline stake. The 0-foot baseline stake is marked by browse tag #7954. The baseline runs 161 degrees magnetic. The baseline doglegs at the 200-foot baseline stake and runs in a direction of 83 degrees magnetic.





Map Name: Coalville Diagrammatic Sketch

Township 3N , Range 4E , Section 34 , UTM COOR: 4-60-264E 45-33-201N

DISCUSSION

Trend Study No. 5-5 (8-7)

The upper Franklin Canyon study samples a rather high elevation (6,960 ft.) winter range near the divide between Franklin and Bromley Canyons. Slope on the site varies from 25% to 50% with a south, southwest aspect. The slope likely remains open and available to deer during all but the harshest of winters. Both deer and elk pellet groups occurred frequently. Two antler drops were observed in 1990. Livestock use includes sheep in spring and summer with no evidence of cattle in 1996. The range type is mixed mountain brush.

Soil textural analysis indicates a loam-clay loam soil with an effective rooting depth (see methods) of 14 inches. The soil is reddish colored and very cobbly throughout the profile. The soil is moderately deep, well-drained, and residually derived from a sedimentary conglomerate formation. One characteristic appears certain, runoff is rapid and the erosion hazard is correspondingly high. Game trails are abundant with bare ground found on these trails as well as in the shrub interspaces. There are no active gullies present but soil is moving downslope and accumulating on the uphill slope of shrubs, trails, and grasses. Percent bare ground has remained nearly the same since 1990 at an estimated 28% in 1996. Litter, as well as rock and pavement cover, has declined since 1990.

Three browse species are of key importance because of their preference and productivity. In order of productivity (cover) they include; true mountain mahogany, serviceberry, and mountain snowberry. True mountain mahogany is the largest browse species with a tree like growth form. These plants are heavily utilized with noticeable highlining. Many mature plants are tall enough to have some unavailable portions which helps maintain a satisfactory level of vigor and seed production. Estimated density for true mountain mahogany is 740 plants/acre. Decadent plants were classified in 1984 and 1990, but none were categorized as decadent in 1996. A substantial number of young mahoganies suggest that this species will be able to maintain itself. Currently, saskatoon serviceberry has an estimated density of 540 plants/acre with 63% classified as mature and 26% classified as young. Decadency has also declined since 1990 from 50% of the population to only 11% in 1996. Heavy utilization has declined as well. Mountain snowberry is less productive and generally not as palatable. Nonetheless, on this site it is sustaining a moderate level of use. The mountain snowberry density appears stable at this time. It was reported in 1990 that the mountain big sagebrush was very heavily utilized and excessively decadent. In 1996 the population has shifted from entirely decadent to a population with a healthy age structure, yet it only contributes <1% of the browse cover. Utilization has also shifted from heavy in the past two readings to light in 1996. Oregon grape density decreased dramatically from 11,099 plants/acre in 1990 to 4,960 plants/acre in 1996. Utilization of this shrub is negligible. Other browse species include stickyleaf low rabbitbrush, broom snakeweed, and slenderbush eriogonum.

Grasses are important to this site, but consist primarily as large pedestaled bunches, separated by eroded bare ground. Although, unlike much of the surrounding area, this site has a healthy stand of bluebunch wheatgrass with cheatgrass occurring in relatively low numbers. Sandberg bluegrass is also present with a slight decline in nested frequency since 1990. Other grasses include muttongrass, Indian ricegrass, sedge, and Japanese Brome.

Many of the more abundant forbs are either annual species or biennial increasers. Stickseed and pale alyssum provide the bulk of the herbaceous cover. There was no use of either the forbs or grasses noted in 1996.

1984 TREND ASSESSMENT

Poor soil conditions and rapid erosion result in a declining soil trend and also strongly influence vegetative conditions. Vegetative trend is down because of heavy use and the inability of some species to adequately reproduce. Two of the key browse species appear to be stable. Mountain big sagebrush, however, seems to be disappearing.

1996 TREND ASSESSMENT

Soil trend is stable with no noticeable accelerated erosion present in 1996. Some erosion will likely always occur on this site due to the soil characteristics and steep slope. Bare ground cover has remained nearly constant in the last two readings while litter, rock, and pavement cover have declined slightly. Browse trend is up with fewer decadent plants reported in 1996 and a lower proportion of heavily utilized plants. Browse populations appear to be stable and becoming more healthy than in the past. Grass composition is more desirable than surrounding sites that are dominated by cheatgrass. Bluebunch wheatgrass provides a bulk of the herbaceous understory cover as well as Sandberg bluegrass. Forbs are dominated by annual species and do not provide much forage at this time. Herbaceous understory trend appears stable.

TREND ASSESSMENT
soil - stable
browse - up
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 5

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	266	233	249	95	89	83	11.23
G	Bromus japonicus (a)	-	-	1	-	-	1	.03
G	Bromus tectorum (a)	-	-	173	-	-	61	2.61
G	Carex spp.	-	-	3	-	-	1	.03
G	Oryzopsis hymenoides	12	11	3	5	5	2	.24
G	Poa fendleriana	-	-	13	-	-	7	.13
G	Poa secunda	a104	b183	b150	48	73	59	1.87
Total for Grasses		382	427	592	148	167	214	16.15
F	Achillea millefolium	-	-	2	-	-	1	.15
F	Agoseris glauca	-	-	7	-	-	3	.01
F	Alyssum alyssoides (a)	-	-	279	-	-	89	2.21
F	Arabis spp.	-	3	6	-	2	3	.01
F	Astragalus cibarius	-	-	6	-	-	3	.04
F	Aster spp.	-	-	4	-	-	2	.01
F	Caulanthus crassicaulis	-	-	3	-	-	1	.00
F	Camelina microcarpa (a)	-	-	22	-	-	12	.20
F	Chaenactis douglasii	3	9	8	3	5	4	.07
F	Cirsium spp.	a78	a79	b41	40	43	23	1.05

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Comandra pallida	2	3	6	2	2	2	.03
F	Crepis acuminata	-	2	5	-	1	3	.04
F	Cruciferae	-	3	-	-	1	-	-
F	Cryptantha spp.	$_{a}$76	$_{b}$9	$_{b}$5	39	4	2	.06
F	Cymopterus spp.	-	1	7	-	1	3	.04
F	Eriogonum brevicaule	10	6	-	6	4	-	-
F	Erigeron pumilus	2	3	2	1	3	1	.00
F	Erigeron strigosis	-	-	6	-	-	3	.06
F	Haplopappus acaulis	4	2	-	1	1	-	-
F	Hackelia patens	$_{a}$-	$_{b}$66	$_{b}$80	-	35	31	2.95
F	Holosteum umbellatum (a)	-	-	11	-	-	6	.03
F	Lappula occidentalis (a)	-	-	4	-	-	2	.01
F	Lactuca serriola	$_{a}$-	$_{a}$4	$_{b}$24	-	1	11	.08
F	Penstemon humilis	22	17	21	10	8	15	.32
F	Phlox hoodii	6	9	7	4	5	4	.09
F	Ranunculus testiculatus (a)	-	-	175	-	-	62	.91
F	Taraxacum officinale	-	1	-	-	1	-	-
F	Tragopogon dubius	$_{a}$16	$_{ab}$7	$_{b}$5	9	4	2	.04
F	Unknown forb-perennial	-	1	-	-	1	-	-
F	Veronica biloba (a)	-	-	68	-	-	29	.24
Total for Forbs		219	225	804	115	122	317	8.72

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 5

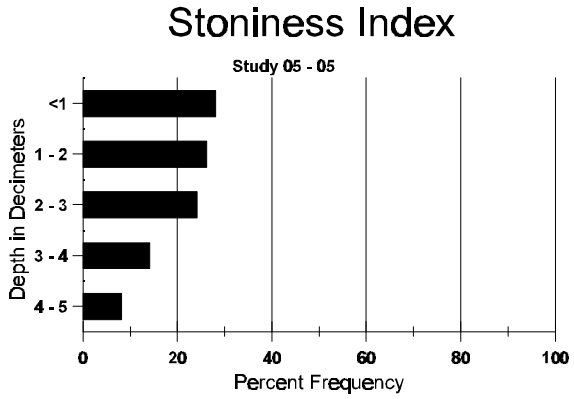
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	21	3.29
B	Artemisia tridentata vaseyana	12	.06
B	Cercocarpus montanus	30	3.50
B	Chrysothamnus viscidiflorus viscidiflorus	32	2.63
B	Eriogonum microthecum	2	.03
B	Gutierrezia sarothrae	6	.64
B	Mahonia repens	27	.77
B	Symphoricarpos oreophilus	14	2.04
Total for Browse		144	13.00

BASIC COVER --
Herd unit 05 , Study no: 5

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	372	4.50	8.00	34.61
Rock	257	17.50	17.25	13.70
Pavement	184	5.50	6.25	2.02
Litter	384	54.75	38.00	34.22
Cryptogams	69	1.25	.75	1.11
Bare Ground	276	16.50	29.75	28.37

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 05

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.3	65.8 (14.3)	7.9	40.6	32.1	27.4	2.5	3.0	28.8	.6



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 5

Type	Quadrat Frequency '96
Rabbit	1
Elk	23
Deer	12

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	3	1	1	-	-	-	-	6	-	-	-	200			6
	96	3	1	1	2	-	-	-	-	-	7	-	-	-	140			7
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	6	-	-	1	-	-	-	7	-	-	-	233	33	17	7
	96	2	1	8	3	2	1	-	-	-	17	-	-	-	340	34	48	17
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	12	-	-	-	-	-	-	12	-	1	-	433			13
	96	-	-	2	-	-	1	-	-	-	2	-	1	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		866			50%
													'96		540			11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	24	1	-	-	-	-	-	-	-	25	-	-	-	500			25
M	84	-	-	5	-	-	-	-	-	-	5	-	-	-	166	24	24	5
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	17	1	1	-	-	-	-	-	-	19	-	-	-	380	21	32	19
D	84	-	3	14	-	-	-	-	-	-	12	-	4	1	566			17
	90	1	1	5	-	-	-	-	-	-	6	-	1	-	233			7
	96	-	1	2	-	-	-	-	-	-	1	-	-	2	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	420			21
Total Plants/Acre (excluding Dead & Seedlings)													'84		765	Dec:		74%
													'90		233			100%
													'96		940			6%
Cercocarpus montanus																		
S	84	16	-	-	-	-	-	-	-	-	16	-	-	-	533			16
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	7	16	-	-	-	-	-	-	23	-	-	-	766			23
	90	1	-	2	-	-	-	-	-	1	4	-	-	-	133			4
	96	2	10	2	-	-	2	-	-	-	16	-	-	-	320			16
M	84	-	-	79	-	-	-	-	-	-	79	-	-	-	2633	64	27	79
	90	-	-	1	-	1	1	-	-	1	4	-	-	-	133	56	38	4
	96	1	3	13	-	1	3	-	-	-	21	-	-	-	420	32	42	21
D	84	-	-	17	-	-	-	-	-	-	17	-	-	-	566			17
	90	-	-	1	-	1	-	-	-	-	2	-	-	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7
Total Plants/Acre (excluding Dead & Seedlings)													'84		3965	Dec:		14%
													'90		332			20%
													'96		740			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus stenophyllus																		
S	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	25	-	-	-	-	-	-	-	-	25	-	-	-	833	12	13	25
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		899	Dec:		-
													'90		0			-
													'96		0			-
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	10	-	-	-	-	-	-	-	-	10	-	-	-	333			10
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	25	12	7	1	-	1	-	-	-	44	-	2	-	1533	13	17	46
	96	79	6	-	2	-	-	-	-	-	87	-	-	-	1740	13	26	87
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	4	-	-	-	-	-	-	-	2	-	3	-	166			5
	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		2032			8%
													'96		1840			1%
Eriogonum microthecum																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	33	2	13	1
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	13	18	2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		33			-
													'96		40			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	9	-	-	-	-	-	-	-	-	9	-	-	-	300	5	5	9
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	6	12	5
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		499			7%
													'96		160			0%
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	94	-	-	-	-	-	-	-	-	94	-	-	-	3133			94
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	47	-	-	-	-	-	-	-	-	47	-	-	-	1566			47
	90	332	-	-	-	-	-	-	-	-	331	-	1	-	11066			332
	96	72	-	-	-	-	-	-	-	-	72	-	-	-	1440			72
M	84	111	-	-	-	-	-	-	-	-	111	-	-	-	3700	4	5	111
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	170	-	-	6	-	-	-	-	-	176	-	-	-	3520	3	6	176
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		5266	Dec:		0%
													'90		11099			0%
													'96		4960			0%
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	1	19	-	-	-	-	-	-	-	20	-	-	-	666			20
	90	1	-	-	-	-	-	2	-	-	3	-	-	-	100			3
	96	8	-	-	4	-	-	1	-	-	13	-	-	-	260			13
M	84	-	16	-	-	-	-	-	-	-	16	-	-	-	533	22	12	16
	90	3	2	-	4	-	-	2	-	-	11	-	-	-	366	22	20	11
	96	1	3	-	5	-	-	-	-	-	9	-	-	-	180	18	36	9
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		1199	Dec:		0%
													'90		499			7%
													'96		460			4%

TREND STUDY 5-6-96 (old 8-10)

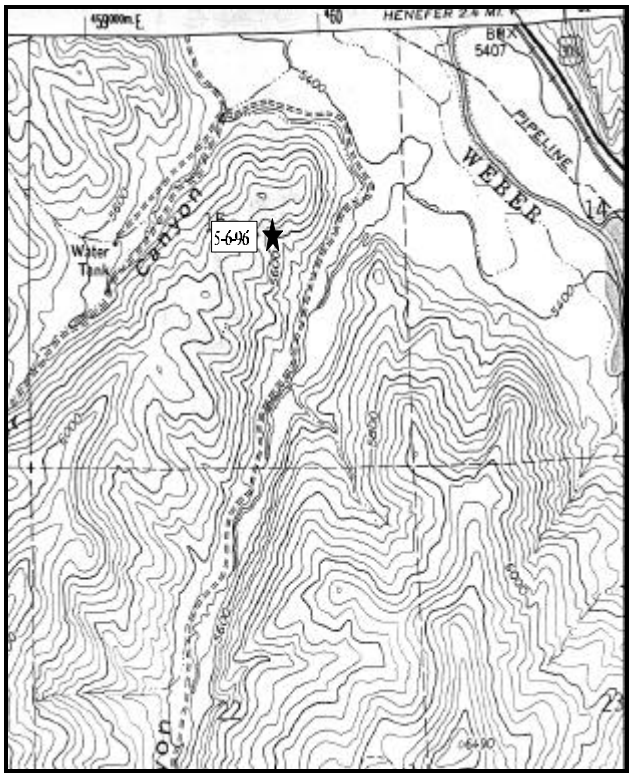
Study site name: Franklin Canyon. Range type: Big sagebrush.

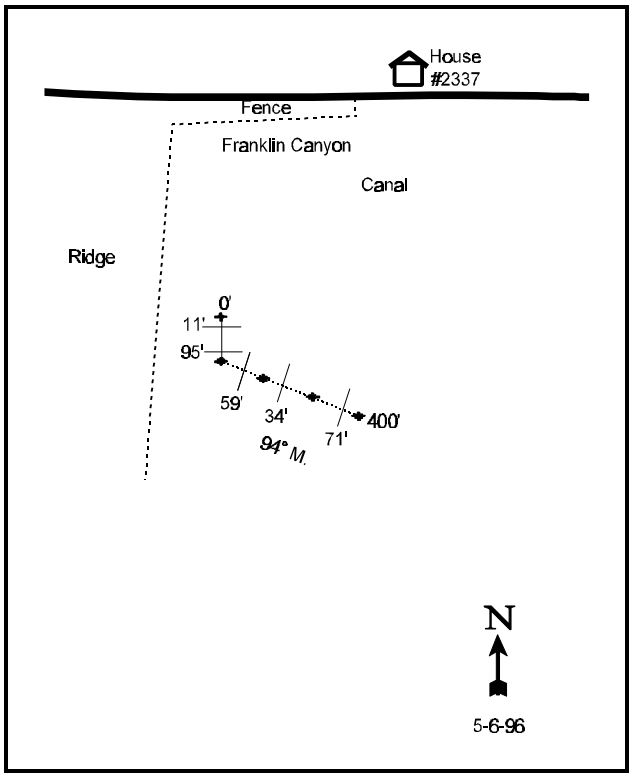
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Henefer, proceed south on the cemetary road to a farm house (No. 2333) at the mouth of Franklin Canyon. Turn right and travel up the canyon for 0.2 miles to a small grove of narrowleaf cottonwoods on the canal bank. From here walk approximately 125 yards on an azimuth of 260 degrees magnetic to the corner post on a fence line. Walk due west along the fence line past 4 large, wooden cross-braces. After the fourth brace, continue on past 3 metal fenceposts. From here walk 30 paces on an azimuth of 180 degrees to density plot 3. The 0-foot mark of the baseline is 3 paces due south from density plot 1. The baseline runs from the 0-foot mark for 100 feet on an azimuth of 180 degrees. The zero mark of the baseline consists of a 12"-18" high, green fencepost with a red browse tag (#7948) attached.





Map Name: Coalville, Utah Diagrammatic Sketch

Township 3N, Range 4E, Section 15, UTM COOR: 4-59-628E 45-38-214N

DISCUSSION

Trend Study No. 5-6 (8-10)

The Franklin Canyon study samples critical deer winter range near the lower end of Franklin Canyon. The site is mountain big sagebrush/grass range that has been seriously depleted by heavy livestock and deer use in the past. Those plants on the west and south exposures appear to have the individuals most affected. Aspect is east-southeast with a 20-25% slope and elevation of 5,440 feet. Although big sagebrush/grass is widespread in lower Franklin Canyon, range condition varies widely. It was reported in 1990 that there were many pellet groups, heavy browse use, several antler drops and at least 12 winter-killed deer. Utilization on browse has declined since that time although there are still many deer pellet groups in the area. Water is available about 1/4 of a mile downslope in the canal. In 1996, sheep were grazing the site and appeared to have been there for most of the spring.

Soil is rocky and classified as a sandy clay loam. Color is light brown and the effective rooting depth (see methods) is just below 8 inches. Soil temperature was measured at 70°F at 8 inches. The profile is very cobbley with some gravel as well. Current erosion is light due to the extensive litter and vegetation cover. Percent bare ground cover has decreased since 1990 to below 2%, further limiting the erosion potential.

The key browse species in this area is mountain big sagebrush. On slopes with a southerly aspect, they are very dry, dominated by cheatgrass, and have abundant dead big sagebrush. This is usually representative of populations with winter injury in association with prolonged drought. Slopes with northern and eastern aspects have much healthier stands of both big sagebrush and rabbitbrush. In the past, big sagebrush populations found on sites similar to this one, were reported to be very decadent and heavily browsed. Presently, this population is becoming more healthy with less utilization and less decadency than in 1990. Dead plants still outnumber live plants. Currently, sagebrush density is estimated to be 920 plants/acre, when in the 1990 it was estimated at 2,466 plants/acre. Broom snakeweed shows an increase in density with many young plants sampled in 1996. White rubber rabbitbrush density has also increased to an estimated 940 plants/acre in 1996. Other species scattered around the site include Saskatoon serviceberry, prickly pear cactus, and mountain snowberry.

Understory composition, density, and production are dominated by cheatgrass brome and a variety of annual forbs. Sandberg bluegrass sum of nested frequency is nearly the same as measured in 1990, with other grasses occurring rarely. Perennial or biennial herbs occur occasionally. The most prevalent are yellow salsify, lupine, Utah milkvetch, thistle, and Louisiana sagebrush. Annual forbs include storksbill, pale alyssum, and umbrella holosteum. This study site has a high fire hazard due to the abundance of dry cheatgrass.

1984 TREND ASSESSMENT

Soil trend is stable only because of a dense litter cover. Soil depth and/or fertility are not the factors limiting development of a more desirable and productive plant community. Vegetative trend is down due to excessive utilization of the major browse species and past depletion of perennial understory plants and their subsequent replacement by annual invaders. This has been exacerbated by the dry, steep aspect. Under these conditions, a destructive fire is a very real possibility.

1990 TREND ASSESSMENT

The slight decline in nested frequency of big sagebrush is not statistically

significant. However, age classification indicates some changes in the population of the key browse species. In 1984, there were 467 mature sagebrush/acre and a high percentage of decadent plants. The 1990 reading found a stand with 266 mature sagebrush/acre and 65% seedlings. Sagebrush canopy cover averages 6%. Density depends on aspect. The shrubs are all dead on the south slopes (refer to discussion above on wintering injuries to sagebrush). Classified as moderately hedged in 1990, compared to the heavily hedged growth form noted in 1984, the sagebrush still have reduced vigor and a low amount of new growth. The data shows some improvements in the herbaceous vegetation, especially the large increase in the frequency of perennial grass. The ground cover changes indicate a decline in the percentage of litter cover and an increase in bare soil. The dense cheatgrass cover provides ephemeral protection. There is little evidence of soil erosion.

TREND ASSESSMENT
soil - stable
browse - down, depends on the success of sagebrush recruitment
herbaceous understory - down, too many weedy annuals, but there were some increases in one perennial grass

1996 TREND ASSESSMENT

Soil trend is stable with very little bare ground cover. Although litter cover has declines since 1990, there is abundant vegetative cover to prevent erosion at this time. Browse trend is still down, even though there are fewer decadent plants reported in 1996 and a lower proportion of heavily utilized plants classified. Fifty-four percent of the population is dead. Browse populations appear to be gaining stability and are more healthy than in the past. Grass composition is dominated by cheatgrass. Forbs are dominated by annual species and do not provide much forage at this time. Herbaceous understory trend is stable.

TREND ASSESSMENT
soil - stable
browse - slightly downward
herbaceous understory - stable, but still very poor composition with too many weedy species

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 6

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	ab12	a4	b15	6	2	9	.26
G	Bromus tectorum (a)	-	-	381	-	-	100	16.79
G	Oryzopsis hymenoides	2	-	3	1	-	2	.16
G	Poa secunda	a7	b227	b228	4	84	79	8.21
G	Vulpia octoflora (a)	-	-	3	-	-	1	.00
Total for Grasses		21	231	630	11	86	191	25.44
F	Alyssum alyssoides (a)	-	-	191	-	-	67	.68
F	Artemisia ludoviciana	a9	ab13	b26	3	5	10	.46
F	Astragalus cibarius	a-	a-	b15	-	-	5	.07

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Astragalus utahensis	$_{a}$5	$_{a}$5	$_{b}$28	3	3	16	.76
F	Camelina microcarpa (a)	-	-	3	-	-	1	.00
F	Cirsium spp.	$_{a}$-	$_{b}$8	$_{c}$37	-	4	21	1.10
F	Collomia spp. (a)	-	-	5	-	-	3	.04
F	Collinsia parviflora (a)	-	-	14	-	-	6	.03
F	Cymopterus spp.	$_{a}$-	$_{a}$-	$_{b}$33	-	-	17	.08
F	Draba spp. (a)	-	-	29	-	-	12	.06
F	Erodium cicutarium (a)	-	-	187	-	-	69	3.17
F	Erigeron eatonii	-	-	3	-	-	1	.00
F	Erigeron pumilus	1	-	-	1	-	-	-
F	Erigeron strigosis	$_{a}$-	$_{a}$-	$_{b}$15	-	-	6	.42
F	Grindelia squarrosa	-	-	4	-	-	2	.03
F	Holosteum umbellatum (a)	-	-	161	-	-	58	.44
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{b}$124	-	-	56	.70
F	Lomatium spp.	-	4	-	-	2	-	-
F	Lupinus sericeus	$_{ab}$43	$_{a}$73	$_{b}$29	20	33	16	1.61
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{b}$22	-	-	11	.08
F	Phlox longifolia	-	-	3	-	-	1	.00
F	Polygonum douglasii (a)	-	-	5	-	-	2	.01
F	Ranunculus testiculatus (a)	-	-	2	-	-	1	.00
F	Sisymbrium altissimum (a)	-	-	19	-	-	7	.55
F	Sphaeralcea coccinea	-	-	-	-	-	-	.00
F	Taraxacum officinale	$_{a}$-	$_{a}$-	$_{b}$22	-	-	10	.29
F	Tragopogon dubius	$_{a}$29	$_{a}$13	$_{b}$194	16	8	79	1.53
F	Vicia americana	-	-	1	-	-	1	.00
Total for Forbs		87	116	1172	43	55	478	12.21

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 6

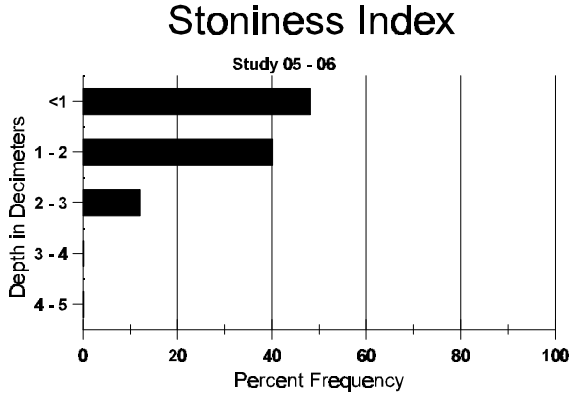
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	26	1.99
B	Chrysothamnus nauseosus albicaulis	30	3.64
B	Chrysothamnus viscidiflorus viscidiflorus	5	.38
B	Gutierrezia sarothrae	18	.64
B	Opuntia spp.	6	.07
Total for Browse		85	6.72

BASIC COVER --
Herd unit 05 , Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	396	1.00	2.50	55.50
Rock	169	.50	1.25	4.57
Pavement	245	4.75	11.50	3.75
Litter	397	92.50	76.50	46.90
Cryptogams	59	.25	.25	.53
Bare Ground	178	1.00	8.00	1.74

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 06

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
7.6	70.2 (8.1)	7.2	56.7	22.0	21.3	2.8	26.6	166.4	.8



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 6

Type	Quadrat Frequency '96
Sheep	3
Rabbit	1
Deer	52
Cattle	9

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	1	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		66			100%
													'96		0			0%
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	69	-	-	-	-	-	-	-	-	69	-	-	-	4600			69
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	90	9	3	-	-	-	-	-	-	-	12	-	-	-	800			12
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	84	-	1	6	-	-	-	-	-	-	7	-	-	-	466	29	35	7
	90	-	4	-	-	-	-	-	-	-	2	2	-	-	266	22	23	4
	96	37	2	-	-	-	-	-	-	-	27	-	-	-	780	25	29	39
D	84	-	1	13	-	-	-	-	-	-	10	-	3	1	933			14
	90	2	16	3	-	-	-	-	-	-	5	-	-	16	1400			21
	96	1	-	-	-	1	-	-	-	-	1	-	-	1	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1100			55
Total Plants/Acre (excluding Dead & Seedlings)													'84		1732	Dec:		54%
													'90		2466			57%
													'96		920			4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	3	1	-	-	-	-	-	-	-	4	-	-	-	266			4
	96	4	-	-	2	-	-	-	-	-	6	-	-	-	120			6
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	37	1	-	3	-	-	-	-	-	40	-	1	-	820	25	37	41
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	266			-
														'96	940			-
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	3	1	-	-	-	-	-	-	-	1	-	3	-	266	11	14	4
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	11	17	5
D	84	-	3	9	-	-	-	-	-	-	-	12	-	-	800			120
	90	5	10	1	-	-	-	-	-	-	5	-	-	11	1066			16
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)														'84	800	Dec:		100%
														'90	1332			80%
														'96	120			0%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	87	-	-	-	-	-	-	-	-	87	-	-	-	1740			87
Y	84	-	3	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	82	-	-	-	-	-	-	-	-	82	-	-	-	1640			82
M	84	1	4	-	-	-	-	-	-	-	1	4	-	-	333	11	16	5
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	266	9	8	4
	96	21	-	-	-	-	-	-	-	-	21	-	-	-	420	7	11	21
D	84	-	-	11	-	-	-	-	-	-	-	11	-	-	733			11
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)														'84	1266	Dec:		58%
														'90	466			0%
														'96	2100			2%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66	7	6	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180	4	11	9
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		0%
													'90		132			50%
													'96		200			10%
Symphoricarpos oreophilus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28	57	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

TREND STUDY 5-7-96 (old 9-1)

Study site name: Baskin Spring. Range type: Perennial grass.

Compass bearing: frequency baseline 180 degrees.

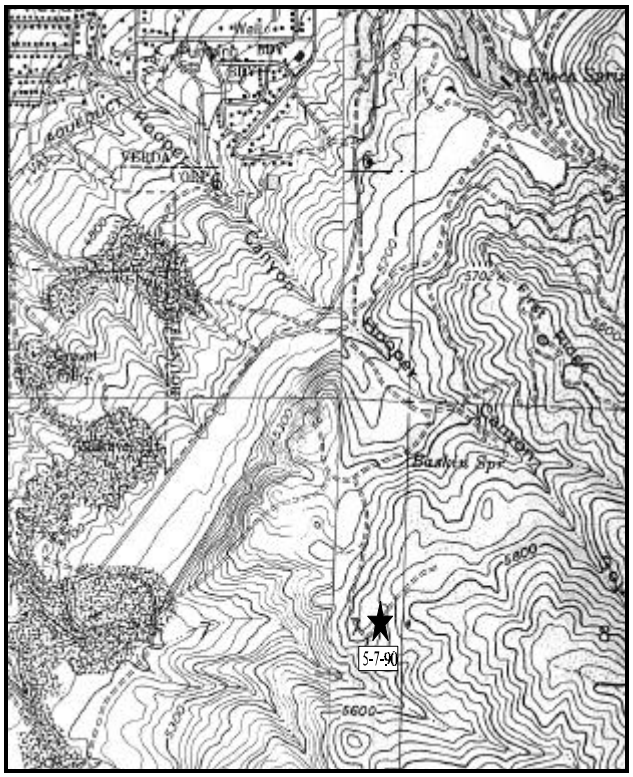
Footmark (first frame at) 5 feet, footmarks (frequency belts) 11, 34, 59, 71, 95.

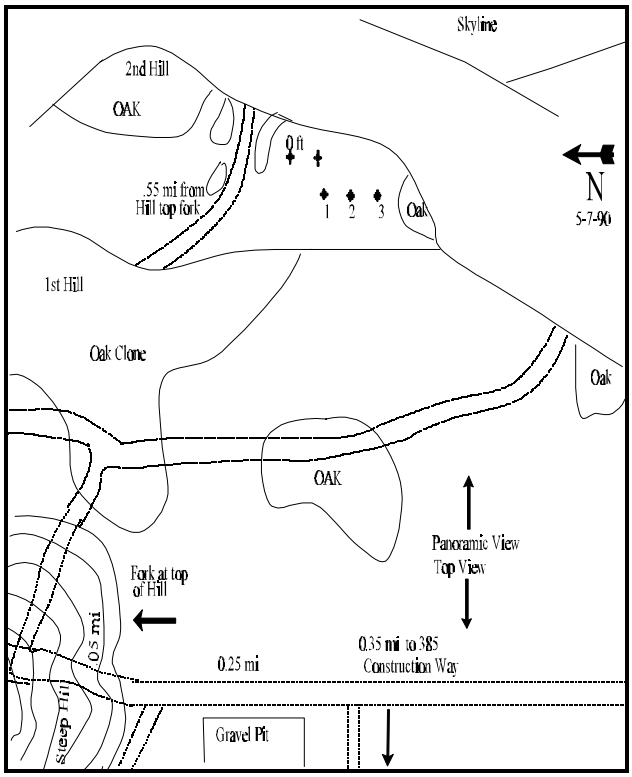
Density plot sizes: grasses and forbs 9.6 ft^2, browse .005 acres.

Distance between density plots 1 & 2 and 2 & 3 50 ft., 50 ft.

LOCATION DESCRIPTION

From the intersection of Orchard blvd. and Center Street in North Salt Lake, go east on Center until it changes to Lacy Way. Follow Lacy Way east to Centennial Street; then follow Centennial south to Freedom Ave. From Freedom Ave. turn south onto Constitution Way. Just past 385 Constitution Way turn left and go through a locked cable gate (North Salt Lake Police Department will have a key). Follow this road .35 miles to a junction with a north-south road. Turn left and continue .25 miles north past the gravel pit to a fork in the road. Take the right fork up a steep hill .05 miles to another fork. Stop here and take a compass bearing of 113° true to the face of the mountain to locate the study area. Now go .55 mile up the right fork to the area you could see from the fork. The 0-foot baseline stake is 50 feet below the road on the other side of a small patch of oak. The 0-foot baseline is marked with a rebar tagged #7036. The density plots start 45 feet south, 7 feet west of the 100-foot baseline stake and run south.





Map Name: Fort Douglas, Utah Diagrammatic Sketch

Township 1N, Range 1E, Section 7

DISCUSSION

Trend Study No. 5-7 (old 9-1)

*** This site was not read in 1996. Text from the 1990 report is found below for your information. Data tables can be found in the 1990 Utah Big Game Trend Study report.

The Baskin Spring trend study is located in the foothills of the Wasatch Mountains above North Salt Lake. The rolling hills are covered mainly by oak brush, with scattered openings. The study is located in a dry meadow. It is on a southwest exposure on a 30% slope with an elevation of 5,700 feet. As part of a protected watershed, this Forest Service land has not been grazed by domestic livestock since the 1930's. There are a low number of deer pellet groups in the immediate area. Protective cover is provided only by nearby oak clumps.

The soil is in the Kilburn Series (USDA 1968). It does not appear to be very deep, and contains 10%-40% small rocks in the surface layer. Rocks and pavement cover 18% of the surface. Bare soil accounts for 27% of the surface, but erosion is not readily apparent except on roads and disturbed areas. The herbaceous vegetation along with the litter provides a fairly uniform cover for the soil.

There is very little browse forage available on the transect, with Gambel oak being prominent on most of the surrounding slopes. The plants are mostly available, vigorous, and only lightly hedged. There are some clumps close to the transect and these appear to be spreading. Broom snakeweed is fairly common in the openings. This low value increaser shows little sign of use.

Perennial grasses and forbs dominate this area. A variety of cool and warm season grasses and annual cheatgrass are moderately abundant. The most abundant species, muttongrass, provides excellent spring forage and erosion protection. Bulbous bluegrass, bluebunch wheatgrass, and cheatgrass also contribute to early season forage production. The warm season grasses, red threeawn and sand dropseed, have considerably less value for big game forage. All grasses are vigorous and current utilization is light.

Forb density is high, but over half of the density is from common ragweed. Many of the mature ragweed are infested with a small caterpillar which appears to kill the terminal bud. A variety of other forbs provide some spring forage. Most abundant are yellow salsify, willowweed, hairy goldaster, mountain sagebrush, sunflower, Utah sweetvetch, and longleaf phlox. Small annual forbs are very common. In spite of the variety, the vegetation seems typical of a disturbed site with many invader and increaser species present. Heavy activity by pocket gophers is evident.

1985 ASSESSMENT OF TREND

Stumps and few remnant plants of big sagebrush in the vicinity indicate that these browse plants were once common in the openings between oakbrush. Currently the annuals, cheatgrass and common ragweed, are abundant. These may be out competed in the long run by more desirable perennial species. The bulbous bluegrass is very vigorous and expanding. The oak appears to be very slowly moving out into the opening. The soil trend is stable.

1990 ASSESSMENT OF TREND

There is no browse in the large openings between the oak clumps on the study site in the foothills above North Salt Lake. The oak has not expanded and is lightly hedged on the available edges. Broom snakeweed increased in frequency and density and remains 99% of the browse composition on the site. Grasses also

increased, some are low value species such as bulbous bluegrass and red three-awn. There are occasional large bunches of bluebunch wheatgrass and sand dropseed. Forb composition is dominated by weedy species such as hairy golden aster, ragweed, Louisiana mountain sage, and star thistle. The increased grasses have led to more litter and vegetative cover, and a reduction in the percentage of bare soil. Soil movement is slight.

TREND ASSESSMENT
soil - stable
browse - downward, broom snakeweed more than doubled it's density
herbaceous understory - downward, almost all species that increased are weedy in habit

TREND STUDY 5-8-96 (old 9-2)

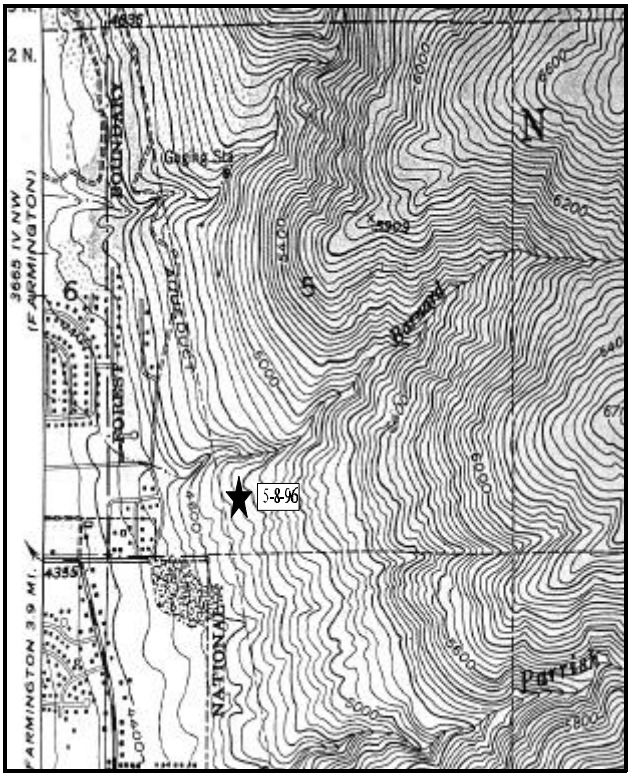
Study site name: Barnard Creek . Range type: Mixed mountain brush .

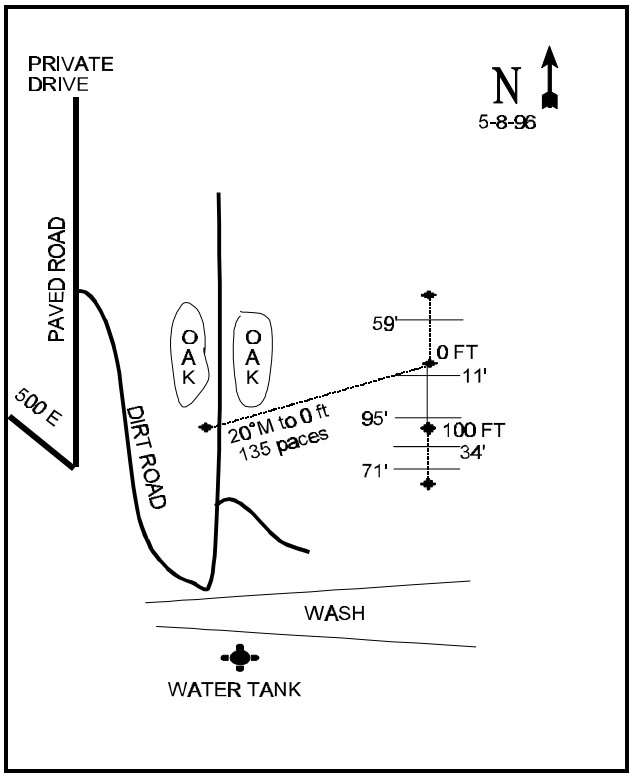
Compass bearing: frequency baseline 180 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).

LOCATION DESCRIPTION

From U-106 in Centerville (400 East) take Barnard Street (1200 North) east to Oak Ridge Drive. Turn left on Oak Ridge to 500 East and stop. Take a bearing of 233 degrees magnetic from the northwest corner of this intersection to locate the transect up the first hill below a band of oak and boulders. Continue along Oak Ridge Drive for 0.2 miles, take a hairpin turn to the right and go 0.2 miles along the Weber Basin Pipeline to a fork in the road. Take the left fork and go 0.2 miles around a bend to a fork. Continue straight 0.1 miles to a witness post on the left just before a patch of oak. The transect starts 378 feet straight up the hill from the point 25 feet beyond the northwest corner of the oak patch. The baseline is marked with a 5 foot green half high, the 0-foot baseline has red browse tag #58 attached. The baseline runs 180 degrees magnetic. The 300 foot line runs off the 0-foot baseline stake an bearing of 360 degrees magnetic.





Map Name: Bountiful Peak, Utah Diagrammatic Sketch

Township 2N , Range 1E , Section 5

DISCUSSION

Trend Study No. 5-8 (9-2)

The Barnard Creek study samples critical deer winter range on the Wasatch Face above Centerville. The range type is mixed mountain brush on a steep, west facing slope at an elevation of 5,000 feet. The transect is about 1,000 feet from the nearest residence. The transect is located on private land within the National Forest Service boundary. More roads and sewer lines have been surveyed in, so development will undoubtedly continue up the mountainside. Deer use is heavy and the range shows some signs of intense utilization. Elk appear to also winter on this slope.

The soil type is similar to that on Study 5-7, with soil that is moderately deep, gravelly sand loam. It has a deep layer of litter and organic matter built up under the shrubs. Soil textural analysis indicates that the soil as a sandy loam with a pH of 7.0 which makes the soil neutral in character. Effective rooting depth (see methods) is a little over 13 inches. Average soil temperature at about 18 inches was only 53ºF. Phosphorous could be a limiting factor with it being below 10ppm (5.7ppm). When the site was sampled in 1985, over half the surface area cover was exposed soil, erosion pavement, and rock. Now they combine for a value of less than 10%, indicating a great improvement in vegetation cover, litter cover, and some soil movement covering some of the rock and pavement. The light soil shows that it is easily disturbed and eroded. There is easy access for ORVs and their frequent use has led to increased erosion and possibly harassment of wintering big game animals.

Antelope bitterbrush and basin big sagebrush are the key species on the study area. The bitterbrush plants are large and vigorous with a average diameter of over 3 feet with a height of just over 6 feet. Although many are partly decadent, there is good annual leader growth. These plants have been heavily hedged. No reproduction of the bitterbrush is apparent but is not critical at this time for they are long-lived and in good vigor. Density of bitterbrush in 1996 was 600 plants/acre. Mountain big sagebrush has been only lightly hedged and exhibits good vigor. However, there has not had adequate reproduction in the last 5 years. At this time it only contributes 16% of the browse cover while bitterbrush provides 83% of the browse cover. Large numbers of the preferred and therefore, heavily hedged smooth sumac are found lower on the slope. Dense oak clumps occupy scattered areas.

The density of perennial grasses is extremely low. Perennial grasses present are bluebunch wheatgrass, purple threeawn, Sandberg bluegrass, and sand dropseed. Annual cheatgrass brome is by far the most common grass and accounts for 62% of the total vegetative cover or 97% of the grass cover.

A variety of forbs can be found, but are fairly uncommon. Pale alyssum, hairy goldaster, Douglas knotweed, and Louisiana sage. There is a general lack of herbaceous forage which would be available to deer in the spring.

1985 TREND ASSESSMENT

The vegetative trend is stable to slowly downward. Most of the key browse species are old, but very vigorous. It would be desirable to see more reproduction among the key browse species. An increase in perennial herbaceous vegetation is also desirable, but unlikely to occur because of the erosion problem. The soil condition will continue to decline, especially in the face of increasing ORV use.

1990 TREND ASSESSMENT

Contrary to the downward trends indicated for the low density browse component on this foothill winter range study, the mountain big sagebrush and bitterbrush populations appear relatively stable. An increased density of the moderately hedged, vigorous bitterbrush was found, including several young plants. Mountain big sagebrush has continued to decline in frequency and density, but 54% of the population was classified as young plants. Sagebrush canopy cover in the oakbrush openings is about 2%. The understory is dominated by cheatgrass and storksbill. Perennial grasses and forbs remain uncommon or scarce. Good ground cover helps limit erosion.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - downward, not many "useful" species, mostly weedy species

1996 TREND ASSESSMENT

Although the soil on this site is highly erodible, there is little evidence of recent erosion. Vegetative and litter cover are adequate at this time to hold the soil in place, except in extreme cases. With percent bare ground, rock, and pavement cover decreasing, soil trend is slightly upward. The key browse species are antelope bitterbrush which makes up 84% of the browse cover and mountain big sagebrush which only contributes to 16% of the browse cover, both of which show stable densities. Utilization is light to moderate with apparently good vigor. Browse trend is stable. The herbaceous understory is sparse with exception of cheatgrass. Cheatgrass provides much of the vegetative cover, and consequently, much of the litter cover. Fire potential is very high on this site with abundant fine fuels to carry the fire. Herbaceous understory trend is stable, but in poor condition because of the high proportion of weedy species.

TREND ASSESSMENT
soil - slightly upward
browse - stable
herbaceous understory - stable, but very poor composition of weedy species

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 8

Type	Species	Nested Frequency '85	'90	'96	Quadrat Frequency '85	'90	'96	Average Cover % '96
G	Agropyron spicatum	8	3	15	3	2	7	.67
G	Aristida purpurea	-	2	5	-	1	3	.09
G	Bromus tectorum (a)	-	-	392	-	-	100	36.54
G	Poa bulbosa	3	-	-	1	-	-	-
G	Poa fendleriana	3	3	-	2	1	-	-
G	Poa secunda	a-	a-	b12	-	-	7	.10
G	Sporobolus cryptandrus	a-	b12	ab4	-	4	2	.30
G	Stipa comata	-	2	-	-	1	-	-
Total for Grasses		14	22	428	6	9	119	37.70

Type	Species	Nested Frequency '85	'90	'96	Quadrat Frequency '85	'90	'96	Average Cover % '96
F	Alyssum alyssoides (a)	-	-	29	-	-	12	.10
F	Allium spp.	$_a$11	$_b$-	$_b$2	6	-	1	.00
F	Ambrosia psilostachya	$_a$-	$_a$-	$_b$9	-	-	4	.27
F	Artemisia ludoviciana	$_a$49	$_b$21	$_b$11	15	10	5	.36
F	Aster chilensis	$_a$63	$_b$-	$_b$-	29	-	-	-
F	Chenopodium album	-	6	-	-	3	-	-
F	Cynoglossum officinale	-	-	3	-	-	1	.00
F	Epilobium paniculatum	$_a$24	$_b$-	$_b$4	13	-	2	.01
F	Eriogonum caespitosum	-	3	-	-	1	-	-
F	Erigeron caespitosus	5	-	-	2	-	-	-
F	Erodium cicutarium (a)	18	-	-	7	-	-	-
F	Euphorbia spp.	-	-	3	-	-	1	.00
F	Helianthus annuus (a)	-	6	-	-	3	-	-
F	Heterotheca villosa	40	46	38	20	19	16	3.22
F	Isatis tinctoria	-	-	9	-	-	6	.31
F	Lactuca serriola	$_a$-	$_b$28	$_a$2	-	14	1	.00
F	Linaria dalmatica	-	-	1	-	-	1	.15
F	Machaeranthera spp	-	-	1	-	-	1	.00
F	Polygonum douglasii (a)	-	-	28	-	-	13	.14
F	Portulaca oleracea	-	3	-	-	1	-	-
F	Salsola iberica (a)	-	8	-	-	4	-	-
F	Tragopogon dubius	$_a$-	$_a$1	$_b$17	-	1	9	.17
F	Unknown forb-perennial	3	-	-	1	-	-	-
F	Verbascum blattaria	-	-	2	-	-	1	.00
Total for Forbs		213	122	159	93	56	74	4.79

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 8

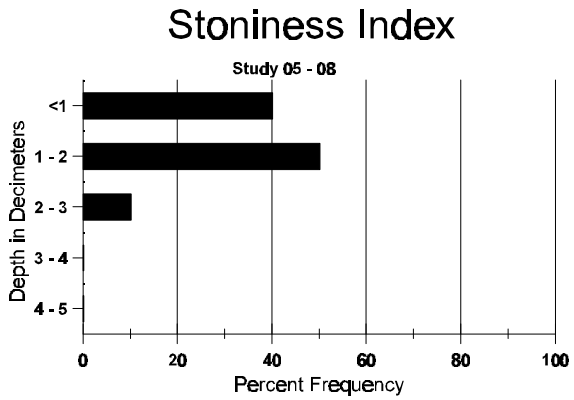
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	25	2.73
B	Gutierrezia sarothrae	8	.06
B	Opuntia spp.	2	-
B	Purshia tridentata	27	14.06
Total for Browse		62	16.86

BASIC COVER --
Herd unit 05 , Study no: 8

Cover Type	Nested Frequency '96	Average Cover % '85	'90	'96
Vegetation	393	7.25	4.75	55.25
Rock	180	5.00	6.50	5.85
Pavement	137	12.50	13.25	3.92
Litter	394	38.00	61.25	55.74
Cryptogams	22	0	0	.12
Bare Ground	52	37.25	14.25	.56

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 08

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
33.5	53.0 (18.1)	7.0	60.9	19.1	20.0	1.1	5.7	118.4	.3



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 8

Type	Quadrat Frequency '96
Deer	20

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	85	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	7	-	-	-	-	-	-	-	-	7	-	-	-	466			7
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	85	4	12	-	-	-	-	-	-	-	15	-	1	-	1066	26	40	16
	90	1	1	-	-	-	-	-	-	-	2	-	-	-	133	13	22	2
	96	21	4	-	2	-	-	-	-	-	27	-	-	-	540	19	35	27
D	85	-	1	2	-	-	-	-	-	-	2	-	1	-	200			3
	90	1	2	-	1	-	-	-	-	-	4	-	-	-	266			4
	96	4	2	-	-	-	-	-	-	-	5	-	-	1	120			6
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	440			22
Total Plants/Acre (excluding Dead & Seedlings)													'85		1332	Dec:		15%
													'90		865			31%
													'96		680			18%
Gutierrezia sarothrae																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140	13	19	7
Total Plants/Acre (excluding Dead & Seedlings)													'85		0	Dec:		-
													'90		0			-
													'96		200			-
Opuntia spp.																		
M	85	1	-	-	-	-	-	-	-	-	1	-	-	-	66	7	17	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	12	2
Total Plants/Acre (excluding Dead & Seedlings)													'85		66	Dec:		-
													'90		0			-
													'96		40			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Purshia tridentata																		
Y	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	85	-	-	1	-	-	-	-	-	-	1	-	-	-	66	36	51	1
	90	2	3	-	-	-	-	-	-	-	5	-	-	-	333	50	66	5
	96	9	20	-	-	-	-	-	-	-	29	-	-	-	580	43	73	29
D	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	85	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'85		66	Dec:		0%
													'90		399			0%
													'96		600			3%

TREND STUDY 5-9-90

Study site name: Davis Co. Rifle Range . Range type: Mixed mountain brush.

Compass bearing: frequency baseline 180 degrees, density plots 180 degrees.

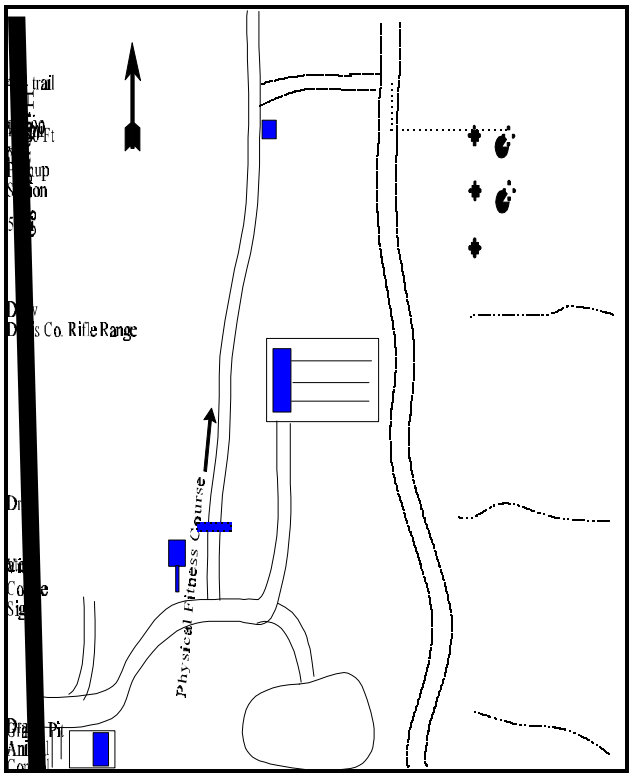
Footmark (first frame at) 5 feet, footmarks (frequency belts)11,34,59,71,95.

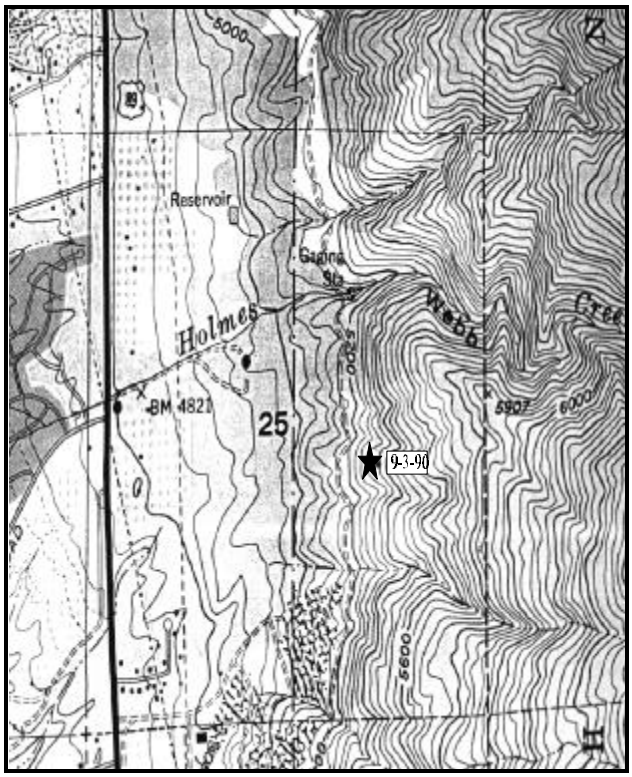
Density plot sizes: grasses and forbs 9.6 ft^2, browse .005 acres.

Distance between density plots 1 & 2 and 2 & 3 100 ft., 100 ft.

LOCATION DESCRIPTION

Take Rt. 89 into Davis County. Turn east up the road towards Animal Control and the Davis County Rifle Range. Go east past the Animal Control Center to a dirt road marked "Par Course." Follow this road .45 miles north to a well-developed trial going east. Walk up the trail to a fire break road, the follow the fire break road south 154 paces to a rebar witness post 10 feet south of a lone oak. From the witness post, head due east 480 feet up a bare ridge, then across to a lone maple. A rebar tagged #7081 marks the 0-foot baseline. The density plots begin 100 feet west of the 0-foot baseline and run due south.





Map Name: Kaysville, Utah Diagrammatic Sketch

Township 4N Range 1W , Section 25

DISCUSSION

Trend Study No. 5-9 (9-3)

*** This site was not read in 1996. Text from the 1990 report is found below for your information. Data tables can be found in the 1990 Utah Big Game Trend Study report.

The Davis County Rifle Range study is located on a slope above the gravel pits and the Davis County Rifle range. This transect samples an area of open, mixed brush range. The 40% slope has a western aspect with an elevation of 5,600 feet. Like other Forest Service land along the Wasatch Front, livestock grazing has been discontinued in order to protect the watershed values. Although there are many roads, the distance to housing developments is greater here than at other transects along the Wasatch Front. Therefore, human pressure is relatively low. Deer pellet groups are very abundant. Good escape and resting cover is provided by nearby patches of oak and maple.

The soil is in the highly erosion-susceptible Ridd series (USDA 1968). It is underlain by bedrock at a depth of 25 to 40 inches. The soil is a rocky sandy loam with a majority of the surface protected by vegetation, litter, and a buildup of organic matter. Approximately 35% of the cover is bare soil with a concentration of rocks and erosion pavement on the surface.

Moderate quantities of quality browse forage are available on this slope. Antelope bitterbrush is highly preferred and displays heavy hedging. The plants are large and vigorous and there appears to be adequate reproduction. Basin big sagebrush is less abundant than the bitterbrush. Equal numbers of sagebrush plants were classified as decadent and mature. Apparently, they were adversely affected by heavy browsing and/or winter damage in conjunction with extended drought with portions of the crowns dead. Eighteen percent of the sagebrush were classified as young plants. No seedlings were encountered. The small slenderbush eriogonum remains unutilized, as do individuals of the most abundant species, broom snakeweed.

Large bunches of bluebunch wheatgrass are prominent. They have considerable buildup of litter around their bases, providing erosion control and good forage for big game. Less noticeable are the smaller species, muttongrass, bulbous bluegrass, and cheatgrass. Total density of the perennial grasses is moderate.

Forbs are diverse and quite abundant. Over 70% of the density is from autumn willowweed, an annual which may provide some spring forage. Yellow salsify, wild onion, pale agoseris, tapertip hawksbeard, prickly lettuce, and annual mustards are also common. Utilization of all herbaceous species is generally light.

1985 ASSESSMENT OF TREND

As with many locations along the Wasatch Front, there appears to be a slow decline in the browse component of the community. The grasses are lightly utilized and increasing faster than the slower-reproducing sagebrush and bitterbrush. The soil is relatively stable.

1990 ASSESSMENT OF TREND

The data comparisons for this site help illustrate the slow decline of browse, especially big sagebrush, found in most places along the Wasatch Front. The mountain big sagebrush have decreased in density and frequency. Sagebrush canopy cover averages only 2%. However, vigor is fair and recent lighter use has resulted in lightly hedged growth forms for the mature plants. Young plants of sagebrush and bitterbrush were found. The bitterbrush is more heavily hedged and

it declined slightly in density and frequency. The question persists, are there enough young plants to replace the steady loss of older shrubs on this critical Wasatch Front winter range? There is considerable competition in the understory from the abundant cheatgrass and small bluegrasses. As in 1985, goatsbeard is the only common forb. Litter cover is high due to the abundance of annuals. Considerable soil movement occurs on the 40% slope. Active gullies cross the site.

TREND ASSESSMENT
soil - down
browse - down
herbaceous understory - stable, but still too many weedy species, even with the increase for bluebunch wheatgrass

TREND STUDY 5-10-96 (old 9-4)

Study site name: Junction 89-193 . Range type: Big sagebrush/grass .

Compass bearing: frequency baseline 180 degrees.

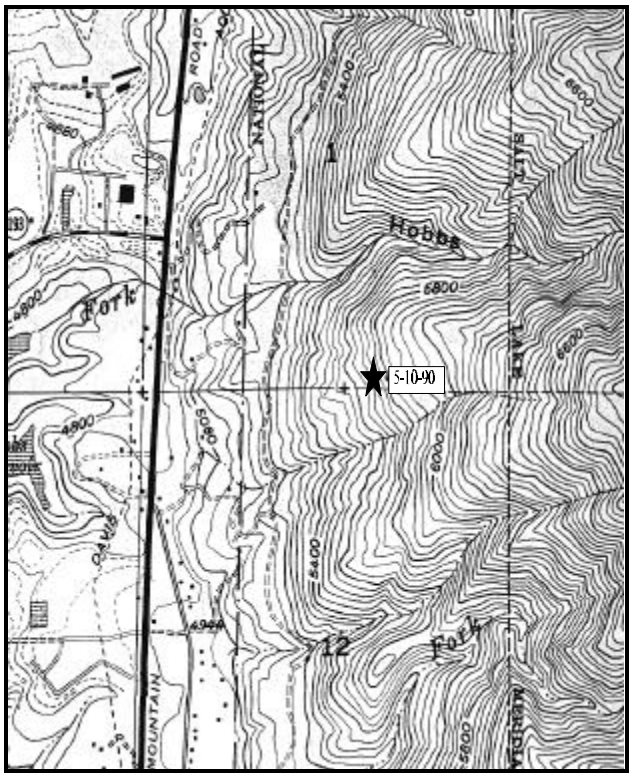
Footmark (first frame at) 5 feet, footmarks (frequency belts) 11, 34, 59, 71, 95.

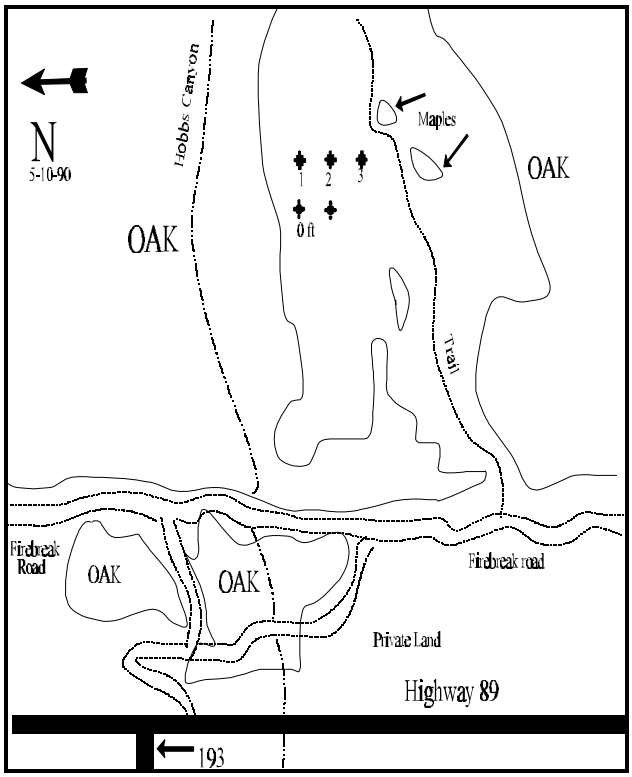
Density plot sizes: grasses and forbs 9.6 ft^2, browse .005 acres.

Distance between density plots 1 & 2 and 2 & 3 50 ft., 50 ft.

LOCATION DESCRIPTION

From the east side of the junction of Highway 89 and U-193 (east of Hill Air Force Base), take the dirt road which angles to the northeast. Follow this road .4 miles to the firebreak road at the base of the mountain. Turn right and proceed .425 mile across Hobbs Creek and along this road to a well-used foot trail on the left side. Follow this foot trail up into a big clearing between .4 and .5 mile to tow clumps of maple on the right side (see diagram). The third density plot is approximately 30 feet from the trail opposite the highest maple clump. The density plots are 100 feet apart and the baseline starts 100 feet west of the first density plot.





Map Name: Kaysville, Utah Diagrammatic Sketch

Township 4N , Range 1W , Section 1

DISCUSSION

Trend Study No. 5-10 (9-4)

*** This site was not read in 1996. Text from the 1990 report is found below for your information. Data tables can be found in the 1990 Utah Big Game Range Trend Studies report.

This transect samples winter range in the foothills east of Hill Air Force Base. It is located on forest Service land about 2,000 feet from the nearest house. It is on a steep (75%) hillside with a western exposure and an elevation of 5,800 feet. The study site is above the severe winter range limits but is still very important winter range. Deer pellet groups are relatively infrequent in the open areas. Three deer were sighted in the oakbrush below the transect on Jun 27. The transect is near a popular hiking and horseback trial, but the nearest road is the firebreak road at the foot of the mountain.

Thirty-eight percent of the surface is bare soil covered with rock fragments and erosion pavement. Of the same series as study 5-9, the soil is rocky sandy loam with a high hazard of erosion on the exposed areas (USDA 1968). Vegetative cover from grasses is high at 11%, and 50% litter cover is provided by dead sagebrush and grasses. Erosion is not severe, except on trails.

At one time, basin big sagebrush was the dominant overstory on the site. However, about 33% were decadent or dead and very few young plants were found. The remaining mature sagebrush are generally vigorous but heavily hedged. There was not obvious sign as to what killed so many of the shrubs, except possibly sustained intense hedging or severe winters of 1983 and 1984. Since then there has been long periods of drought. The only other woody species encountered on the transect is the undesirable increaser, broom snakeweed. Scattered oak located nearby have been highlined, and thicker stands surrounding the clearing provide cover and are moderately hedged.

Grasses and forbs cover at least five times more area than the declining sagebrush. Density of grasses is high mainly from the abundant muttongrass. Other species present are bluebunch wheatgrass, rattlesnake brome, bulbous bluegrass, oniongrass and intermediate wheatgrass. Cheatgrass is present in low amounts. Vigor is good and the grasses are only lightly utilized.

Forbs are even more numerous than grasses, but many are small and inconspicuous. Some, especially the Astragalus, have been defoliated, probably by grasshoppers. The annual ragweed is fairly common, as is heartleaf twistflower, mountain sagebrush, yellow salsify and Pacific aster. None would provide much forage except in spring and summer.

1985 ASSESSMENT OF TREND

As far as deer winter range is concerned, the apparent trend is downward because of the sparse and declining population of the key species, big sagebrush. There is still a variety of forage available for transitional range, although many of the forb species are not very desirable for range. The soil trend is stable as long as the grass cover is maintained.

1990 ASSESSMENT OF TREND

The decline of big sagebrush is most obvious at this site where both frequency and density declined and no young sage were encountered. The moderately hedged sagebrush are small and display little growth and poor vigor. Annuals and weedy species, many exotic, are becoming increasingly dominant. The loose, rocky soil on the steep slope is subject to moderate levels of erosion. There is an

increased amount of rock and pavement cover.

TREND ASSESSMENT
soil - down
browse - down
herbaceous understory - down, composed mostly of weeds

TREND STUDY 5-11-96 (old 10-1)

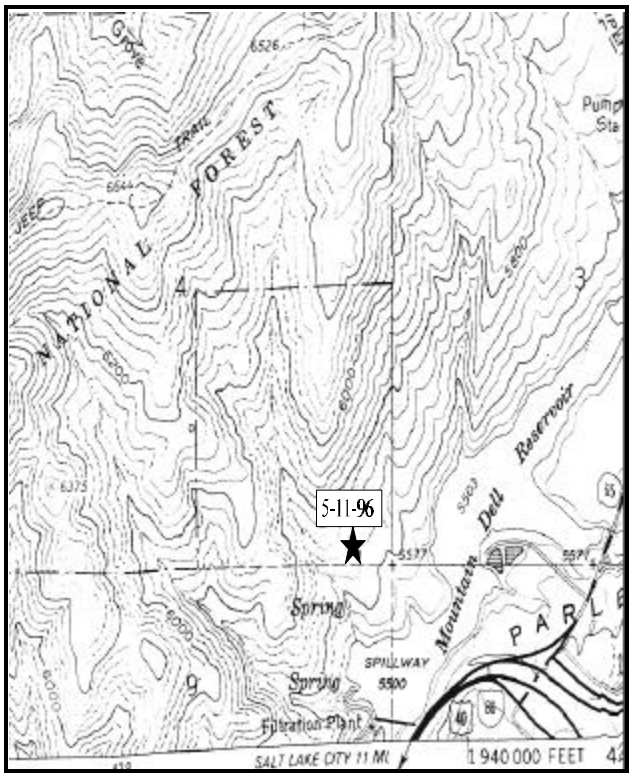
Study site name: Mountain Dell Reservoir. Range type: Big Sagebrush/grass.

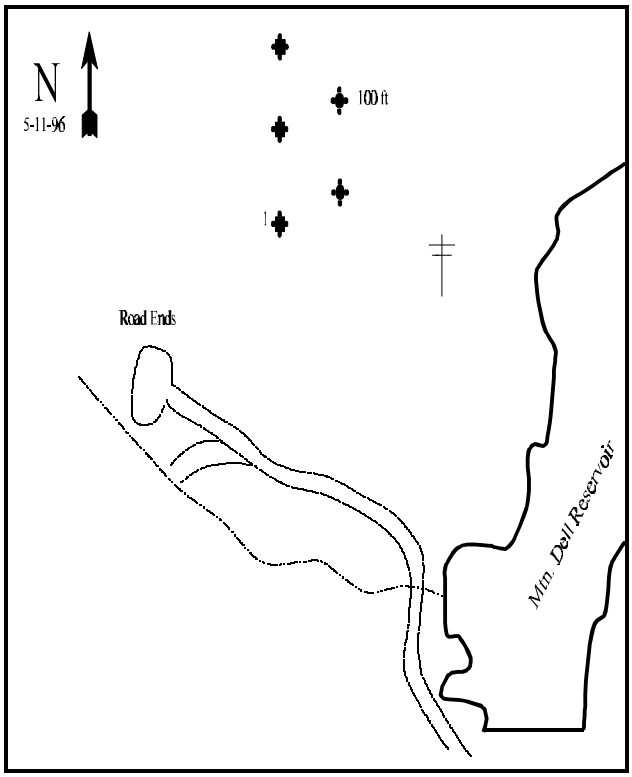
Compass bearing: frequency baseline 130 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

On I-80 heading up Parleys Canyon, take exit 133 to Mountain Dell Dam. You will come to a gate where you will need to Push the button to open the gate and drive down to the Water Purification Plant to get a key for the second gate. To get to the site you must obtain permission from Parleys Water Purification Plant (Ph # 583-2186). From the west end of Mountain Dell Dam at the second gate, proceed northwesterly for 0.30 miles to a point where a single aerial telephone line with power poles crosses the road. From this point, walk northerly (i.e., uphill) to the third telephone pole. From the third telephone pole, the 0-foot baseline stake is located 24 paces away on an azimuth of 330 degrees magnetic, towards a large clump-like Hawthorn (Craetaegus) bush. The 0-foot baseline stake has a red browse tag # 32901 attached. The baseline runs 130 degrees magnetic.





Map Name: Mountain Dell, Utah Diagrammatic Sketch

Township 15, Range 2E, Section 4

DISCUSSION

Trend Study No. 5-11 (10-1)

The Mountain Dell Reservoir study site (now in herd unit no. 5) is on a sagebrush/grass slope bordered by Gambel oakbrush located immediately north of Mountain Dell Reservoir. All of Mountain Dell drainage is owned by Salt Lake City and makes up part of the collection system for the city's culinary water. Grazing of domestic livestock is prohibited, as is off-road vehicle use. The study is at an elevation of approximately 5,900 feet on a north-northeasterly aspect with a 10% to 20% slope. Deer use the area primarily as spring-fall range and during mild winters. Elk and moose are occasionally observed in the area.

Soil is deep and well drained with a clay loam texture. Litter and vegetative cover are excellent, as is organic matter content. No evidence of accelerated erosion is present. The estimated effective rooting depth (see methods) was estimated to be 23 inches with an average temperature of 46°F at 18 inches. Bare ground cover was estimated at 3% in 1996. Overall soil condition is good to excellent.

Mountain big sagebrush density was estimated at 2,740 plants/acre in 1996 which is quite similar to the 1990 estimate of 2,599 plants/acre. The percent decadency has declined since 1990 with most plants classified as lightly hedged. The mountain big sagebrush population appears stable. Overall vigor is good. With the greatly increased sample size used in 1996, several other browse species were encountered. Antelope bitterbrush is scattered through the site with an estimated density of 120 plants/acre. Utilization is moderate with good vigor. Oregon grape has an estimated density of 1,480 plants/acre. These plants small in stature averaging 6 inches in height with a 7 inch crown. Other browse includes saskatoon serviceberry, wyeth eriogonum, chokecherry, wood’s rose, and blueberry elder. A short distance to the north, bitterbrush is more abundant.

With total exclusion from livestock grazing, grasses and forbs have become very abundant and diverse. Diversity of grasses and forbs is high with more than 56 species sampled on the 5 belts. Grasses are quite diverse, but there are about 5 times more forbs species. Annual forbs and grasses are rare and limited to an occasional hairy brome, a few mustards and a fair amount of catchweed bedstraw. Utilization of grasses and forbs is uniformly light.

1983 TREND ASSESSMENT

Soil condition continues to improve. The city's watershed management objectives are probably being met. Vegetative trend is debatable and depends on objectives. The trend seems to be toward an increasing level of grass/forb dominance. Although the data is inconclusive; shrub density, vigor, and reproduction, especially of mountain big sagebrush, seems to be declining in the face of herbaceous competition.

1990 TREND ASSESSMENT

The mountain big sagebrush on this lightly used, 5,600 foot elevation winter range is very vigorous and productive. Although the number of mature sagebrush decreased from 1,633 to 1,200 plants/acre, there is abundant reproduction. The population was classified as 57% seedlings in 1990. Sagebrush canopy cover averages 16%. The understory supports a dense and diverse stand of valuable grasses and forbs. Kentucky bluegrass, bluebunch wheatgrass, pacific aster, western yarrow, and showy goldeneye are common species. There is complete ground cover of vegetation and litter, leaving only 1% bare soil.

TREND ASSESSMENT
soil - stable
browse - improving
herbaceous understory - stable

1996 TREND ASSESSMENT

Soil trend continues to be stable with abundant vegetative and litter cover. No recent erosion was apparent. Browse tend is slightly upward with a decline in the number of mountain big sagebrush classified as decadent. Other browse species, such as chokecherry and antelope bitterbrush show utilization, but these plants are scattered throughout the site. The understory still supports a dense and diverse herbaceous understory of valuable grasses and forbs. Kentucky bluegrass, cheatgrass, Pacific aster, western yarrow, and showy goldeneye are common species. Herbaceous trend is stable.

TREND ASSESSMENT
soil - stable, excellent condition
browse - slightly upward
herbaceous understory - stable, excellent condition

HERBACEOUS TRENDS --
Herd unit 05, Study no: 11

Type	Species	Nested Frequency '83	'90	'96	Quadrat Frequency '83	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	-	7	-	-	2	-	-
G	Agropyron intermedium	-	-	2	-	-	1	.03
G	Agropyron spicatum	a-	b93	a-	-	36	-	-
G	Agropyron trachycaulum	a-	a-	b37	-	-	15	2.03
G	Bromus brizaeformis (a)	-	-	3	-	-	1	.03
G	Bromus japonicus (a)	-	-	229	-	-	68	4.84
G	Bromus tectorum (a)	-	-	24	-	-	7	.54
G	Carex spp.	a46	b-	b-	21	-	-	-
G	Elymus cinereus	a24	b3	b2	10	3	1	.15
G	Elymus spp.	a16	ab3	b-	5	1	-	-
G	Poa pratensis	a347	b230	c284	96	78	80	25.28
G	Unknown grass - perennial	4	-	-	2	-	-	-
Total for Grasses		437	336	581	134	120	173	32.92
F	Achillea millefolium	a155	a151	b50	51	53	21	.89
F	Agoseris glauca	a33	b-	b1	14	-	1	.00
F	Alyssum alyssoides (a)	-	-	14	-	-	5	.05
F	Allium spp.	a24	a32	b2	11	14	1	.00
F	Arabis spp.	-	-	-	-	-	-	.00
F	Artemisia dracunculus	a8	a16	b-	4	5	-	-
F	Artemisia ludoviciana	4	2	-	2	1	-	-
F	Aster chilensis	a177	a161	b84	62	58	34	1.30
F	Astragalus convallarius	1	3	-	1	1	-	-

Type	Species	Nested Frequency '83	'90	'96	Quadrat Frequency '83	'90	'96	Average Cover % '96
F	Balsamorhiza macrophylla	$_{a}$26	$_{b}$6	$_{b}$3	10	4	2	.24
F	Brodiaea douglasii	$_{a}$19	$_{b}$-	$_{b}$-	9	-	-	-
F	Calochortus nuttallii	4	-	-	2	-	-	-
F	Cirsium spp.	-	4	1	-	2	1	.00
F	Collomia linearis (a)	-	-	17	-	-	9	.04
F	Collinsia parviflora (a)	-	-	17	-	-	5	.27
F	Crepis acuminata	-	9	6	-	3	2	.01
F	Cynoglossum officinale	$_{a}$-	$_{b}$27	$_{a}$2	-	11	1	.00
F	Epilobium paniculatum (a)	-	-	49	-	-	20	.33
F	Erigeron spp	-	-	1	-	-	1	.03
F	Eriogonum spp.	2	-	-	1	-	-	-
F	Eriogonum umbellatum	$_{a}$35	$_{a}$26	$_{b}$-	14	10	-	-
F	Galium aparine (a)	2	-	13	1	-	5	.07
F	Geranium spp.	$_{a}$12	$_{ab}$7	$_{b}$-	4	2	-	-
F	Hackelia patens	1	-	-	1	-	-	-
F	Helianthella uniflora	$_{ab}$37	$_{a}$60	$_{b}$27	15	26	9	1.68
F	Holosteum umbellatum (a)	-	-	2	-	-	1	.03
F	Lathyrus brachycalyx	$_{a}$85	$_{b}$29	$_{ab}$47	31	15	25	.63
F	Lathyrus pauciflorus	$_{a}$101	$_{b}$-	$_{b}$-	40	-	-	-
F	Lactuca serriola	$_{a}$-	$_{b}$39	$_{b}$42	-	17	22	.29
F	Lithophragma parviflora	$_{a}$28	$_{b}$-	$_{b}$-	12	-	-	-
F	Lithospermum ruderale	$_{a}$16	$_{a}$23	$_{b}$-	7	14	-	-
F	Lupinus sericeus	$_{a}$43	$_{a}$29	$_{b}$12	18	18	5	.72
F	Mertensia brevistyla	$_{a}$14	$_{b}$-	$_{b}$-	6	-	-	-
F	Microsteris gracilis (a)	-	-	12	-	-	6	.03
F	Polygonum douglasii (a)	-	-	82	-	-	36	.40
F	Rumex spp.	-	2	-	-	1	-	-
F	Senecio integerrimus	4	-	-	3	-	-	-
F	Solidago missouriensis	-	-	7	-	-	2	.30
F	Taraxacum officinale	3	7	3	2	3	1	.03
F	Tragopogon dubius	$_{a}$17	$_{b}$58	$_{c}$106	11	27	54	1.30
F	Unknown forb-perennial	$_{a}$6	$_{b}$-	$_{b}$-	4	-	-	-
F	Verbascum thapsus	-	-	3	-	-	1	.03
F	Vicia americana	$_{a}$120	$_{b}$7	$_{b}$-	52	3	-	-
F	Viguiera multiflora	$_{a}$20	$_{b}$74	$_{a}$18	10	31	8	.11
Total for Forbs		997	772	621	398	319	278	8.85

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 05 , Study no: 11

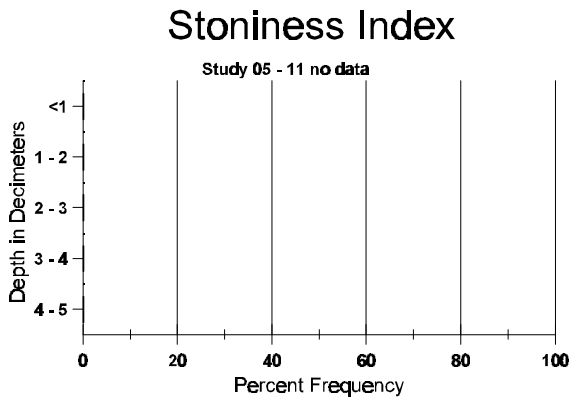
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	80	15.98
B	Eriogonum heracleoides	8	1.01
B	Mahonia repens	10	.57
B	Prunus virginiana	11	.33
B	Purshia tridentata	4	1.54
B	Rosa woodsii	3	.06
B	Sambucus racemosa pubens microbotrys	1	.03
B	Symphoricarpos oreophilus	2	.30
Total for Browse		119	19.85

BASIC COVER --
Herd unit 05 , Study no: 11

Cover Type	Nested Frequency '96	Average Cover % '83	'90	'96
Vegetation	394	9.25	13.00	58.34
Rock	8	0	0	.02
Pavement	5	0	0	.01
Litter	400	89.75	86.00	71.09
Cryptogams	-	0	0	0
Bare Ground	109	1.00	1.00	3.40

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 11

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
23.4	46.2 (18.1)	6.2	38.2	33.1	28.7	3.5	34.7	297.6	.4



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 11

Type	Quadrat Frequency '96
Elk	1
Deer	6

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 11

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	122	84	0
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	99	-	-	6	-	-	-	-	-	105	-	-	-	3500			105
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	6	-	-	-	-	-	-	-	-	6	-	-	-	200			6
	90	15	-	-	1	-	-	-	-	-	16	-	-	-	533			16
	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	83	25	23	1	-	-	-	-	-	-	43	-	6	-	1633	33	42	49
	90	33	2	-	1	-	-	-	-	-	36	-	-	-	1200	34	44	36
	96	112	4	-	-	-	-	-	-	-	116	-	-	-	2320	27	45	116
D	83	4	1	-	-	-	-	-	-	-	3	-	2	-	166			5
	90	23	3	-	-	-	-	-	-	-	19	-	-	7	866			26
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	900			45
Total Plants/Acre (excluding Dead & Seedlings)													'83		1999	Dec:		8%
													'90		2599			33%
													'96		2740			9%
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	1	-	-	-	-	-	-	-	-	-	1	-	-	33	15	6	1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		33			-
													'96		0			-
Eriogonum heracleoides																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	9	33	15
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		300			-
Mahonia repens																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	7	-	-	5	-	-	-	-	-	12	-	-	-	240			12
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	34	-	-	28	-	-	-	-	-	62	-	-	-	1240	6	7	62
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		1480			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Prunus virginiana																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	7	-	-	-	-	-	-	-	-	6	1	-	-	140			7
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	7	-	-	3	-	-	-	-	-	10	-	-	-	200	25	19	10
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		340			-
Purshia tridentata																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	4	-	-	-	-	-	-	-	6	-	-	-	120	34	66	6
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		120			-
Rosa woodsii																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	1	-	-	-	-	-	5	-	-	-	100	18	8	5
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		100			-
Sambucus racemosa pubens microbotrys																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15	13	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		0			-
													'96		20			-
Symphoricarpos oreophilus																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40	41	65	2
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'90		33			-
													'96		40			-

TREND STUDY 5-15-96 (old 8-11)

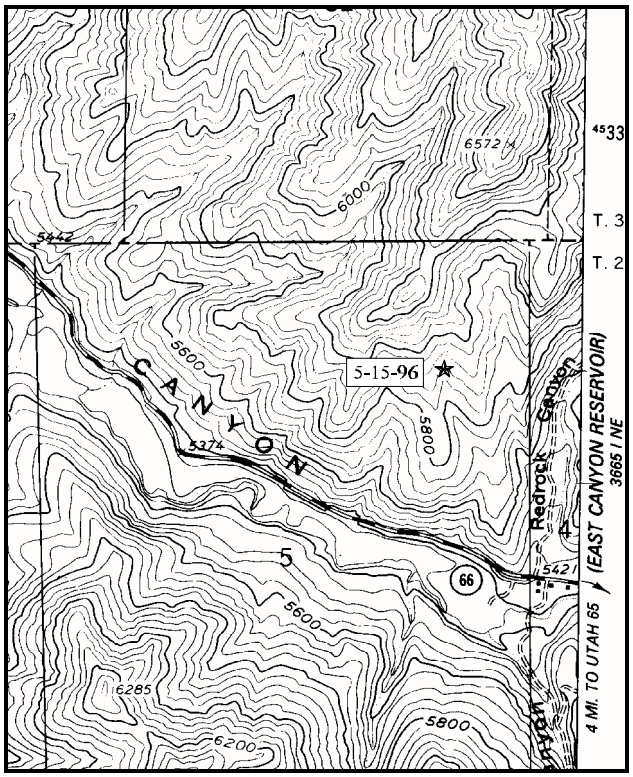
Study site name: Red Rock Canyon. Range type: Burned - reseeded.

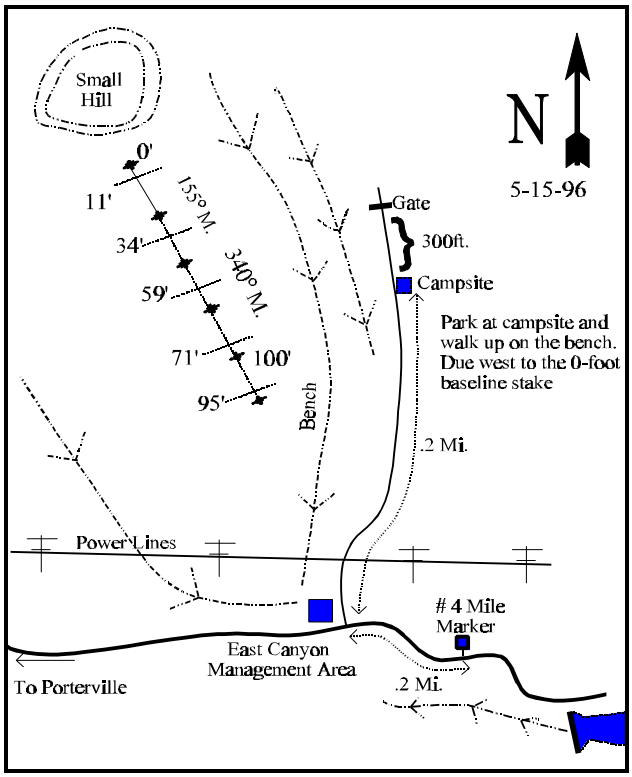
Compass bearing: frequency baseline 155 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Travel east for 0.2 miles past mile marker # 4 on highway 66 heading towards Porterville and turn right (sign says East Canyon Wildlife Management Area). Travel north for 0.2 miles to a campsite. Park at the campsite and walk up on the bench due west to the 0-foot baseline stake. The 0-foot baseline stake is marked by a browse tag # 52. The baseline runs 155 degrees magnetic.





Map Name: Porterville Diagrammatic Sketch

Township 2N, Range 3E, Section 5, UTM COOR: 4-57-033E 45-32-128N

DISCUSSION

Trend Study No. 5-15

This study is located north of East Canyon Reservoir on a small bench that was burned then seeded in 1992. The site was seeded with a combination of forbs and grasses which have established relatively well. Elevation is approximately 5,620 feet with a south aspect and slight slope (3-5%). Considered winter range, yet very little wildlife use was noted in 1996.

Soil textural analysis reveals a clay loam-sandy clay loam with a neutral pH. Effective rooting depth (see methods) was estimated to be 13.5 inches with an average temperature of 66°F at 16 inches. There is very little rock in the soil profile or on the soil surface. Percent bare ground is also low with most of the bare ground being contributed by gopher activity. Vegetative and litter cover are high with no erosion apparent. Broom snakeweed is the most abundant plant with an estimated 1,580 plants/acre. These plants average 11 inches in height with a 10 inch crown. Sixty-five percent of the plants were classified as mature and 35% were classified as young. No seedlings were encountered. Mountain big sagebrush has an estimated density of 220 plants/acre, all of which were classified as young. Other browse species include white rubber rabbitbrush, stickyleaf low rabbitbrush, and mountain snowberry.

Japanese brome dominates the herbaceous understory at this time. Cheatgrass is also present, but not as prominent. Seeded grasses established relatively well with crested wheatgrass occurring in over 50% of the quadrats. Other perennial grass species include Kentucky bluegrass, bluebunch wheatgrass, orchard grass, mountain rye, Sandberg bluegrass, thickspike wheatgrass, and Great Basin wildrye.

Yellow salsify is the dominant forb followed by species such as prickly lettuce and the increaser cirsium. Annual species include autumn willow weed, Douglas knotweed, tumble mustard, and pale alyssum. Some seeded forbs have established and include Lewis flax, small burnet, alfalfa, and yellow sweetclover. Some utilization of alfalfa and yellow salsify.

1996 APPARENT TREND ASSESSMENT

There is no erosion apparent on the site at this time with abundant litter and vegetative cover. Most bare ground can be contributed by gopher activity. Browse species are sparse with white rubber rabbitbrush being the most abundant. The mountain big sagebrush density is not high, but the population is healthy and vigorous. Herbaceous understory is dominated by Japanese brome. There are several seeded species present which should provide forage and competition for the annual and increaser species.

HERBACEOUS TRENDS --
Herd unit 05 , Study no: 15

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron cristatum	180	54	9.30
G	Agropyron dasystachyum	6	3	.06
G	Agropyron spicatum	27	10	.66
G	Bromus japonicus (a)	394	87	21.03
G	Bromus tectorum (a)	121	33	3.38

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Dactylis glomerata	18	9	.16
G	Elymus cinereus	2	1	.85
G	Poa pratensis	51	18	1.11
G	Poa secunda	9	5	.05
G	Secale montanum	14	6	.40
Total for Grasses		822	226	37.02
F	Achillea millefolium	27	12	.23
F	Agoseris glauca	17	9	.10
F	Alyssum alyssoides (a)	11	6	.03
F	Cirsium spp.	39	18	.66
F	Collomia linearis (a)	13	6	.03
F	Comandra pallida	19	7	.08
F	Epilobium paniculatum	122	43	1.10
F	Erodium cicutarium (a)	8	4	.09
F	Erigeron pumilus	1	1	.00
F	Galium aparine (a)	1	1	.00
F	Grindelia squarrosa	2	2	.03
F	Helianthus spp.	3	2	.03
F	Lactuca serriola	154	61	1.77
F	Linum lewisii	99	39	1.39
F	Machaeranthera canescens	4	1	.18
F	Madia glomerata (a)	1	1	.00
F	Melilotus officinalis	11	6	.48
F	Medicago sativa	48	20	1.71
F	Phlox longifolia	2	1	.00
F	Polygonum douglasii (a)	50	23	.19
F	Sanguisorba minor	32	19	.60
F	Sisymbrium altissimum (a)	16	7	.25
F	Tragopogon dubius	190	72	3.86
F	Vicia americana	11	9	.07
Total for Forbs		881	370	12.95

BROWSE TRENDS --
Herd unit 05 , Study no: 15

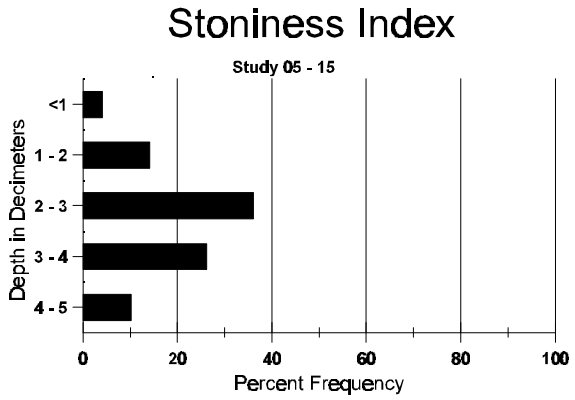
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	10	.10
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	51	7.43
B	Gutierrezia sarothrae	22	1.45
B	Purshia tridentata	0	.00
B	Symphoricarpos oreophilus	3	.38
Total for Browse		87	9.37

BASIC COVER --
Herd unit 05 , Study no: 15

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	493	63.68
Rock	39	.35
Pavement	53	.20
Litter	500	79.98
Cryptogams	8	.04
Bare Ground	129	3.74

SOIL ANALYSIS DATA --
Herd Unit 05, Study no: 15

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.5	66.2 (16.4)	7.2	44.6	25.4	30.0	3.3	41.4	291.2	.6



PELLET GROUP FREQUENCY --
Herd unit 05 , Study no: 15

Type	Quadrat Frequency '96
Elk	1
Deer	5

BROWSE CHARACTERISTICS --
Herd unit 05 , Study no: 15

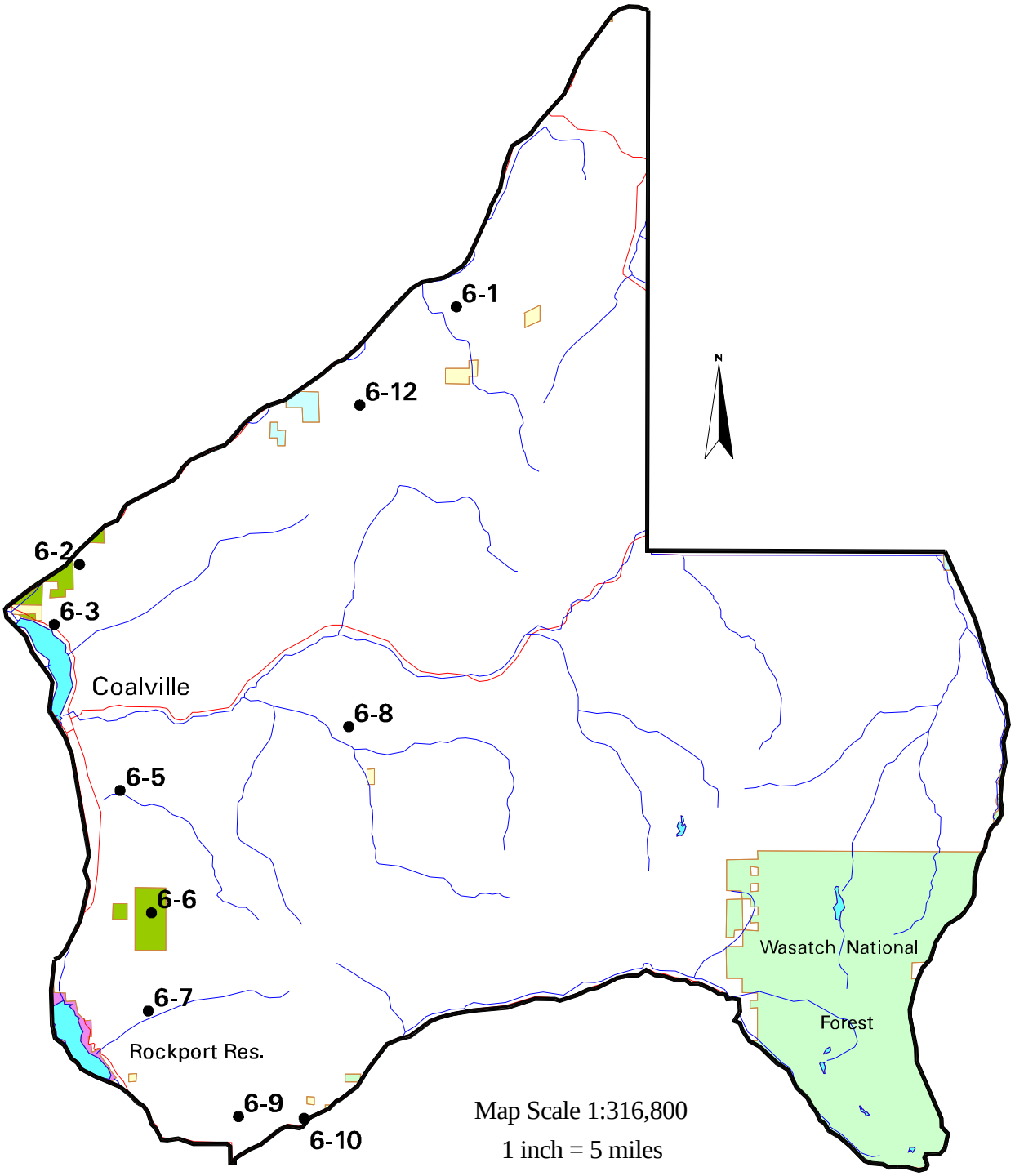
AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	9	0
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															220	Dec:		-
Chrysothamnus nauseosus albicaulis																		
M	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	25	25	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Chrysothamnus viscidiflorus viscidiflorus																		
Y	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	96	101	-	-	-	-	-	-	-	-	101	-	-	-	2020	17	28	101
D	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															2200	Dec:		1%
Gutierrezia sarothrae																		
Y	96	27	-	-	1	-	-	-	-	-	28	-	-	-	560			28
M	96	51	-	-	-	-	-	-	-	-	51	-	-	-	1020	11	10	51
Total Plants/Acre (excluding Dead & Seedlings) '96															1580	Dec:		-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Symphoricarpos oreophilus																		
Y	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	23	32	2
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96 80 Dec: -																		

SUMMARY

Site	1990			1996		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
5-1 Geary Hollow	stable	stable	improving	stable	stable	slightly upward
5-2 Tuscon Hollow (new location in 1996)						
5-3 East Canyon Reservoir	stable	stable	stable	slightly upward	slightly upward	stable
5-4 Wanship	stable	down	slightly downward	slightly upward	up	up
5-5 Upper Franklin Canyon				stable	up	stable
5-6 Franklin Canyon	stable	down	down	stable	slightly down	stable
5-8 Barnard Creek	stable	stable	downward	slightly upward	stable	stable
5-11 Mountain Dell Reservoir	stable	improving	stable	stable	slightly upward	stable
5-15 Red Rock Canyon (new study in 1996)						

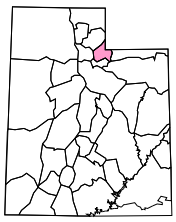
Chalk Creek Management Unit



Legend

- Forest Service
- Bureau of Land Management
- State of Utah
- Private Land
- State Wildlife Ref.
- Water Body
- Transect Location
- Road
- Water Course

Unit Location



UDAF GIS May, 2000

WILDLIFE MANAGEMENT UNIT - 6 (19) - CHALK CREEK

Boundary Description

> **Summit and Duchesne counties** - Boundary begins at the junction of Interstates 84 and 80 near Echo; then northeast on I-80 to the Utah-Wyoming state line; south and east along this state line to Highway SR-150; south on SR-150 to Pass Lake and the Weber River Trail; west on this trail to Holiday Park and the Weber River road; west on this road to Highway SR-32; north and west on SR-32 to I-80 and Wanship; north on I-80 to I-84 near Echo.

Boundary changes in 1985 from the old Herd Unit 19 boundaries resulted in larger acreages of winter range for herd Unit 6. The change moved the boundary south from the ridge between Chalk Creek and the Weber River to Highway 213 and the bottom of Weber Canyon. There is now 331,100 acres of big game range in Herd Unit #6 with 72% classified as summer range (238,100 acres) and only 28% being identified as winter range (93,000 acres). Ninety-eight percent of the winter range and 95% of the summer range is on private land.

Widespread private ownership and subsequent control of the land, leads to numerous management complications. Unregulated development and loss of habitat are some of the biggest problems. Another major problem is the dominance within many herbaceous understories by exotic weeds and its accumulative affect, causing poor browse reproduction and establishment. The discovery, development and removal of oil throughout the unit, especially the Chalk Creek area, has led to increased road and housing developments. Agricultural projects on critical winter range also continue to increase depredation problems and further decrease the range available to big game. Because of the preponderance of private land and the establishment of hunting clubs, access is severely restricted for trophy hunting on large portions of the unit. Private landowners are also less likely to undertake extensive rehabilitation projects to improve the value of the remaining range for wildlife. Out of the 93,000 acres of winter range, it is estimated that the DWR needs to maintain in good condition, 28,800 acres of winter range to maintain the deer population (Mann 1985). This unit has the largest acreage requirement of range needed to be acquired for any herd unit in the state. Unfortunately, the high cost of the land, related mainly to soil development potential, would probably prevent the acquisition of this critical range.

The topography of the unit is influenced mainly by the Uinta mountains to the east, with their drainages flowing through long, gradual slopes down into the Weber River Valley. Other major drainages include Crandall Canyon, Chalk Creek, Echo Canyon, Hixon and Pecks Canyons, and Grass Creek. The southern exposures of these canyons are especially important winter range. The rest of the winter range is found in the low rolling foothills of the western and central parts of the unit. The upper limits vary between approximately 6,800 and 7,200 feet (Giunta 1979).

Towns are located in the valley along the Weber River. They are Peoa, Wanship, Hoytsville and Coalville. Echo and Rockport reservoirs, located on the west side of the unit on the Weber River, are both significant barriers to big game movement. Additionally, I-80 through Echo Canyon serves to discourage big game movement and deer losses are high on the highway in winter and spring.

In the 1977 range inventory, the winter range was classified into 12 distinct vegetation types (Giunta 1979). Of these, seven of the larger, more important types were sampled. The sagebrush/grass and oakbrush types are the most prevalent. Sagebrush/grass is a type that is quite variable, dominated by basin

big sagebrush, mountain big sage brush or Wyoming big sagebrush which occurs on a variety of exposures, slopes, and elevations. It occupies 36% of the normal winter range and produces 33% of the total production. It is even more important on severe winter range, occupying 43% of the available range. The oakbrush type, covering 32% of the winter range, is the most productive type, but becomes largely unavailable in severe winters. This type intergrades with the sagebrush/grass and other types. Other important types are juniper, especially important for cover, and mountain brush. Air dry production from the 1977 range inventory report are as follows: aspen, 435 lbs/acre; juniper, 240 lbs/acre; sagebrush-grass, 383 lbs/acre; mountain brush, 510 lbs/acre; oakbrush, 580 lbs/acre; grassland, 285 lbs/acre.

Fires in recent years have destroyed large tracts of important range in the Grass Creek area. Because of this habitat loss, severe winters in the last few years have forced deer, and increasing numbers of elk and moose, to concentrate in the lower areas on agricultural land and at mouths of canyons.

All of the transects reread or established in 1984 are located on important big game winter range. Six of the 19 line intercept transects established in 1977 were in areas considered important for continued monitoring. Theses transects were reread and replaced with new interagency trend studies. One additional site was chosen as a new trend study. Out of necessity, all of the transects, except the Hixon Canyon and Echo Canyon Rest Area study located on DWR property, are on private land. A variety of vegetation types are sampled, and comparisons with the 1977 line intercept data were made where appropriate. Often, these comparison revealed apparent declines of browse and increased animal use. The juniper type especially showed excessive use and poor vegetative condition. If one would like to look more closely at these comparisons, they should refer to the Utah big game range trend studies done in 1984 and published in May 1986.

Management options are rather limited in this herd unit because of predominance of private land ownership, on both winter and summer range. The herd unit management plan in 1983 (Kearl 1983) stated a harvest objective of 2,500 to 3,000 bucks per year and outlined various management programs and numerous problems with possible solutions. In the 1998 management plan, annual buck harvest is expected to be about 1,600 under normal conditions. This is with a target population size 11,500 wintering animals (modeled number). This is significantly lower than the 1983 plan. It is more practical to look at the regression of the buck harvests since 1950 to get a better understanding of the overall trends since then. The analysis demonstrates an increased buck harvest since 1950 even with the great deal of variation for buck harvest which begins with 2,031 and goes up to 2,323 in 1990. This variation can be further depicted by some low harvests in the 1950's, 60's, and 70's of around 900 and high harvests of over 3,000 in the mid 50's and early 80's. Management of the deer herd is further complicated by the presence of other big game species, migrations, the excessive road kills on I-80 and many hunting restrictions. A serious problem in this unit is the composition of herbaceous understories, which on most sites is mostly made up of annual species, primarily cheatgrass which prohibits sagebrush seedling establishment during our hot, dry summers. Another serious concern is the rapidly increasing loss of critical wintering habitat through urbanization. A DWR program to acquire additional land and/or conservation easements, and landowner cooperation are both necessary to help perpetuate the big game herds on this unit.

TREND STUDY 6-1-96 (old 19-1)

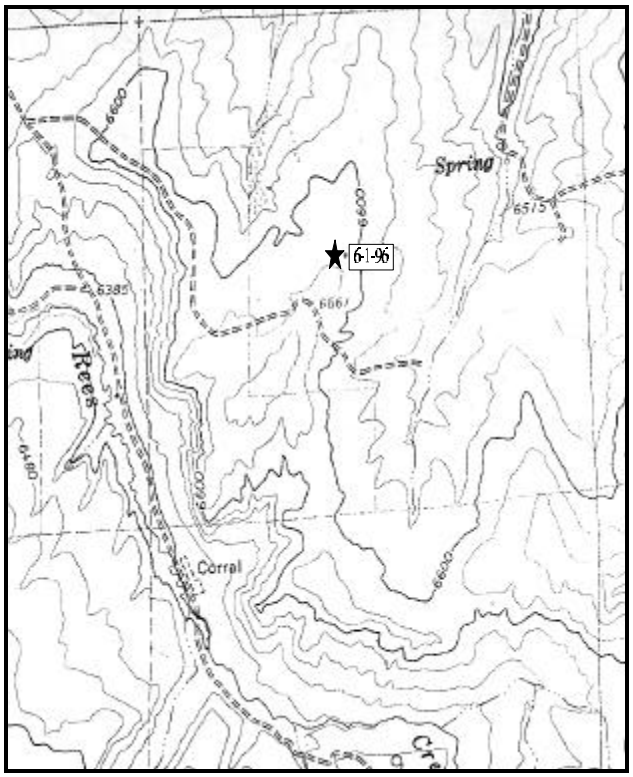
Study site name: Anshutz Ranch. Range type: Sagebrush/grass.

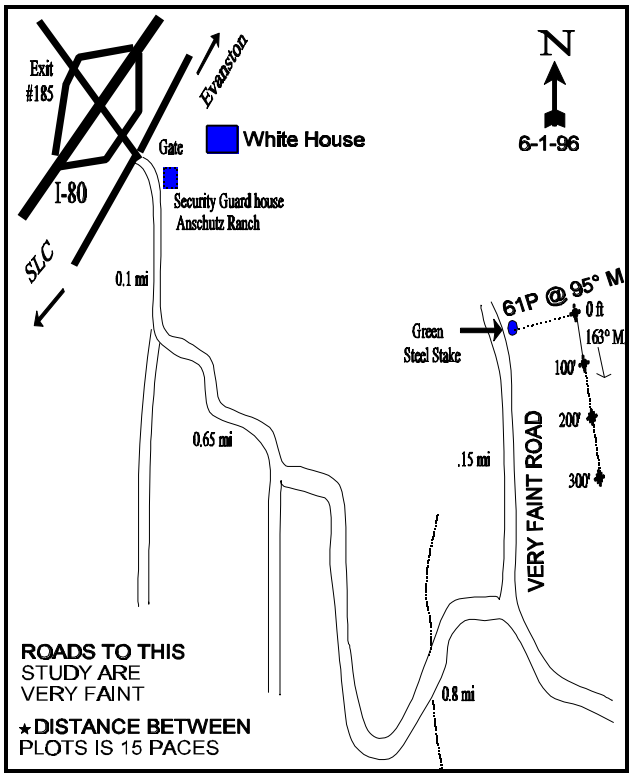
Compass bearing: frequency baseline 163 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).

LOCATION DESCRIPTION

Proceeding east on I-80 from Echo, leave I-80 at exit number 185 and proceed east to Anshutz Ranch headquarters. From the security guard house proceed 0.1 miles and turn left. Proceed 0.65 miles (passing ranch lumber and equipment yard and a gate)to a faint road to the left. Turn left, proceed 0.8 miles (go through gate) to a crossroad on a small ridge. Turn left(road not on quad and quite faint) and proceed 0.15 miles to a green steel stake on the right(east)side of the road. From stake, walk 61 paces at 95 degrees magnetic to the 0-foot of the baseline marked by browse tag #7949.





Map Name: Castle Rock Diagrammatic Sketch

Township 4N, Range 7E, Section 4, UTM COOR: 4-86-252E 45-51-089N

DISCUSSION

Trend Study No. 6-1 (19-1)

This winter range study site is located at a moderately high elevation (6,640 ft.) southeast of the Anshutz Ranch headquarters. Big game use of the study area is light to moderate and comes chiefly from elk. The area is also important for sage grouse. The land is privately owned and is utilized by sheep, cattle, and horses. Vegetatively, a number of range types are closely intermingled. In swales, grass or tall-growing basin big sagebrush often predominate. On gentle slopes and flat areas, mixed communities consist of basin big sagebrush, low sagebrush, and possibly even Wyoming big sagebrush occurring occasionally. On more well-drained ridgetops, low sagebrush is the most common. Scattered throughout this area is an abundance of stickyleaf low rabbitbrush and broom snakeweed. In a few places, these two increaser species have gained dominance. The entire area is very open with little protective cover and gently rolling topography. The actual study site is level to perhaps gently sloping (5%) to the southeast. Vegetation consists of a mixture of basin big sagebrush and low sagebrush with broom snakeweed and stickyleaf low rabbitbrush as abundant subdominants.

Soil is moderately deep (effective rooting depth, see methods section) with an effective rooting depth of 13.9 inches. The soil is classified as a clay loam, slightly alkaline (pH of 7.6), with a percent organic matter of 2.9%. The soil has some variable-sized rock interspersed throughout the profile, with surface rock and pavement combined for a cover value of just over 3%. Vegetation and litter cover are above the average for this management unit. Shrub interspaces are often barren and can be a source of erosion. Soil loss, however, is minimized because of the gentle terrain.

Browse composition appears stable for the most dominant key species, low sagebrush, which contributes 62% of the total browse cover. The other key species is basin big sagebrush which occurs mostly in the swales and makes up an additional 21% of the browse cover. Between these two species, they contribute 83% of the total browse cover. These two key species are mostly mature plants (70-80%) with percent decadency ranging from 12-20%, which are improvements from 1990. Percent decadence has decreased for both species significantly. There has been some losses in the populations, but this cannot be attributed to use for heavy use has been less than 5% for both species since 1984. The losses that have taken place (mostly to basin big sagebrush) can be attributed to the extended drought. The basin big sagebrush population is associated with swales and the deeper soils. This clumped distribution caused its population to be overestimated in 1984 and 1990 because the previous sample size was quite small compared to the larger sample used now. For example, there have been some losses with the drought, but not a 66% decrease for basin big sagebrush. These data also indicate generally light use with a surprisingly large number of decadent low rabbitbrush. This again shows the long-range affects of drought to stickyleaf low rabbitbrush, and even to broom snakeweed. Our view is that the sagebrush population is now stabilizing after the detrimental affects of extended drought to the area.

It was mentioned in earlier reports that broom snakeweed and/or stickyleaf low rabbitbrush appeared to be on the verge of increasing their numbers exponentially in this sagebrush community. But, the 1996 data show the stickyleaf low rabbitbrush had a 46% decrease in its estimated density, while broom snakeweed decreased by 89%.

Grass and forb composition have been quite variable through time, but have shown increasing nested frequency values since 1984. The herbaceous understory is producing (compared to the unit wide herbaceous cover average of almost 22%)

slightly below average cover for the understory.

1984 APPARENT TREND ASSESSMENT

Soil trend is stable because of gentle terrain. If slopes were steeper, the expanse of bare soil in the shrub interspaces would probably allow gully and sheet erosion to occur at a much more rapid rate. Vegetative trend is unclear but our best estimate, based partly on data and opinion is that plant composition is declining in quality because of a shift from sagebrush to rabbitbrush and snakeweed.

1990 TREND ASSESSMENT

Big game use is not concentrated on the large expanse of sagebrush range sampled by this trend study. The big sagebrush, identified as *Artemisia tridentata tridentata*, displays light to moderate hedging. The low sagebrush (*A. arbuscula*) are lightly used. There is a high percentage of decadence in the low sage population, but a large number of young sagebrush were also found. Total sagebrush canopy cover is 26%, with equal percentages of both species. Low rabbitbrush is unutilized. Density slightly deceased while the population is still 53% decadent. Broom snakeweed did not increase. The increases in grass frequency are a result of increases in the smaller bunch grasses, this would not include western or bluebunch wheatgrass. Utilization of grasses has been light this year, but overall there is limited herbaceous forage available. Perennial forbs are insignificant. Ground cover percentages are unchanged.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

1996 TREND ASSESSMENT

Big game use is not concentrated on this open expanse of sagebrush range, it shows light use by both elk and deer as indicated by the pellet group frequency data. Soil trend would be improving with a decrease in percent bare ground from 24% down to 16% since 1990. The browse trend is slightly improved because low sagebrush, which makes up 62% of the browse cover, has improved vigor and percent decadency has declined from 54% to 12%. The other key browse species, basin big sagebrush which accounts for an additional 21% of the browse cover, has also shown a significant reduction in the percentage of plants classified as decadent. The reduction in density for this species is mostly reflective of the larger sampling design giving a greatly improved density estimate. Broom snakeweed and stickyleaf low rabbitbrush are not showing any tendencies toward any uncommon increases in their respective densities. The herbaceous understory trend is slightly improving with increasing values for both grasses and forbs. Cheatgrass which is a concern on many of the winter ranges in the Northern Region is moderately low, making up 11% of the herbaceous understory.

TREND ASSESSMENT
soil - improving
browse - slightly improving
herbaceous understory - slightly improving

HERBACEOUS TRENDS --
Herd unit 06, Study no: 1

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	72	71	72	25	25	25	1.80
G	Agropyron spicatum	$_{a}$4	$_{a}$12	$_{b}$98	3	4	38	2.77
G	Bromus japonicus (a)	-	-	2	-	-	1	.03
G	Bromus tectorum (a)	-	-	78	-	-	31	2.00
G	Oryzopsis hymenoides	$_{ab}$3	$_{a}$-	$_{b}$8	1	-	4	.09
G	Poa fendleriana	-	-	26	-	-	11	.42
G	Poa pratensis	$_{a}$3	$_{a}$8	$_{b}$27	1	3	10	.75
G	Poa secunda	$_{a}$76	$_{b}$230	$_{c}$154	33	87	55	2.01
G	Sitanion hystrix	$_{a}$118	$_{b}$162	$_{a}$127	53	69	56	2.63
G	Stipa columbiana	$_{a}$5	$_{b}$23	$_{ab}$10	3	10	7	.35
G	Stipa comata	17	9	14	6	3	6	.25
Total for Grasses		298	515	616	125	201	244	13.15
F	Achillea millefolium	4	13	7	2	4	4	.07
F	Agoseris glauca	4	3	-	2	1	-	-
F	Allium acuminatum	44	-	-	27	-	-	-
F	Antennaria rosea	$_{a}$35	$_{b}$82	$_{a}$10	15	35	6	.27
F	Arabis spp.	$_{a}$-	$_{b}$22	$_{c}$9	-	11	5	.02
F	Astragalus convallarius	11	5	7	5	3	5	.12
F	Calochortus nuttallii	$_{a}$8	$_{ab}$2	$_{b}$-	4	1	-	-
F	Cirsium spp.	$_{a}$15	$_{b}$40	$_{a}$12	9	22	7	.13
F	Collinsia parviflora (a)	-	-	43	-	-	23	.14
F	Erigeron pumilus	$_{ab}$47	$_{a}$74	$_{b}$31	22	35	14	.22
F	Eriogonum umbellatum	-	1	3	-	1	2	.06
F	Holosteum umbellatum (a)	-	-	18	-	-	7	.03
F	Linum lewisii	-	-	3	-	-	1	.03
F	Machaeranthera canescens	-	9	-	-	3	-	-
F	Phlox austromontana	$_{a}$-	$_{a}$2	$_{b}$60	-	2	27	1.36
F	Phlox longifolia	$_{a}$40	$_{b}$164	$_{b}$158	21	62	63	1.16
F	Polygonum douglasii (a)	-	-	85	-	-	34	1.08
F	Ranunculus testiculatus (a)	-	-	14	-	-	7	.03
F	Sphaeralcea coccinea	1	2	-	1	2	-	-
F	Taraxacum officinale	$_{a}$-	$_{b}$9	$_{b}$8	-	6	5	.05
F	Tragopogon dubius	$_{a}$-	$_{a}$-	$_{b}$11	-	-	5	.02
F	Unknown forb-perennial	3	-	-	1	-	-	-
Total for Forbs		212	428	479	109	188	215	4.84

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 1

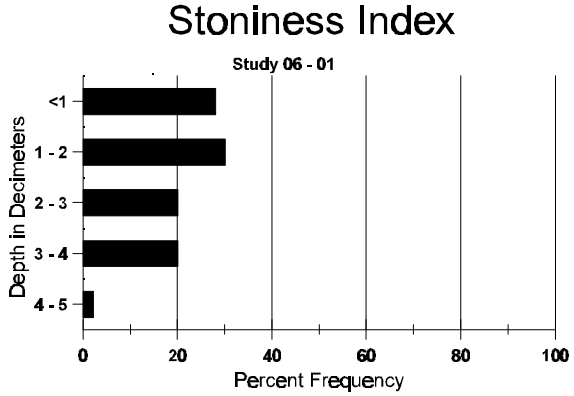
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia arbuscula	90	22.02
B	Artemisia tridentata tridentata	53	7.44
B	Ceratoides lanata	3	-
B	Chrysothamnus viscidiflorus viscidiflorus	94	5.53
B	Gutierrezia sarothrae	18	.28
B	Tetradymia canescens	9	.03
Total for Browse		267	35.31

BASIC COVER --
Herd unit 06, Study no: 1

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	348	2.25	12.25	49.98
Rock	152	2.25	1.25	1.98
Pavement	185	0	2.00	1.36
Litter	398	71.25	60.25	55.00
Cryptogams	72	.50	.50	.77
Bare Ground	255	23.75	23.75	16.36

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 1

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.9	63.3 (14.9)	7.6	40.7	26.0	33.3	2.9	5.9	83.2	.8



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 1

Type	Quadrat Frequency '96
Rabbit	11
Elk	8
Deer	6
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia arbuscula																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	6	-	-	2	-	-	8	-	-	-	533			8
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	2	1	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	9	-	-	4	-	-	-	-	-	13	-	-	-	866			13
	96	21	-	-	-	-	-	-	-	-	20	-	1	-	420			21
M	84	8	47	1	-	-	-	-	-	-	56	-	-	-	3733	12	17	56
	90	41	1	-	3	-	-	-	-	-	45	-	-	-	3000	9	15	45
	96	280	46	3	-	-	-	-	-	-	322	3	4	-	6580	9	20	329
D	84	6	51	2	-	-	-	-	-	-	53	-	6	-	3933			59
	90	69	-	-	1	-	-	-	-	-	52	1	-	17	4666			70
	96	23	26	2	1	-	-	-	-	-	41	-	-	11	1040			52
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17
Total Plants/Acre (excluding Dead & Seedlings)													'84		7866	Dec:		50%
													'90		8532			55%
													'96		8040			13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata tridentata																		
S	84	37	-	-	-	-	-	-	-	-	37	-	-	-	2466			37
	90	3	-	-	1	-	-	2	-	-	5	-	1	-	400			6
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	64	6	-	-	-	-	-	-	-	69	-	1	-	4666			70
	90	29	10	-	10	-	-	-	-	-	48	1	-	-	3266			49
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	84	11	20	2	-	-	-	-	-	-	33	-	-	-	2200	27	35	33
	90	16	2	2	1	-	-	-	-	-	20	1	-	-	1400	28	29	21
	96	35	39	4	-	-	-	-	-	-	68	1	9	-	1560	29	34	78
D	84	1	23	2	-	-	-	-	-	-	24	-	2	-	1733			26
	90	19	8	-	-	-	-	-	-	-	22	-	2	3	1800			27
	96	6	15	2	-	-	-	-	-	-	10	-	12	1	460			23
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23
Total Plants/Acre (excluding Dead & Seedlings)														'84	8599	Dec:		20%
														'90	6466			28%
														'96	2200			21%
Ceratoides lanata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	7	3	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	1	-	-	-	-	-	2	-	-	-	40	7	8	2
Total Plants/Acre (excluding Dead & Seedlings)														'84	66	Dec:		-
														'90	0			-
														'96	60			-
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	20	-	-	5	-	-	2	-	-	26	-	1	-	1800			27
	96	92	-	-	5	-	-	-	-	-	96	-	1	-	1940			97
M	84	115	-	-	-	-	-	-	-	-	115	-	-	-	7666	9	11	115
	90	64	4	-	8	-	-	3	-	-	68	-	11	-	5266	9	13	79
	96	286	4	-	16	-	-	-	-	-	306	-	-	-	6120	8	12	306
D	84	127	-	-	-	-	-	-	-	-	123	-	4	-	8466			127
	90	95	-	-	2	-	-	23	-	-	69	-	9	42	8000			120
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)														'84	16132	Dec:		52%
														'90	15066			53%
														'96	8100			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	14	-	-	-	-	-	1	-	-	14	1	-	-	1000			15
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	123	-	-	-	-	-	-	-	-	123	-	-	-	8200	7	6	123
	90	99	-	-	-	-	-	1	-	-	93	6	1	-	6666	5	7	100
	96	41	-	-	-	-	-	-	-	-	41	-	-	-	820	5	6	41
D	84	12	-	-	-	-	-	-	-	-	12	-	-	-	800			12
	90	12	-	-	-	-	-	-	-	-	10	-	-	2	800			12
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		9000	Dec:		9%
													'90		8466			9%
													'96		900			0%
Tetradymia canescens																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8	3	1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	4	5	1
	96	3	1	4	-	-	-	-	-	-	8	-	-	-	160	7	13	8
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		132	Dec:		0%
													'90		66			0%
													'96		240			8%

TREND STUDY 6-2-96 (old 19-2)

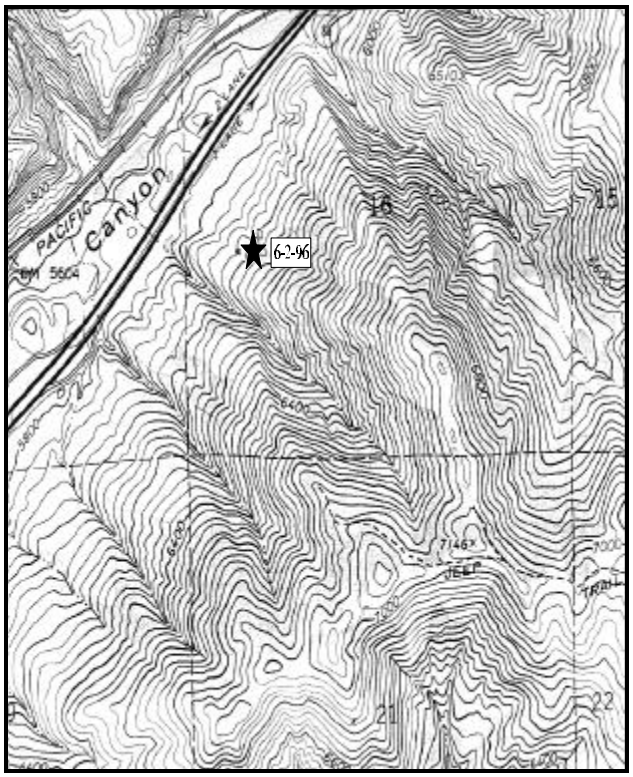
Study site name: Echo Canyon Rest Area . Range type: Mixed mountain brush .

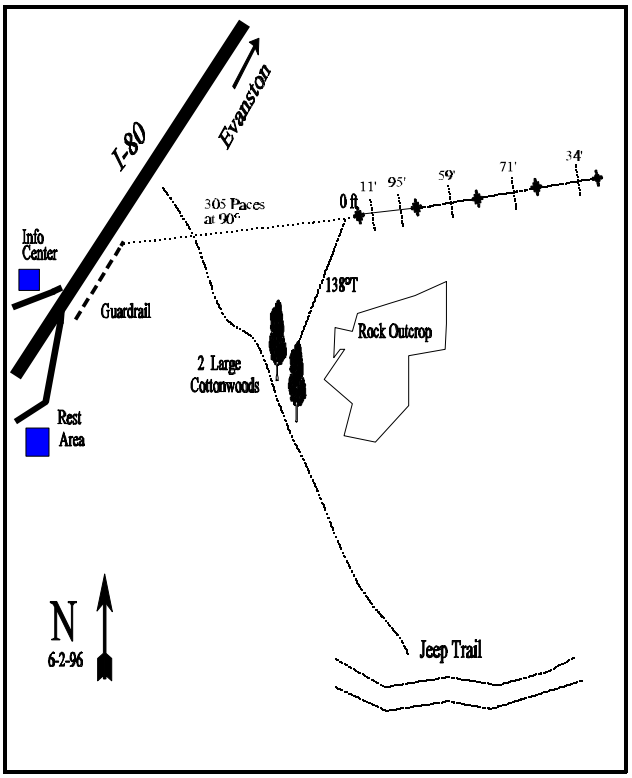
Compass bearing: frequency baseline 90 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately 2 miles). From the rest area, follow the guard-rail on the right side of the freeway until it ends (approximately 100 yards). From the end of the guard-rail, proceed on an azimuth of 90 degrees magnetic for approximately 305 paces to a point on the left-hand or north side of the canyon. The 0-foot stake of the baseline consists of a green steel fencepost, 12"-18" high, and is marked with a red browse tag (#7950).





Map Name: Coalville, Utah Diagrammatic Sketch

Township 3N , Range 5E , Section 16 , UTM COOR: 4-66-914E 45-37-867N

DISCUSSION

Trend Study 6-2 (19-2)

This study (Echo Canyon Rest Area) originally replaced a line intercept transect established in 1977. It was located slightly uphill from Line 2 of that study, which sampled similar plant communities where true mountain mahogany was prominent. However, this site had many problems. It had a very steep south slope (>80%), rock and pavement cover together was more than 32%, and the site showed almost no big game use. Therefore, the study site was moved up onto a nearby ridge. The study now has a west aspect, a slope of about 32%, and an elevation of approximately 6,300 feet. This new site location has much more big game sign. Pellet group quadrat frequency showed moderately high use for deer, light use for elk, and occasional use by moose.

The soil on the site is classified as a sandy-clay-loam, with an effective rooting depth (see methods section) of almost 15 inches. This is the second deepest effective rooting depth on any of the studies within the management unit. Surface rock is less than 5%, yet the soil profile is moderately stony throughout. Erosion is not a problem on this moderately sloping ridge because of the well dispersed vegetative cover (51%), litter cover (56%), and low percentage of bare ground (7%).

The key browse on this site is made up mostly of mountain big sagebrush, snowberry, true mountain mahogany, Gambel oak, bitterbrush, and serviceberry. These species respectively make up 44%, 17%, 13%, 9%, 3%, and 1% of the browse cover. Together these species make up 84% of the total browse cover. Gambel oak and stickyleaf low rabbitbrush populations do not appear to be increasing at this time which was inferred on the previous site report. The large increase in the mountain big sagebrush population is because of the relocation of the transect to a more favorable site. The one characteristic that should be noted is that the percent decadence for sagebrush has decreased from about 60% to 39% which is a significant improvement. The extended drought conditions have obviously taken a toll on the sagebrush because of the number of dead individuals that were counted within the population. The ratio was 1 dead plant for every 3.3 live plants in the population. This would equate to about 23% of the population being dead. The trend that should be followed with concern is that of the decadent plants, in which 56% were classified as having poor vigor or dying. This could result in additional dead plants being censussed next time it is inventoried.

The grasses and forbs are relatively important on this site where they make up 48% of the total vegetative cover. Eighty-eight percent of the herbaceous understory is made up of grasses. Sandberg bluegrass and bluebunch wheatgrass make up 85% of the grass cover. Cheatgrass only makes up 14% of the grass cover, making it one of the minor components of the understory. The forbs are of little importance on this site only making up 12% of the herbaceous understory. The most abundant forb on the site is western yarrow which makes up more than half of the forb cover.

1996 APPARENT TREND ASSESSMENT

This site was moved a short distance to a more representative place in 1996. The previous two assessment year summaries for 1984 and 1990 have been deleted because they would have been counter intuitive to the trend that is occurring on the new site at this time.

The trend for soil would be considered stable because of the high amounts of vegetative cover (51%) and litter cover (56%), with percent bare ground at only 7%. The key browse species is mountain big sagebrush which contributes 44% of the browse cover. Percent decadence has decreased, but 56% of the decadent

plants were classified as dying or with poor vigor. This could cause a continuing loss to the population, but does appear to have become more stable with increased precipitation. All the other key browse species have very low or no decadent plants. Gambel oak seems to be stable and not increasing into the interspaces. Trend appears mixed with sagebrush being slightly down and the remainder of the browse being stable. Overall, the trend would be slightly down for mountain big sagebrush because it makes up most of the browse cover. The herbaceous understory is stable, providing almost half of the total vegetative cover.

TREND ASSESSMENT
soil - stable
browse - slightly down for sagebrush and stable for the remainder of the key species
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 06, Study no: 2

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	-	2	-	-	1	-	-
G	Agropyron spicatum	a29	a22	b155	14	15	60	6.88
G	Bromus tectorum (a)	-	-	142	-	-	44	3.30
G	Festuca ovina	-	-	4	-	-	1	.03
G	Koeleria cristata	-	-	3	-	-	1	.03
G	Oryzopsis hymenoides	a84	a98	b-	42	45	-	.00
G	Poa fendleriana	-	-	6	-	-	3	.18
G	Poa secunda	a-	a6	b270	-	3	85	13.49
Total for Grasses		113	128	580	56	64	194	23.93
F	Achillea millefolium	a-	a4	b105	-	1	41	1.82
F	Alyssum alyssoides (a)	-	-	23	-	-	9	.11
F	Allium spp.	-	-	4	-	-	2	.03
F	Antennaria rosea	-	-	1	-	-	1	.03
F	Arabis spp.	-	-	1	-	-	1	.00
F	Artemisia ludoviciana	3	-	-	1	-	-	-
F	Astragalus convallarius	-	-	3	-	-	1	.03
F	Aster spp.	-	-	3	-	-	2	.03
F	Castilleja linariaefolia	-	-	3	-	-	1	.03
F	Chaenactis douglasii	a15	b34	c-	8	19	-	-
F	Cirsium spp.	11	2	13	6	2	8	.11
F	Collomia linearis (a)	-	-	1	-	-	1	.00
F	Comandra pallida	1	-	3	1	-	1	.00
F	Collinsia parviflora (a)	-	-	12	-	-	7	.03
F	Crepis acuminata	-	-	3	-	-	1	.00
F	Erigeron pumilus	a-	a-	b26	-	-	12	.65

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Gayophytum ramosissimum	-	-	3	-	-	1	.00
F	Hackelia patens	-	-	3	-	-	2	.03
F	Holosteum umbellatum (a)	-	-	6	-	-	2	.01
F	Oenothera caespitosa	a14	b-	b-	6	-	-	-
F	Penstemon spp.	-	-	1	-	-	1	.00
F	Phlox longifolia	-	-	6	-	-	3	.02
F	Polygonum douglasii (a)	-	-	6	-	-	3	.01
F	Ranunculus testiculatus (a)	-	-	9	-	-	5	.02
F	Verbascum thapsus	2	-	-	2	-	-	-
F	Vicia americana	a-	a-	b35	-	-	16	.28
Total for Forbs		46	40	270	24	22	121	3.33

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 2

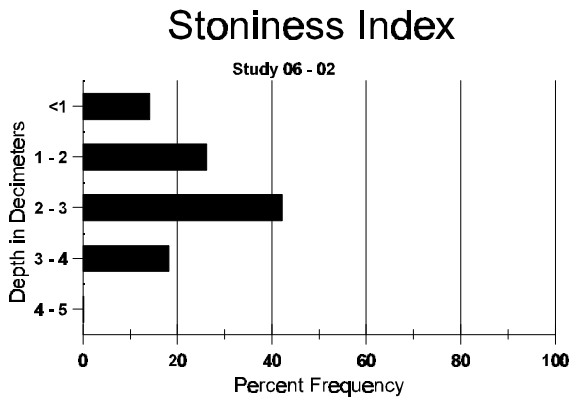
Type	Species	Strip Frequency ‘96	Average Cover % ‘96
B	Amelanchier alnifolia	6	.07
B	Artemisia tridentata vaseyana	75	12.75
B	Cercocarpus montanus	18	3.73
B	Chrysothamnus viscidiflorus viscidiflorus	55	3.87
B	Gutierrezia sarothrae	4	.06
B	Opuntia spp.	1	-
B	Purshia tridentata	2	1.00
B	Quercus gambelii	6	2.57
B	Symphoricarpos oreophilus	32	4.96
Total for Browse		199	29.04

BASIC COVER --
Herd unit 06, Study no: 2

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	362	2.75	9.00	51.15
Rock	158	25.75	20.00	1.75
Pavement	172	18.25	12.50	2.69
Litter	397	35.50	38.50	55.56
Cryptogams	163	0	.25	6.57
Bare Ground	167	17.75	19.75	7.26

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 2

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.9	65.2 (19.7)	6.7	44.7	22.0	33.3	2.9	14.4	92.8	.4



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 2

Type	Quadrat Frequency '96
Rabbit	3
Moose	1
Elk	6
Deer	38

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	1	-	-	-	-	1	-	-	-	66			1
	96	1	-	1	1	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	1	-	-	-	1	-	-	2	-	-	-	133	31	29	2
	96	-	-	3	-	-	-	-	-	-	-	2	1	-	60	34	36	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		199			-
													'96		120			-
Artemisia tridentata vaseyana																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	4	2	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	-	1	3	-	-	-	-	-	-	4	-	-	-	266	32	43	4
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	44	19	-	-	-	-	-	-	50	-	18	-	1360	22	37	68
D	84	-	1	6	-	-	-	-	-	-	4	-	2	1	466			7
	90	1	2	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	7	28	13	-	-	-	-	-	-	21	-	23	4	960			48
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	740			37
Total Plants/Acre (excluding Dead & Seedlings)													'84		798	Dec:		58%
													'90		333			60%
													'96		2440			39%
Cercocarpus montanus																		
Y	84	-	40	-	-	-	-	-	-	-	40	-	-	-	2666			40
	90	-	-	4	3	-	-	-	-	-	2	5	-	-	466			7
	96	2	1	-	-	-	-	-	-	-	1	2	-	-	60			3
M	84	-	2	98	-	-	-	-	-	-	100	-	-	-	6666	52	26	100
	90	-	-	11	-	1	-	-	-	-	9	3	-	-	800	36	23	12
	96	-	10	7	1	-	-	-	-	-	5	13	-	-	360	49	47	18
D	84	-	-	4	-	-	-	-	-	-	4	-	-	-	266			4
	90	-	-	4	-	-	-	-	-	-	1	2	-	1	266			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		9598	Dec:		3%
													'90		1532			17%
													'96		420			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333	20	28	5
	90	4	-	-	-	-	-	-	-	-	1	-	3	-	266	14	19	4
	96	105	-	-	8	-	-	-	-	-	110	-	3	-	2260	15	21	113
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	1	-	2	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)														'84	333	Dec:		0%
														'90	266			0%
														'96	2400			3%
Gutierrezia sarothrae																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133	6	7	2
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	7	8	6
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	266			-
														'96	120			-
Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	26	2
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	40			-
Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	1	2	-	-	-	-	-	3	-	-	-	60	34	64	3
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	60			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	15	34	-	-	-	-	-	-	-	49	-	-	-	3266			49
	90	9	6	-	3	-	-	1	-	-	13	6	-	-	1266			19
	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460			23
M	84	-	4	5	-	-	-	-	-	-	9	-	-	-	600	68	48	9
	90	7	-	-	4	-	-	3	-	-	14	-	-	-	933	40	23	14
	96	10	3	-	-	-	-	-	-	-	10	3	-	-	260	16	29	13
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	2	-	-	1	-	-	-	-	3	2	-	-	333			5
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		3866	Dec:		0%
													'90		2532			13%
													'96		760			5%
Symphoricarpos oreophilus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	11	5	-	1	-	-	-	-	-	17	-	-	-	340			17
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	16	17	7	6	-	-	-	-	-	42	2	-	2	920	22	43	46
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	1	-	-	-	-	-	-	-	-	1	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		1280			2%

DISCUSSION

Trend Study No. 6-3 (19-6)

*** This site was not read in 1996 because the land owners would not give us permission to go onto the property. Therefore, the study site description and associated trend assessments for 1984 and 1990 are left here for those who possibly need this information. Site maps and data tables can be found in the 1990 Utah Big Game Range Trend Study report.

This study (Spring Hollow Burn) is located on an old burned over area in the upper part of Spring Hollow. The area is deer winter range originally dominated by big sagebrush/grass and juniper/pinyon communities that subsequently were seeded with perennial grasses, most notably crested and intermediate wheatgrass. The study area was formerly a big sagebrush/grass type. Although the original line intercept study extended over a variety of slopes, the Interagency study is located on a relatively gently (10%) southeast facing exposure with an elevation of 5,560 feet. This area is privately-owned and grazed by a variety of domestic animals in addition to winter use by deer and elk. Forage utilization appears heavy but may be somewhat misleading because of the scarcity of browse. Deer pellet groups, however, occur frequently and three shed deer antlers and one elk antler were observed within the immediate area.

Soil survey data is unavailable. Visually it exhibits a very rocky or cobbly soil of at least moderate depth. It appears to be a permeable, well-drained soil where moisture availability could easily be growth limiting by mid to late summer. Plant cover is primarily a function of herbaceous plants which in combination with other cover categories prevents serious erosion. This site appears to be slowly stabilizing, however, livestock use is having obvious effects on soil compaction and plant cover which tends to slow recovery.

Vegetative appearance comes from grass, especially seeded crested wheatgrass which is easily the most numerous and productive species. Although five other grass species and a few forbs were encountered, all are secondary to the dominance of crested wheatgrass. Grass appears less vigorous than at the line intercept study because of grazing effects and damage by ants and aphids, which indirectly has possibly allowed a moderately dense stand of broom snakeweed to become established. This species is very abundant and shows characteristics of further increase. Mountain big sagebrush, although present in much smaller numbers, also shows signs of increase. The rate of stand development will likely be much slower. Over the entire burned area, the distribution of big sagebrush is very patchy and probably results from the reproductive efforts of a few surviving mature plants. At current reproductive rates and given existing management, it will be a long time before a productive big sagebrush population redevelops.

1984 APPARENT TREND ASSESSMENT

Our estimate of soil trend, based on rereading the line intercept study, cover data from the 984 study and on-site reconnaissance, is that soil condition is fair and slowly improving. Vegetative trend is more difficult to assess. Although long-term trend may be toward an improving big sagebrush stand, it will likely be a very slow process. In the interim, the area will continue to be grass dominated and subject to sharp increases of undesirable shrubs in an irregular pattern.

1990 TREND ASSESSMENT

There is a significant increase in percent decadence in the low density, heavily used big sagebrush population and the increased frequency of snakeweed indicate definite downward trends on this winter range. The site has an incredible infestation of ants and aphids on the sagebrush. In spite of these factors, the sagebrush display fair growth and seed production. No seedlings were found. Openings in the dense crested wheatgrass could allow young sagebrush to become established, but are crowded with seedling and young of snakeweed. The dense stand of small crested wheatgrass plants had increased nested frequency values. It has been 40-60% utilized, and cattle are still in the area utilizing the fall green-up. Litter cover is fair. The percentage of cryptograms as ground cover decreased from 11 to 2%. There is evidence of some soil erosion.

TREND ASSESSMENT
soil - down
browse - down
herbaceous understory - stable

TREND STUDY 6-4-96 (old 19-8)

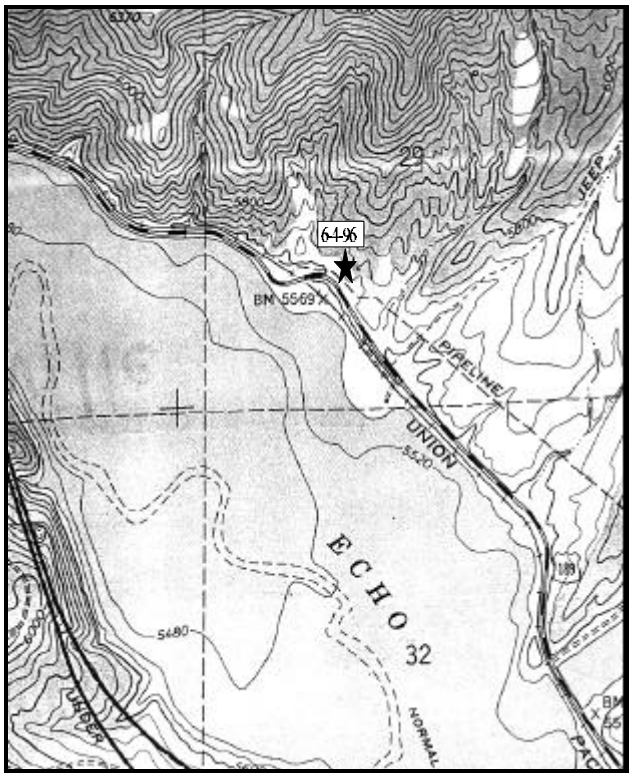
Study site name: Echo Reservoir. Range type: Juniper.

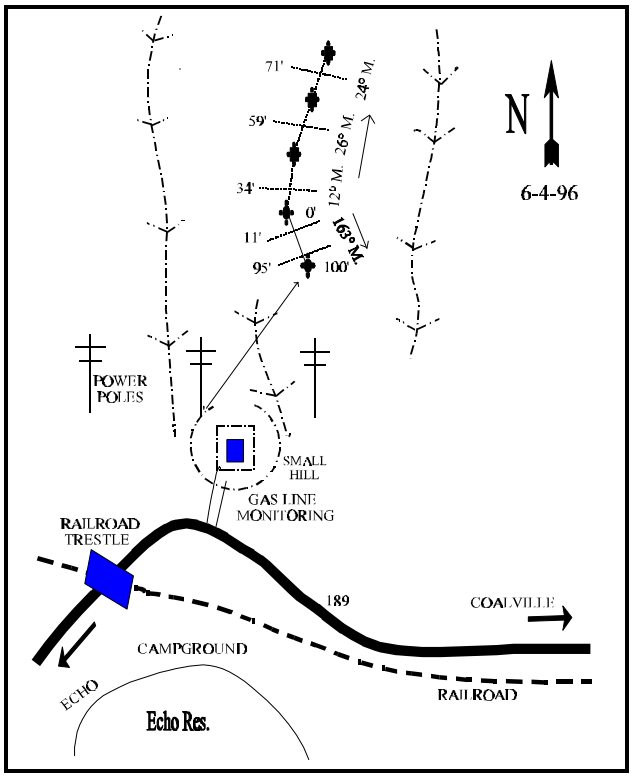
Compass bearing: frequency baseline 163 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the east end of Echo dam, proceed toward Coalville on Highway 189 to a point where the road passes over railroad tracks. Continue for approximately 150 yards to a spur road on the left that leads to a gas monitoring station on a small hill. From the power pole, approximately 25 yards north of the station, walk up the narrow ridge north of the power pole approximately 70 paces at 45 degrees true to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7970. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs in a direction of 34 degrees magnetic. Line 3 runs in a direction of 26 degrees magnetic. Line 4 runs in a direction of 24 degrees magnetic.





Map Name: Coalville Diagrammatic Sketch

Township 3N, Range 5E, Section 29, UTM COOR: 4-65-612E 45-34-779N

DISCUSSION

Trend Study No. 6-4 (19-8)

The Echo Reservoir study samples a depleted Utah juniper community located immediately east of Echo Reservoir and north of Grass Valley. This area has critical importance to wintering deer, and to a lesser extent elk. Topographically, the study area is a rugged south or southwest facing slope which is more gentle near the reservoir, but quickly becomes very steep to the north and east. Elevation for the study is about 5,700 feet. Much of the surrounding area, including the high ridge to the north and the bench lands lying immediately adjacent to Grass Creek, were consumed by fire prior to 1977. Both the older line intercept and newer Interagency studies, however, lie entirely within unburned juniper. Big game use of this study area can only be classified as heavy. Deer use was known to be heavy prior to 1977 and has, if anything, increased in the intervening years. Although deer were fed at two nearby locations during the winter of 1983-84, signs of long-term winter use are intense. The result of heavy use has been a nearly competed elimination of browse forage which was never very abundant in association with the juniper. The only species currently capable of proving more than token amounts of browse forage is Utah juniper. However, even this species has been intensely "highlined" and can provide only limited forage. Further evidence of heavy deer use is provided by the more than 50 winter-killed carcasses from the critical winter of 1983-84 being observed along the old line intercept transect.

Soil is a coarse textured cobbly loam derived from conglomerate parent material. It is moderately deep with an effective rooting depth of a little over 12 inches. The soil is classified as a clay-loam with a pH of 7.9 which is described as moderately alkaline. One characteristic that is concern is that the soil temperature at about 12 inches was quite high at 76^{0}F. This high a temperature probably helps explain the dominance of cheatgrass to this site which is a winter annual. On the more gentle slopes, soil depth is moderate. On steep slopes, soil depth is shallower and the erosion rate is more rapid. These sites also have minimal plant cover and litter is unable to accumulate under juniper crowns. On more gentle areas there is a good litter cover under tree crowns and a fair grass cover in tree interspaces. Apart from some unpalatable increasers, shrubs provide almost no vegetative cover.

Browse composition consists of a variety of shrubs, of which only mountain big sagebrush and Saskatoon serviceberry are palatable. The remaining species are less preferred and generally classed as increasers or invaders. Most abundant are stickyleaf low rabbit brush and broom snakeweed. Big sagebrush and service berry are at very low densities with a high incidence of decadence. Now, most of these plants have died off. Their trend is continuing downward. Utah juniper is highlined, but not like it was in the winters of 1982-84. It has shown significant recovery yet it is still a limited source of low quality browse.

Grasses, especially annual cheatgrass brome, are abundant. Cheatgrass currently contributes 64% of the grass cover. Overall, perennial grass sum of nested frequency values have decreased since 1990. Only bluebunch wheatgrass and needle-and-thread grass have nested frequency values that have consistently increased since 1984. Forbs are a relatively insignificant, contributing only 18% of the herbaceous understory cover. Although a fair number of annual and perennial forb species occur, none are more than occasionally abundant.

1984 APPARENT TREND ASSESSMENT

Although this area is characterized by heavy sheet and gully erosion, there is some evidence of improvement since 1977. The increase in grass density and vigor, especially that of perennial grasses, suggests a slight improvement in

soil trend. In contrast, there has been a new low in shrub cover. Overall trend is only marginally better. Our evaluation of the vegetative trend is downward because of the obvious decline or disappearance of valuable browse species, the severe high-lining of Utah juniper and an apparent increase among less palatable increaser shrubs.

1990 TREND ASSESSMENT

The downward browse trend assessed for this heavily used winter range in 1984 still applies. The 101 juniper trees/acre are mostly mature, severely highlined trees. Low rabbitbrush provides most of the browse forage. The Opuntia and broom snakeweed are the only browse species that increased in density. The perennial grass component has improved since 1984. The site has a good stand of bluebunch wheatgrass, which increased significantly in frequency, plus Indian ricegrass, and needle-and-thread. However, the percentage of litter cover declined, which would be expected with the extended drought. Bare areas increased which could cause more sheet and gully erosion on the steeper slopes.

TREND ASSESSMENT
soil - slightly downward
browse - down
herbaceous understory - improving, good increases in perennial grasses

1996 TREND ASSESSMENT

Percent bare ground has decreased and is now only at 23% (33% in 1990). The ratio of percent bare ground to vegetative and litter cover sum of nest frequency is marginal at 1:2.7, but it is still an improvement over 1990. Soil trend is considered slightly up. The browse trend is continuing downward with most all of the preferred key browse species dying off. Trend for browse is continuing downward. The trend for the herbaceous understory is slightly down for the perennial species, especially perennial grasses with make up 82% of the herbaceous understory. The annual cheatgrass contributes 64% of the grass cover. With its current abundance, it is considered a hazard if a wildfire occurs within the area, for it could easily become totally dominated by cheatgrass. This is especially true with a soil temperature that exceeds 76^{0}F.

TREND ASSESSMENT
soil - improved, still only fair
browse - continuing downward, loss of almost all preferred browse species
herbaceous understory - slightly down, mostly because of some losses to the perennial grasses

HERBACEOUS TRENDS --
Herd unit 06, Study no: 4

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	$_{ab}$13	$_{a}$21	$_{b}$7	6	9	3	.18
G	Agropyron spicatum	$_{a}$81	$_{b}$130	$_{c}$177	31	51	63	5.22
G	Bromus brizaeformis (a)	-	-	7	-	-	4	.02
G	Bromus tectorum (a)	-	-	323	-	-	93	15.37
G	Oryzopsis hymenoides	$_{a}$71	$_{a}$79	$_{b}$26	31	38	13	.43
G	Poa fendleriana	-	-	18	-	-	6	.13
G	Poa pratensis	-	-	2	-	-	1	.00

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Poa secunda	$_{a}$10	$_{b}$143	$_{c}$63	5	52	24	.93
G	Sitanion hystrix	-	-	1	-	-	1	.03
G	Sporobolus cryptandrus	2	1	-	1	1	-	-
G	Stipa comata	32	47	61	16	25	26	1.87
Total for Grasses		209	421	685	90	176	234	24.20
F	Agoseris glauca	-	1	-	-	1	-	-
F	Alyssum alyssoides (a)	-	-	291	-	-	90	2.98
F	Antennaria rosea	$_{a}$24	$_{a}$20	$_{b}$-	10	8	-	-
F	Astragalus utahensis	$_{a}$79	$_{b}$17	$_{a}$68	34	10	31	1.45
F	Cirsium spp.	8	2	3	4	2	2	.03
F	Crepis acuminata	-	-	1	-	-	1	.00
F	Cryptantha spp.	-	-	10	-	-	3	.06
F	Cymopterus spp.	-	-	2	-	-	2	.01
F	Eriogonum brevicaule	6	2	5	2	2	4	.09
F	Erigeron pumilus	-	5	-	-	2	-	-
F	Hackelia patens	-	-	4	-	-	3	.01
F	Holosteum umbellatum (a)	-	-	1	-	-	1	.00
F	Penstemon humilis	1	-	-	1	-	-	-
F	Phlox austromontana	22	21	12	11	9	5	.12
F	Phlox longifolia	-	1	-	-	1	-	-
F	Sphaeralcea coccinea	30	29	24	12	13	11	.49
F	Tragopogon dubius	$_{a}$15	$_{b}$1	$_{b}$1	8	1	1	.00
Total for Forbs		185	99	422	82	49	154	5.29

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 4

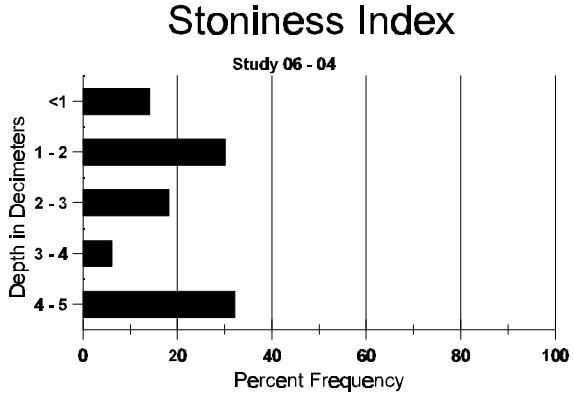
Type	Species	Strip Frequency '96	Average Cover % '96
B	Chrysothamnus nauseosus albicaulis	2	-
B	Chrysothamnus viscidiflorus viscidiflorus	36	1.18
B	Gutierrezia sarothrae	36	1.12
B	Juniperus osteosperma	3	7.92
B	Opuntia spp.	36	1.15
B	Tetradymia canescens	1	-
Total for Browse		114	11.39

BASIC COVER --
Herd unit 06, Study no: 4

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	381	6.50	7.25	37.54
Rock	132	1.25	1.50	2.04
Pavement	248	2.25	4.50	6.47
Litter	387	61.00	46.50	37.07
Cryptogams	161	.75	7.75	6.51
Bare Ground	282	28.25	32.50	23.30

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 4

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.3	75.6 (12.1)	7.9	44.7	24.0	31.3	2.1	4.3	38.4	.5



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 4

Type	Quadrat Frequency '96
Rabbit	2
Elk	5
Deer	31
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	5	-	-	1	-	-	-	6	-	-	-	400	42	14	6
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	-	6	-	-	-	-	-	-	5	1	-	-	400			6
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		866	Dec:		46%
													'90		0			0%
													'96		0			0%
Artemisia tridentata vaseyana																		
D	84	-	1	1	-	-	-	-	-	-	1	-	1	-	66			2
	90	-	1	-	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	260			13
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		100%
													'90		33			100%
													'96		0			0%
Chrysothamnus nauseosus albicaulis																		
M	84	-	-	1	-	-	-	-	-	-	-	1	-	-	33	19	18	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	27	40	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	-	-	1	-	33			1
	96	1	-	1	-	-	-	-	-	-	1	-	-	1	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		0%
													'90		33			100%
													'96		40			100%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560			28
M	84	31	-	-	-	-	-	-	-	-	14	17	-	-	2066	12	18	31
	90	22	3	1	-	-	-	-	-	-	9	-	17	-	1733	10	14	26
	96	67	-	-	-	-	-	-	-	-	67	-	-	-	1340	8	14	67
D	84	34	11	-	-	-	-	-	-	-	45	-	-	-	3000			45
	90	5	-	3	-	-	-	-	-	-	1	-	5	2	533			8
	96	1	1	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		5132	Dec:		58%
													'90		2332			23%
													'96		1940			2%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	17	-	-	-	-	-	-	-	-	17	-	-	-	566			17
	96	35	-	-	-	-	-	-	-	-	35	-	-	-	700			35
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	36	-	-	-	-	-	-	-	-	31	-	4	1	1200			36
	96	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
M	84	40	-	-	-	-	-	-	-	-	40	-	-	-	1333	13	14	40
	90	31	-	-	-	-	-	-	-	-	30	-	1	-	1033	8	7	31
	96	64	-	-	-	-	-	-	-	-	64	-	-	-	1280	8	10	64
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	4	-	-	-	-	-	-	-	-	3	-	-	1	133			4
	96	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		1432	Dec:		2%
													'90		2366			6%
													'96		1900			2%
Juniperus osteosperma																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	1	-	-	-	-	-	1	-	33	69	47	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	1	-	3	-	-	-	60	-	-	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		33			-
													'96		60			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	90	9	-	-	1	-	-	-	-	-	9	-	1	-	333			10
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	84	19	-	-	-	-	-	-	-	-	19	-	-	-	633	6	16	19
	90	25	-	-	-	-	-	-	-	-	18	-	7	-	833	4	16	25
	96	48	-	-	1	-	-	-	-	-	47	-	2	-	980	5	18	49
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6
Total Plants/Acre (excluding Dead & Seedlings)													'84		999	Dec:		0%
													'90		1199			3%
													'96		1300			5%
Symphoricarpos oreophilus																		
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	8	4	-	-	-	-	-	-	-	12	-	-	-	800	27	25	12
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		1266	Dec:		11%
													'90		0			0%
													'96		0			0%
Tetradymia canescens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	8	16	2
D	84	-	2	-	-	-	-	-	-	-	-	2	-	-	66			2
	90	-	2	-	-	-	-	-	-	-	-	1	1	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		100%
													'90		66			100%
													'96		40			0%

TREND STUDY 6-5-96 (old 19-13)

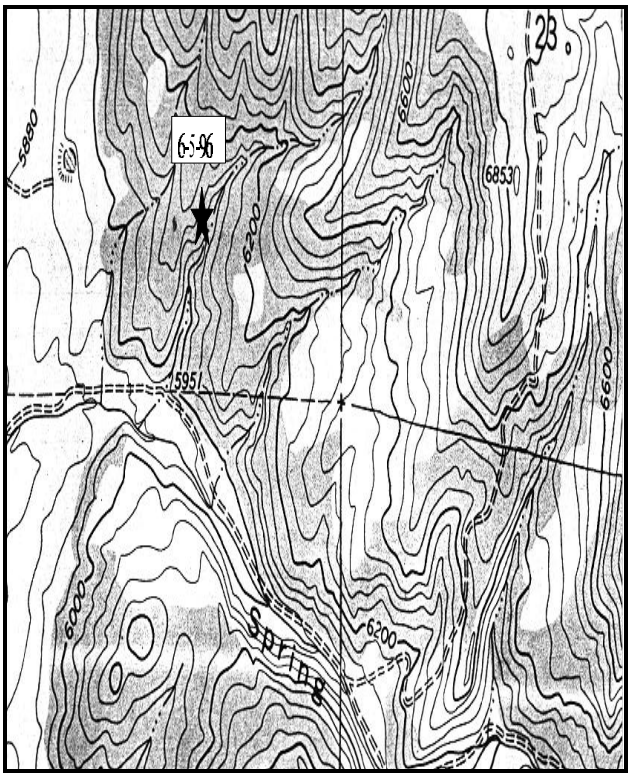
Study site name: Spring Canyon . Range type: Juniper .

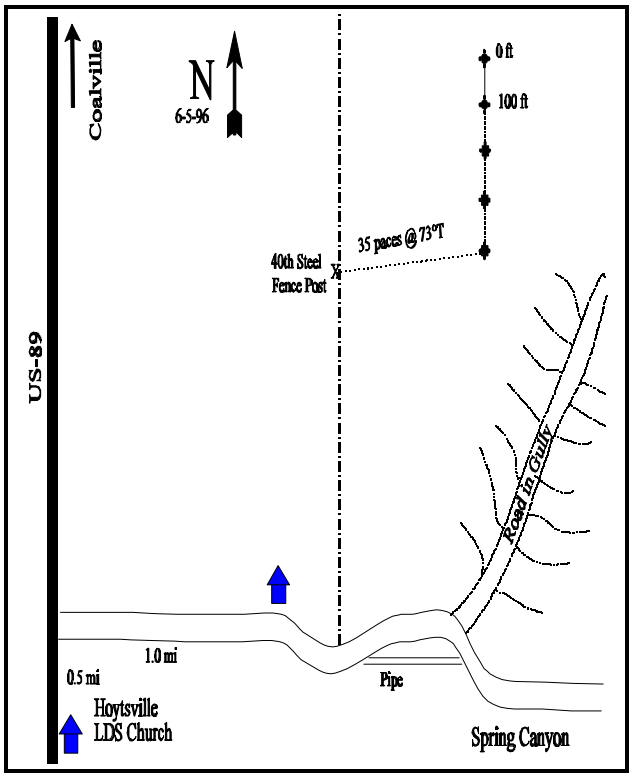
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the LDS Church in Hoytsville, travel north 0.5 miles on old U.S. 189. At 0.5 miles note a dirt road to the right with a sign "Echo-Chalk Creek Range Owners Protective Association" and turn right (east). Proceed 1.0 miles to a sharp bend to the right (south) with a large pipe in the bend. There should also be a road up a gully to the left at this point. Walk to the north side of the road to a north/south running fence. From here walk north along the fence to the 40th metal fence post. From post #40 walk 35 paces at 73 degrees true to the 400-foot baseline stake. The 0-foot stake is marked with browse tag #7953.





Map Name: Turner Hollow Diagrammatic Sketch

Township 2N , Range 5E , Section 22 , UTM COOR: 4-63-989E 45-26-269N

DISCUSSION

Trend Study No. 6-5 (19-13)

The Spring Canyon study area is located on a juniper covered ridge immediately east of Hoytsville and north of the mouth of Spring Canyon on south facing slopes, seldom exceeding 15%. The area is considered critical deer winter range and is occupied by a closed and relatively unproductive Utah juniper community. Canopy cover is estimated at 34%. The juniper range type is very uniform in this area and characterized by a moderately dense stand of uneven aged junipers. Other shrubs or trees are rare. Herbaceous understory is equally sparse and is not an important cover or forage source. Animal use is heavy and includes sheep, deer and elk. Domestic sheep were on the area in late August of 1984 when the study was conducted. Deer pellet groups are common and nine winter-killed deer were observed in the immediate vicinity in 1984. Utilization of available forage usually exceeded 100 percent in the past. Browsing often extends into three-year, four-year and even older wood on mountain big sagebrush, true mountain mahogany, and juniper. Few preferred shrubs are found on the site anymore.

Soil is typical of the low elevation juniper type in this area. It is rocky on the surface and moderately stony throughout the profile. Soil has a clay-loam texture and a pH of 7.3 which is considered neutral to almost slightly alkaline. Effective rooting depth is a little over 12 inches. Soil temperature at this depth is moderately high at a little over 70^0F which would make it more difficult for perennial grasses to become established on the site. This would tend to make the soil dry for long periods during the summer. This higher temperature and dryness would favor winter annuals like cheatgrass. The erosion hazard is moderately high because of poor understory cover and low permeability.

Browse species consists basically of broom snakeweed, juniper, prickly pear cactus, and a very few snowberry. Utah juniper is the dominant plant but currently provides little forage because of past high-lining.

1984 APPARENT TREND ASSESSMENT

Soil is moderately shallow and inadequately protected from erosion. The current rate of erosion is high and will continue to be so. Trend is down. Overall vegetative trend is marginally down. We say "marginally down" only because it is difficult to imagine conditions being much worse than they currently are. Plant composition shows little evidence of significant change beyond the continuing decline of all palatable browse species and possibly a small increase in density, cover and production of perennial grasses. Utah juniper will likely become even more dominant than it is now. Very heavy use in the past seven years, especially the last two, has adversely affected long-term forage production potential of the site as well as further depleting shrub diversity. Of particular concern is the "high-lining" of juniper which formerly provided an "emergency" forage source.

1990 TREND ASSESSMENT

Unfortunately, this depleted juniper range type is representative of a majority of winter range in the area above Hoytsville. There is very little browse forage available. The steeper slopes and west exposures support a variety of browse species, but all are heavily hedged and mostly decadent. The point-centered quarter method estimate of juniper density is 232 trees/acre, all are highlined mature trees. Notably, bluebunch wheatgrass decreased in nested frequency while Indian ricegrass frequency was almost unchanged. These plants show evidence of recent grazing. The highly erodible soil is exposed except in the dense litter under the junipers.

TREND ASSESSMENT
soil - slightly downward
browse - continue downward
herbaceous understory - downward

1996 TREND ASSESSMENT

This site has the lowest herbaceous cover of all the sites within management unit #6 at only 8%. This doesn't allow very much protective cover. Percent bare ground actually increased since 1990. Trend for soil is slight down and in poor condition. The browse trend is down, actually there are no preferred browse within the sampled area. Trend for the herbaceous understory is stable for perennial species, but it still is in very poor condition contributing to only 8% cover.

TREND ASSESSMENT
soil - slightly down, poor condition
browse - down, most preferred browse is gone
herbaceous understory - stable for perennial species, but still not enough cover to protect the soil

HERBACEOUS TRENDS --
Herd unit 06, Study no: 5

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	[a]59	[b]32	[b]44	31	13	20	.59
G	Bromus tectorum (a)	-	-	129	-	-	48	2.82
G	Oryzopsis hymenoides	68	66	78	34	31	36	1.08
G	Poa pratensis	3	-	-	2	-	-	-
G	Poa secunda	[a]13	[b]56	[b]47	7	28	17	.48
G	Sitanion hystrix	[a]1	[b]34	[b]22	1	18	12	.28
G	Stipa comata	13	27	29	7	13	11	.30
Total for Grasses		157	215	349	82	103	144	5.58
F	Alyssum alyssoides (a)	-	-	239	-	-	76	1.10
F	Antennaria spp.	-	6	1	-	3	1	.00
F	Arabis spp.	-	3	5	-	1	3	.01
F	Astragalus convallarius	4	-	-	2	-	-	-
F	Astragalus utahensis	1	-	2	1	-	1	.03

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Camelina microcarpa (a)	-	-	5	-	-	2	.01
F	Chaenactis douglasii	2	-	-	2	-	-	-
F	Cirsium spp.	2	-	1	2	-	1	.03
F	Collinsia parviflora (a)	-	-	2	-	-	2	.01
F	Cryptantha spp.	30	13	21	16	8	11	.25
F	Cymopterus longipes	$_{a}$-	$_{ab}$2	$_{b}$5	-	2	4	.02
F	Eriogonum umbellatum	7	2	-	3	1	-	-
F	Hackelia patens	$_{a}$-	$_{b}$11	$_{b}$7	-	5	4	.04
F	Hedysarum boreale	8	-	-	5	-	-	-
F	Machaeranthera canescens	-	-	2	-	-	2	.01
F	Penstemon humilis	1	5	3	1	2	1	.03
F	Penstemon spp.	$_{a}$17	$_{b}$-	$_{b}$3	7	-	1	.03
F	Phlox austromontana	$_{ab}$27	$_{a}$20	$_{b}$39	12	8	17	.66
F	Phlox longifolia	-	-	5	-	-	3	.01
F	Ranunculus testiculatus (a)	-	-	86	-	-	35	.27
F	Senecio multilobatus	-	-	2	-	-	1	.00
F	Sisymbrium altissimum (a)	-	-	1	-	-	1	.00
Total for Forbs		99	62	429	51	30	166	2.56

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 5

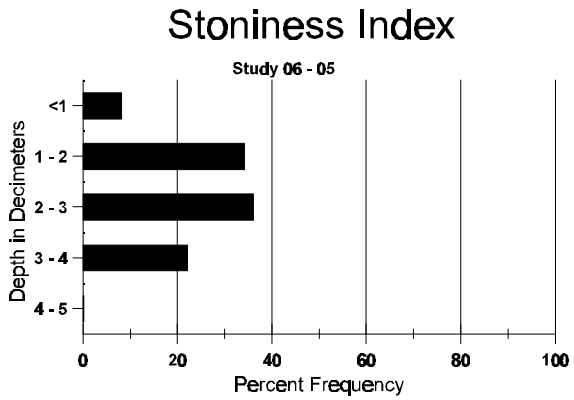
Type	Species	Strip Frequency '96	Average Cover % '96
B	Gutierrezia sarothrae	6	.20
B	Juniperus osteosperma	12	16.73
B	Opuntia spp.	8	.22
B	Symphoricarpos oreophilus	1	-
Total for Browse		27	17.15

BASIC COVER --
Herd unit 06, Study no: 5

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	337	.50	1.00	25.55
Rock	129	1.75	6.25	2.94
Pavement	207	9.25	12.50	3.84
Litter	382	56.25	48.50	40.31
Cryptogams	152	2.75	5.25	3.52
Bare Ground	260	29.50	26.50	28.08

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 5

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.1	70.2 (11.9)	7.3	32.6	30.7	36.7	2.9	3.8	38.4	.6



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 5

Type	Quadrat Frequency '96
Sheep	2
Rabbit	12
Elk	1
Deer	44

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	-	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		33			-
													'96		0			-
Chrysothamnus viscidiflorus stenophyllus																		
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		50%
													'90		0			0%
													'96		0			0%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200	7	8	10
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		240			-
Juniperus osteosperma																		
Y	84	-	1	1	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	1	-	-	1	-	-	-	33			1
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	3	3	-	-	-	-	3	-	9	-	-	-	300	67	157	9
	90	1	-	-	-	-	-	4	-	3	8	-	-	-	266	186	153	8
	96	5	-	-	-	-	-	3	3	-	11	-	-	-	220	-	-	11
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		366	Dec:		-
													'90		299			-
													'96		260			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Opuntia spp.																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33	7	14	1
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	10	2
	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160	5	12	8
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	5	-	-	-	-	-	-	-	-	1	-	4	-	100			5
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		0%
													'90		165			20%
													'96		280			36%
Symphoricarpos oreophilus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	12	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-

TREND STUDY 6-6-96 (old 19-16)

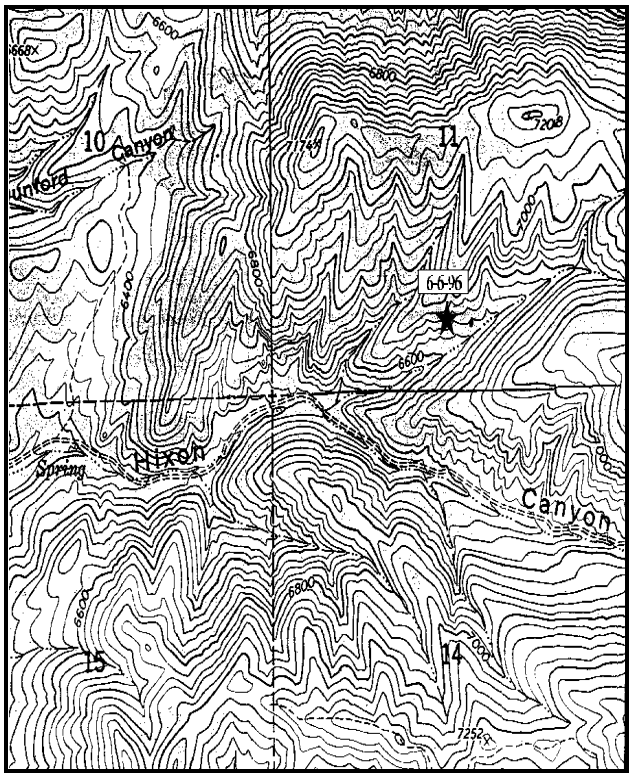
Study site name: Hixon Canyon. Range type: True mountain mahogany.

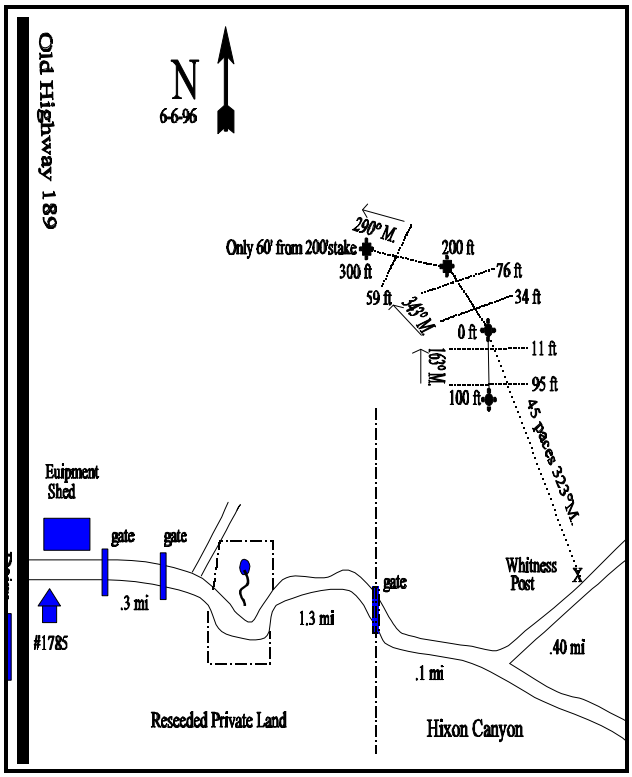
Compass bearing: frequency baseline 146 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34 & 76ft), line 3 (59ft).

LOCATION DESCRIPTION

From 1785 Old Highway 189, travel east up Hixon Canyon on a dirt road through a gate and proceed 0.3 miles to another gate. Turn right and proceed 1.3 miles to a fence with a gate. Continue 0.1 miles and turn left at the fork. This road is only shown as an intermittent stream on 1967 quad map. Proceed 0.40 miles to a white topped green steel fence post stake in a rock pile. From the rock pile, walk 45 paces at 323 degrees magnetic to the 0-foot stake of the baseline marked by browse tab #7966. The baseline runs 146 degrees. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs 326 degrees magnetic. Line 3 runs 288 degrees magnetic.





Map Name: Crandall Canyon Diagrammatic Sketch

Township 1N, Range 5E, Section 11, UTM COOR: 4-70-604E 45-19-983N

DISCUSSION

Trend Study No. 6-6 (19-16)

The Hixon Canyon site is the second of two newly established studies on Wildlife Management Unit 6 (old Herd Unit 19) in 1984. This site is located in the upper reaches of Hixon Canon at 6,680 feet elevation. It samples a mixed mountain brush range type on moderately gentle (20-25% slope) south facing terrain. Although higher up in the canyon than the old line intercept transect it replaces, this study is still within the limits of critical deer winter range. Browse utilization appears to be moderately heavy, but this appearance is exacerbated by extended drought. In 1996, pellet group frequency for deer appears to indicate moderate use (17%), with elk pellet groups displaying only light use (3%). Domestic sheep and cattle also utilize the site. There was significant use of Indian ricegrass noted in 1984.

Soil is red in color and appears to be highly erodible. Most surface rock and herbaceous plants are pedestaled. Soil texture is classified as sandy-clay-loam with a pH of 7.9 which is within the descriptive range of moderately alkaline. Percent organic matter in the soil is the lowest of all sites in the Chalk Creek management unit at only 1.7%, where the average for the unit is 3%. The range for percent organic matter for Utah is generally from 1.5 to 5.0%. Drainage and permeability are probably quite rapid. Effective rooting depth (see methods) is moderate at a little over 12 inches. Soil temperature at this depth is about 66^{0}F with a moderately rocky soil profile. Percent bare ground was originally quite high at 39% (1984) and now is about 18% in 1996. The ratio and distribution (nested frequency) of protective ground cover (vegetation and litter cover) to percent bare ground is considered only fair with a value of 1:2.8. A value of 1:3 or higher usually affords moderately good protection from high intensity summer storm events. Consequently, the erosion rate is moderate and continuing soil loss is a problem.

This site, like many mountain brush types, has a plant composition that is quite variable according to the availability of microsites. On much of the area, the key browse species (true mountain mahogany and mountain big sagebrush) and juniper provide the vegetative aspect for the community. In terms of abundance however, they provide respectively 2%, 23%, and 56% of the browse cover. From 1984 and 1990, it appeared that broom snakeweed was going to take over the site with a population that had increased to more than 22,000 plants per acre. Since then, the population is estimated at only 740 plants per acre. The drought has obviously had a detrimental effect on its density. Now only 3% of the browse cover is contributed by broom snakeweed. Both of the preferred "key" species as well as the less abundant Saskatoon serviceberry and even mountain snowberry have sustained heavy use which has been intensified by prolonged drought. Utilization coupled with drought has effected the vigor and age structure of mountain big sagebrush and true mountain mahogany. Even stickyleaf low rabbitbrush, a species that seldom is utilized, shows moderately heavy use. Almost all of the browse populations mentioned above, but especially the key species, have excessively decadent age structures. What is most alarming on this site is the proportion of dead plants for mountain big sagebrush and true mountain mahogany which is respectively 56% and 29%.

The herbaceous understory contributes little quality forage for the majority is cheatgrass. Plants occur erratically and appear to be greatly effected by soil erosion. Many of the shrub interspaces are bare soil and rock. The most numerous perennial species are Sandberg bluegrass, bluebunch wheatgrass, and Indian ricegrass which are important forage species. All show evidence of considerable current grazing use.

1984 APPARENT TREND ASSESSMENT

Soil is derived from conglomerate parent material and thus is highly erodible. Heavy animal use is contributing to conditions that favor rapid soil erosion, which in turn adversely affects vegetative potential. Soil trend is definitely down. Vegetative trend is also declining because of decadent age structures and excessive use on the key browse species and an apparent increase of undesirable shrubs such as broom snakeweed and prickly pear cactus.

1990 TREND ASSESSMENT

The key browse species on this DWR winter range are highly decadent and heavily used. The south-facing slope at the site has a steepness of 35%. North-facing slopes in the area support more and healthier browse, attesting to the effects of the prolonged drought. There is some recruitment with the young age class accounting for 13% of the population. The low-density sagebrush population has canopy cover averaging only 2%. Undesirable woody species make up the vast majority of the browse composition and are increasing, especially the broom snakeweed, which has increased by 31%. Junipers have a density of 78 trees/acre. Indian ricegrass shows an increase in nested frequency with moderate utilization. There was a 78% increase in the amount of erosion pavement.

TREND ASSESSMENT
soil - downward
browse - downward, density losses for key browse species and large increase for broom snakeweed
herbaceous understory - stable to slightly improving with increased nested frequencies for Indian ricegrass and Sandberg bluegrass

1996 TREND ASSESSMENT

The trend for soil is mixed, but is stable with percent bare ground going from 39% (1984) to 31% (1990), currently it is 18%. Trend is stable, but the soil is in poor condition with most of the herbaceous cover coming from annual cheatgrass. The trend for the two preferred browse is down because 56% of the mountain big sagebrush is dead and 30% of the true mountain mahogany are dead. Percent decadency for sagebrush is still high at 61%. Mahogany is showing some improvement with only about 20% decadency, but its density is down to only 300 plants per acre. This is one of the only sites that has dead mahoganies on it. You can usually have a moderately high percent decadency, but usually no significant number of dead plants. The only real positive note for this site is that Broom snakeweed’s population has decreased by 98% with the prolonged drought. The herbaceous understory (perennial component) is also down for both the grasses and forbs where most of the herbaceous cover is from annuals.

TREND ASSESSMENT
soil - stable but poor condition
browse - continuing downward trend for preferred browse species with continued drought
herbaceous understory - downward for perennial grasses and forbs with continued drought

HERBACEOUS TRENDS --
Herd unit 06, Study no: 6

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	-	-	3	-	-	1	.03
G	Agropyron spicatum	$_{a}$29	$_{a}$27	$_{b}$64	13	12	28	1.64
G	Bromus tectorum (a)	-	-	269	-	-	85	6.09
G	Elymus cinereus	-	-	6	-	-	2	.53
G	Oryzopsis hymenoides	$_{a}$86	$_{a}$116	$_{b}$29	44	47	15	1.04
G	Poa bulbosa	-	-	3	-	-	1	.00
G	Poa fendleriana	-	-	1	-	-	1	.15
G	Poa secunda	$_{a}$18	$_{b}$58	$_{b}$69	7	25	29	1.97
Total for Grasses		133	201	444	64	84	162	11.48
F	Alyssum alyssoides (a)	-	-	252	-	-	77	2.32
F	Artemisia ludoviciana	$_{a}$21	$_{a}$17	$_{b}$-	9	6	-	.03
F	Camelina microcarpa (a)	-	-	1	-	-	1	.00
F	Calochortus nuttallii	-	5	-	-	2	-	-
F	Chenopodium album	-	-	1	-	-	1	.00
F	Chaenactis douglasii	$_{a}$9	$_{b}$53	$_{a}$3	7	27	3	.01
F	Cirsium undulatum	$_{ab}$9	$_{a}$17	$_{b}$5	5	10	2	.04
F	Comandra pallida	$_{ab}$6	$_{a}$1	$_{b}$11	3	1	4	.07
F	Cryptantha spp.	6	16	8	3	6	4	.02
F	Cynoglossum officinale	1	-	-	1	-	-	-
F	Erigeron pumilus	-	-	8	-	-	3	.01
F	Hackelia patens	6	12	11	3	5	5	.02
F	Holosteum umbellatum (a)	-	-	1	-	-	1	.00
F	Machaeranthera canescens	1	2	-	1	1	-	-
F	Oenothera caespitosa	$_{ab}$8	$_{a}$13	$_{b}$-	3	6	-	-
F	Phlox austromontana	-	-	2	-	-	1	.00
F	Phlox longifolia	-	2	-	-	2	-	-
F	Ranunculus testiculatus (a)	-	-	13	-	-	4	.02
F	Tragopogon dubius	2	1	-	1	1	-	-
Total for Forbs		69	139	316	36	67	106	2.57

Values with different subscript letters are significantly different at % = 0.10
(annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 6

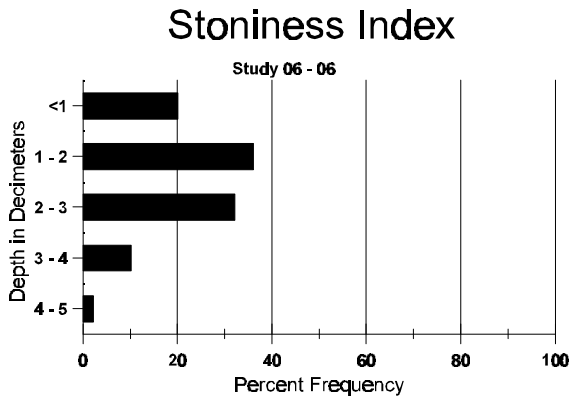
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata vaseyana	10	.25
B	Cercocarpus montanus	15	2.93
B	Chrysothamnus viscidiflorus viscidiflorus	3	.03
B	Gutierrezia sarothrae	11	.32
B	Juniperus osteosperma	8	7.08
B	Opuntia spp.	19	.16
B	Quercus gambelii	2	1.63
B	Symphoricarpos oreophilus	1	.18
Total for Browse		71	12.62

BASIC COVER --
Herd unit 06, Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	350	2.75	7.00	28.37
Rock	290	21.00	23.00	15.63
Pavement	258	4.00	18.25	10.17
Litter	388	33.25	20.50	39.14
Cryptogams	17	0	0	.09
Bare Ground	268	39.00	31.25	17.65

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 6

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.3	66.3 (12.4)	7.9	46.9	35.1	28.0	1.7	9.7	19.2	.5



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 6

Type	Quadrat Frequency '96
Rabbit	18
Elk	3
Deer	17
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66	30	30	2
	90	-	-	2	-	-	-	-	-	-	2	-	-	-	66	39	31	2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	24	24	1
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		99	Dec:		33%
													'90		66			0%
													'96		40			50%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	2	5	-	-	-	-	-	-	7	-	-	-	233	21	28	7
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	43	1
	96	2	3	-	-	-	-	-	-	-	5	-	-	-	100	18	32	5
D	84	-	-	16	-	-	-	-	-	-	14	-	-	2	533			16
	90	1	1	1	-	-	-	-	-	-	1	-	-	2	100			3
	96	3	4	1	-	-	-	-	-	-	6	-	-	2	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	320			16
Total Plants/Acre (excluding Dead & Seedlings)													'84		766	Dec:		70%
													'90		166			60%
													'96		260			62%
Cercocarpus montanus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	1	1	-	-	-	-	-	-	2	-	-	-	66			2
	96	1	1	1	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	2	-	-	-	-	-	-	1	1	-	-	66	22	31	2
	96	-	1	8	-	-	-	-	-	-	9	-	-	-	180	23	34	9
D	84	-	-	14	-	-	-	-	-	-	14	-	-	-	466			14
	90	-	-	11	-	-	-	-	-	-	2	-	4	5	366			11
	96	-	1	2	-	-	-	-	-	-	2	-	-	1	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6
Total Plants/Acre (excluding Dead & Seedlings)													'84		499	Dec:		93%
													'90		498			73%
													'96		300			20%
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	4	-	3	-	-	-	-	-	-	7	-	-	-	233	20	18	7
	90	9	-	-	1	-	-	-	-	-	6	-	4	-	333	19	27	10
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	11	19	3
D	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		299	Dec:		22%
													'90		366			9%
													'96		60			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	97	-	-	-	-	-	-	-	-	97	-	-	-	3233			97
	90	445	-	-	-	-	-	-	-	-	445	-	-	-	14833			445
	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	84	363	-	-	-	-	-	-	-	-	363	-	-	-	12100	9	9	363
	90	213	1	-	3	-	-	-	-	-	216	-	1	-	7233	9	10	217
	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460	7	13	23
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	8	-	-	-	-	-	-	-	-	4	-	-	4	266			8
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		15333	Dec:		0%
													'90		22332			1%
													'96		740			0%
Juniperus osteosperma																		
M	84	2	-	-	2	-	-	-	-	-	4	-	-	-	133	60	48	4
	90	2	-	-	1	-	-	-	-	-	3	-	-	-	100	71	56	3
	96	4	-	2	-	-	-	2	-	-	8	-	-	-	160	-	-	8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		133	Dec:		-
													'90		100			-
													'96		160			-
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	90	6	-	-	1	-	-	-	-	-	7	-	-	-	233			7
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	15	-	-	-	-	-	-	-	-	15	-	-	-	500	6	7	15
	90	6	-	-	1	-	-	-	-	-	6	-	1	-	233	4	8	7
	96	26	1	-	-	-	-	-	-	-	23	1	1	2	540	6	16	27
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'84		633	Dec:		0%
													'90		499			7%
													'96		560			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Quercus gambelii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	7	-	-	7	-	-	-	140	-	-	7
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		140			-
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33	19	17	1
	90	7	-	-	-	-	-	-	-	-	-	-	7	-	233	23	24	7
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	37	0
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		50%
													'90		266			12%
													'96		20			0%

TREND STUDY 6-7-96 (old 19-18)

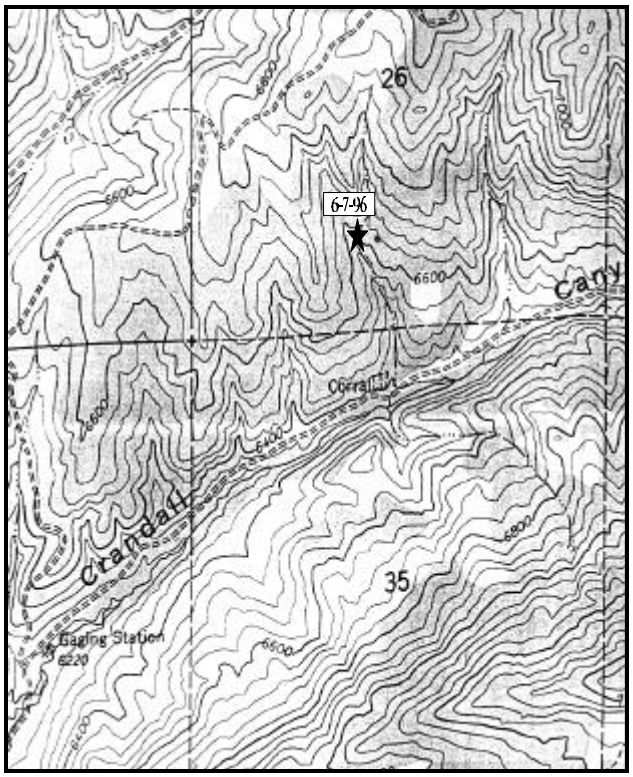
Study site name: Crandall Canyon. Range type: Mixed mountain brush.

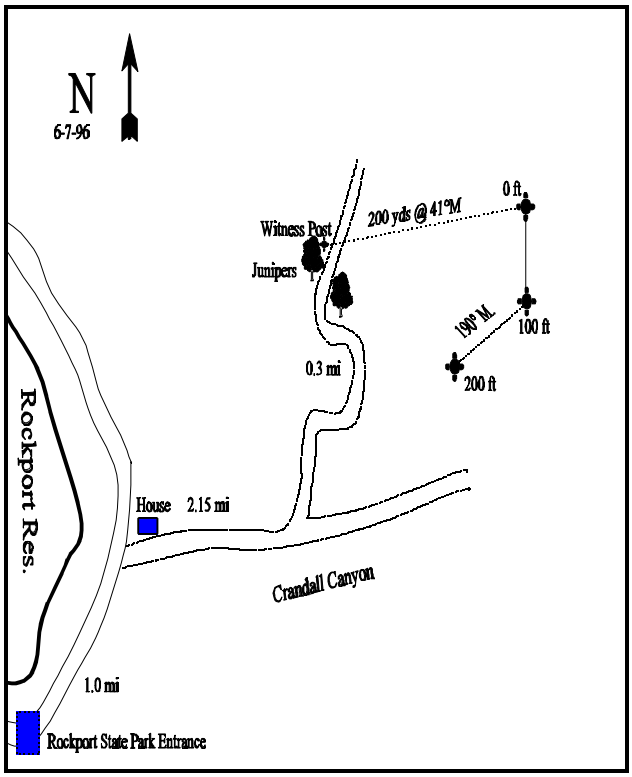
Compass bearing: frequency baseline 165 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11, 31, & 71ft), line 2 (59 & 95ft).

LOCATION DESCRIPTION

From the guard house at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed up Crandall Canyon (dirt road) for 2.15 miles, and turn left at the fork. Travel 0.30 miles north on this road to a pair of junipers on either side of the road. Just past the junipers on the left hand side of the road is a witness post. From the witness post walk approximately 200 yards at 41 degrees magnetic to the 0-foot stake of the baseline. The 0-foot stake is marked by browse tag #7956. The 200-foot baseline doglegs and runs 190 degrees magnetic.





Map Name: Crandall Canyon Diagrammatic Sketch

Township 1N, Range 5E, Section 26, UTM COOR 4-70-438E 45-14-954N

DISCUSSION

Trend Study No. 6-7 (19-18)

This study is located on critical deer and elk winter range in Crandall Canyon. The site has a 35% southwest facing slope at approximately 6,640 feet elevation. The plant community in this area is basically mixed mountain brush, that varies from mountain big sagebrush/grass to nearly dominated by Gambel oakbrush. The study area is vegetatively variable and has a mosaic-like appearance. It is excellent big game habitat. Crandall Canyon, however, is entirely private land and is intensively grazed by sheep and cattle. Deer, elk, and moose must therefore compete for available forage. The intensity of use tends to be heavy and at least one of the users is on the site at all times of the year. All classes of vegetation show the impact of grazing or browsing use and many pellet groups and droppings are present, use is low for deer and light for elk.

Soil texture on this site is classified as sandy-clay-loam with a pH of 8.0, which is categorized as moderately alkaline. The soil profile is moderately rocky throughout, appears well-drained and seems to have good growth potential. This soil shows signs of erosion with pedestalling in some of the plants and bare interspaces (31% bare ground). Gullies appear easily formed, but many of them show signs of healing. Most of the area has been utilized heavily enough to adversely effect plant and litter cover, especially when associated with an extended period of drought. Sheet and gully erosion has been unacceptably high in the past, but appears to have been stabilizing in recent years. This, incidentally, is approximately the situation that prevailed in 1977. Basic ground cover data indicates improvement in percent bare ground, along with less rock-pavement cover. Photo point comparisons do not indicate any detectable change in soil condition or erosion rate. However, a grazing system needs to be implemented that will allow for long-term improvements in soil condition and vegetative cover.

The range type is mixed mountain brush made up of 12 species, where the principal browse species are true mountain mahogany, mountain snowberry, Gambel oak, serviceberry, mountain big sagebrush, and bitterbrush. Increaser shrubs include broom snakeweed, stickyleaf low rabbitbrush and prickly pear cactus. Of these, only broom snakeweed comprises a substantial portion of the composition, making up 19% of the browse cover. This species is unused, in good vigor, yet its population appears to be stable at this time. The other browse species receive moderate to heavy use and appear to have stable populations except for mountain big sagebrush which shows 29% of the adult population is dead at this time. The two species on the site that appeared clumped in their distribution (serviceberry and mountain big sagebrush) showed declines in their respective populations. But, only sagebrush had any dead found in their populations, indicating that much of the loss, especially serviceberry, was the result of the larger sample being taken in 1996. Therefore, those species with discontinuous distributions, more attention should be paid to the ratios of dead, decadent, and young plants in their respective populations. For example, an examination of 1990 data indicated that mountain big sagebrush and true mountain mahogany were overly decadent and may be in a state of long-term decline. Now, with more precipitation, true mountain mahogany percent decadency has gone from 87% to only 3% in 1996. Mountain big sagebrush percent decadency was also high at 70% in 1990, now it is only at 5%. Both are great improvements, but the high rate of decadency caused a great deal of death to the sagebrush yet not for true mountain mahogany. One other influence on browse species was noted earlier, but was not observed again in 1996. This influence was pocket gopher and badger diggings in much of the area around plants. It is also interesting that the serviceberry in this area has a moderate infestation of juniper-apple rust. This disease does not usually kill plants, but does effect vigor.

1984 APPARENT TREND ASSESSMENT

In spite of rather heavy big game and livestock use, this area does not have a sharply declining trend. Range condition may be changing slightly downward, if so, the rate is relatively slow. With respect to soil, there is little empirical evidence to suggest that the erosion rate is increasing. A more subjective view reveals the presence of active gullies in the area and signs of ongoing sheet erosion. Both of these observations suggest a declining soil trend. Vegetatively, the data are inconclusive. Broom snakeweed, an aggressive and undesirable increaser shrub, appears to be becoming more abundant. Both the old line intercept and Interagency studies document this. Perennial grasses may be increasing slightly in density and species diversity. This observation is somewhat tentative but if confirmed, could eventually have a detrimental effect on shrub reproduction. Utilization, especially of browse, appears to be heavier now than in 1977. Forage production appears to have remained stable since 1977. There are some very tentative clues to suggest that there may be declining populations of mountain big sagebrush and true mountain mahogany.

1990 TREND ASSESSMENT

The mixed mountain brush community on this privately-owned winter range east of Rockport Reservoir still provides good big game habitat, although conditions have deteriorated for some species since 1984. Photo point comparisons depict a loss of sagebrush cover and production, shown in the data by an increase in the percentage of decadent plants to 71% and heavier hedging recorded. Density is slightly higher. Sagebrush canopy cover averages only 5%. The data also illustrates a slight decline in true mountain mahogany density and loss of mature plants resulting in 88% decadence. Vigor is poor on these heavily hedged shrubs. Oakbrush, low rabbitbrush, and snakeweed increased in several, but not all measurements. Thickspike wheatgrass increased significantly. The nested frequency of Indian ricegrass is almost unchanged, while that of bluebunch wheatgrass was significantly lower. Forbs are relatively insignificant. The amount of litter cover decreased, percent bare ground increased, leaving the rocky soil more vulnerable to erosion.

TREND ASSESSMENT
soil - down
browse - downward, 58% of the decadent sagebrush were classified as dying
herbaceous understory - stable

1996 TREND ASSESSMENT

Since the extended drought since 1986, there has been some signs of recovery. Percent bare ground has decreased to 31% and percent litter cover is slowly increasing. The gullies around the site show signs of healing. Soil trend for this site appears stable to improving at this time. The overall browse trend for the site is also up and improving except for mountain big sagebrush which now only provides 4% of the browse cover. This species seems to have reached its lowest density with almost 30% being classified as dead. With continued normal precipitation patterns this would be expected to turn around in the future. The best description for the herbaceous understory trend would be stable. Many of the species have changed either up or down, but overall it has remained basically stable for perennial species.

TREND ASSESSMENT
soil - slightly improving
browse - overall, improving
herbaceous understory - stable for perennial grass and forb species

HERBACEOUS TRENDS --
Herd unit 06, Study no: 7

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	$_{a}$26	$_{b}$268	$_{c}$126	11	89	40	3.48
G	Agropyron spicatum	$_{a}$244	$_{b}$21	$_{a}$147	83	11	48	4.57
G	Bromus tectorum (a)	-	-	57	-	-	24	.22
G	Carex spp.	19	12	8	7	6	3	.16
G	Oryzopsis hymenoides	53	53	72	23	26	29	1.62
G	Poa pratensis	-	-	1	-	-	1	.00
G	Poa secunda	4	6	20	2	3	7	.18
G	Sitanion hystrix	-	3	4	-	2	1	.00
G	Stipa comata	$_{a}$1	$_{b}$10	$_{ab}$8	1	5	3	.45
Total for Grasses		347	373	443	127	142	156	10.70
F	Achillea millefolium	-	-	4	-	-	2	.03
F	Alyssum alyssoides (a)	-	-	215	-	-	71	1.00
F	Aster spp.	$_{a}$-	$_{a}$-	$_{b}$32	-	-	11	.52
F	Astragalus spp.	-	3	-	-	1	-	-
F	Balsamorhiza sagittata	3	3	5	1	1	2	.06
F	Chaenactis douglasii	4	11	13	2	6	7	.08
F	Cirsium spp.	9	5	22	6	4	11	.63
F	Comandra pallida	28	12	28	11	6	13	.19
F	Cryptantha spp.	$_{a}$19	$_{b}$34	$_{a}$22	9	21	10	.27
F	Descurainia pinnata	-	-	1	-	-	1	.00
F	Epilobium paniculatum	-	-	1	-	-	1	.00
F	Eriogonum umbellatum	-	3	-	-	1	-	-
F	Hackelia patens	$_{a}$32	$_{b}$10	$_{ab}$21	16	6	11	.20
F	Lactuca serriola	-	-	1	-	-	1	.00
F	Penstemon spp.	11	6	9	7	4	4	.09
F	Smilacina spp.	-	-	6	-	-	4	.07
F	Tragopogon dubius	2	-	4	1	-	3	.06
F	Unknown forb-perennial	3	-	-	1	-	-	-
Total for Forbs		111	87	384	54	50	152	3.25

Values with different subscript letters are significantly different at % = 0.10
(annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 7

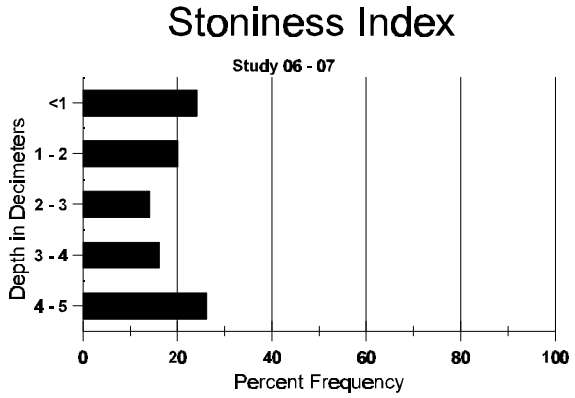
Type	Species	Strip Frequency ‘96	Average Cover % ‘96
B	Amelanchier alnifolia	22	1.68
B	Artemisia tridentata vaseyana	13	.94
B	Cercocarpus montanus	38	5.02
B	Chrysothamnus viscidiflorus viscidiflorus	20	.74
B	Gutierrezia sarothrae	82	4.02
B	Juniperus osteosperma	2	2.39
B	Opuntia spp.	10	.51
B	Purshia tridentata	1	.63
B	Quercus gambelii	6	2.65
B	Rosa woodsii	0	.15
B	Symphoricarpos oreophilus	19	2.75
B	Tetradymia canescens	4	.18
Total for Browse		217	21.69

BASIC COVER --
Herd unit 06, Study no: 7

Cover Type	Nested Frequency ‘96	Average Cover % '84	'90	'96
Vegetation	353	4.50	9.50	34.75
Rock	153	2.75	4.75	3.69
Pavement	229	11.25	7.25	5.34
Litter	388	46.50	37.00	38.81
Cryptogams	3	.25	0	.03
Bare Ground	311	34.75	41.50	31.27

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 7

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.8	68.0 (14.8)	8.0	58.7	12.0	29.3	1.7	5.1	32.0	.5



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 7

Type	Quadrat Frequency '96
Elk	5
Deer	15

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 7

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	2	-	3	-	-	3	-	-	8	-	-	-	533			8
	96	4	-	1	-	1	-	-	-	-	6	-	-	-	120			6
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	3	4	11	1	-	-	-	-	16	-	4	-	400	21	22	20
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	3	-	1	-	2	2	-	4	-	-	5	600			9
	96	-	-	1	1	1	-	-	-	-	3	-	-	-	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		1133			53%
													'96		580			10%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	1	-	-	-	-	-	-	4	-	-	-	80			4
M	84	1	4	1	-	-	-	-	-	-	6	-	-	-	400	20	23	6
	90	-	1	4	-	-	-	-	-	-	5	-	-	-	333	19	23	5
	96	2	4	5	1	-	-	-	-	-	12	-	-	-	240	14	25	12
D	84	-	3	3	-	-	-	-	-	-	6	-	-	-	400			6
	90	5	1	6	-	-	-	-	-	-	5	-	3	4	800			12
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7
Total Plants/Acre (excluding Dead & Seedlings)													'84		866	Dec:		46%
													'90		1133			71%
													'96		340			6%
Cercocarpus montanus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	5	6	-	-	-	-	-	-	-	11	-	-	-	220			11
M	84	-	-	9	-	-	-	-	-	-	9	-	-	-	600	17	18	9
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	6	10	1
	96	1	2	24	9	7	-	-	-	-	42	-	1	-	860	21	29	43
D	84	-	1	8	-	-	-	-	-	-	9	-	-	-	600			9
	90	-	1	11	-	-	2	-	-	-	9	-	1	4	933			14
	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		1333	Dec:		45%
													'90		1065			88%
													'96		1120			4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	21	-	-	-	-	-	-	-	-	19	-	2	-	1400			21
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	44	2	-	1	-	-	-	-	-	23	-	24	-	3133	9	7	47
	96	42	1	1	4	-	-	-	-	-	48	-	-	-	960	10	12	48
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	9	13	-	-	-	-	4	-	-	12	-	3	11	1733			26
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		6266			28%
													'96		1020			4%
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	35	-	-	-	-	-	-	-	-	35	-	-	-	2333			35
	96	31	-	-	-	-	-	-	-	-	31	-	-	-	620			31
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	36	-	-	7	-	-	-	-	-	43	-	-	-	2866			43
	96	41	-	-	-	-	-	-	-	-	41	-	-	-	820			41
M	84	66	1	-	-	-	-	-	-	-	67	-	-	-	4466	11	13	67
	90	63	-	-	1	-	-	1	-	-	63	-	2	-	4333	8	7	65
	96	341	-	-	-	-	-	-	-	-	341	-	-	-	6820	9	11	341
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	12	-	-	-	-	-	-	-	-	10	-	-	2	800			12
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		4599	Dec:		3%
													'90		7999			10%
													'96		7640			0%
Juniperus osteosperma																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		40			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200	10	7	3
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133	6	6	2
	96	15	-	-	1	-	-	-	-	-	16	-	-	-	320	5	15	16
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		399	Dec:		17%
													'90		199			0%
													'96		380			0%
Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		0			0%
													'96		40			50%
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	9	-	-	1	-	-	-	-	-	10	-	-	-	666			10
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	84	8	2	1	-	-	-	-	-	-	11	-	-	-	733			11
	90	33	13	1	1	-	-	-	-	-	43	-	5	-	3200			48
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	-	6	11	-	-	2	-	-	-	19	-	-	-	1266	30	19	19
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	28	-	-	2	-	-	-	-	-	30	-	-	-	600	28	18	30
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	11	4	3	-	-	-	-	-	-	11	-	6	1	1200			18
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		1999	Dec:		0%
													'90		4400			27%
													'96		720			0%
Rosa woodsii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	10	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	-	-	-	-	1	-	-	2	-	-	-	133			2
	96	14	-	-	3	-	-	-	-	-	17	-	-	-	340			17
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	12	1	7	1	-	-	-	-	26	-	-	-	520	16	26	26
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	6	1	1	-	-	1	-	-	3	-	-	8	733			11
	96	1	2	-	1	-	-	-	-	-	3	-	-	1	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		0%
														'90	866			85%
														'96	940			9%
Tetradymia canescens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	8	-	-	-	-	-	-	-	9	-	-	-	180	15	18	9
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	200			-

TREND STUDY 6-8-96 (old 19-19)

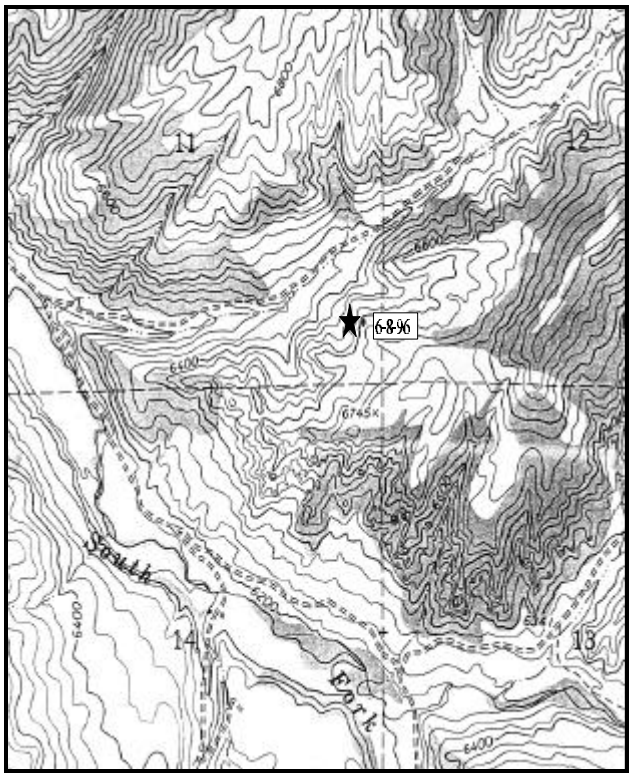
Study site name: South Fork Chalk Creek . Range type: Mixed mountain brush .

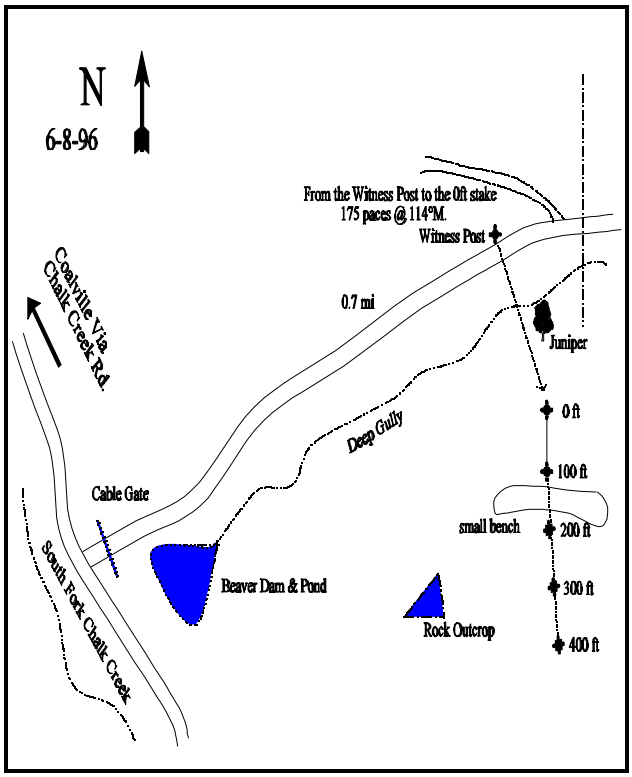
Compass bearing: frequency baseline 121 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Coalville, go up Chalk Creek to the South Fork Road. Go up the south fork of Chalk Creek approximately 3 miles to a cable gate at the mouth of Cottonwood Canyon. Go up this side canyon 0.7 miles to a witness post and park. A lone juniper should be across the flat on the other side of a deep gully. Cross the gully and walk up the slope approximately 175 paces at 114 degrees magnetic from the witness post to the 0-foot baseline stake which is located just below a knoll of conglomerate rock on the ridge. All study stakes are short fenceposts, the 0-foot stake has a white top.





Map Name: Upton Diagrammatic Sketch

Township 2N , Range 6E , Section 11 , UTM COOR 4-80-731E 45-29-544N

DISCUSSION

Trend Study No. 6-8 (19-19)

The South Fork Chalk Creek trend study was established in 1990 and is located in a wide side canyon of the South Fork of Chalk Creek. The area is privately-owned, as is all the winter range in the area. The study is on the northwest-facing slope, which supports a mixed mountain brush community dominated by mountain big sagebrush which contributes 64% of the browse cover. The south-facing slopes in the area have juniper and sparse stands of sagebrush. The bottoms of the canyon have been sprayed to kill shrubs. Cattle use is heavy in the bottom areas. The ridges to the south have burned recently. All these factors tend to concentrate deer use on the areas where browse forage still remains. In 1996, quadrat frequency pellet-group data indicated that deer use was moderately high with that of elk (8%) and cattle (3%) light to occasional use.

The study site is on a ridge with a northwest exposure and a moderately steep slope (56%) and an elevation of 6,600 feet. The soil texture is classified as sandy-clay-loam with a pH of 6.2 which is classified as slightly acidic. Effective rooting depth is the most shallow of any site in this management unit at 8 inches. This is mostly because the soil surface and profile are rocky with rock-pavement covering more than 25% of the ground surface. Vegetative cover, litter cover, and percent organic matter is above average when compared to other sites within the area. There is a very deep gully in the canyon bottom.

The study samples a sagebrush covered ridge with components of serviceberry, true mountain mahogany, and snowberry. Sagebrush cover is currently at 16% with a density of 4,220 plants/acre. The sagebrush has a moderately hedged growth form. Vigor and production varies, but is generally good. Those classified with poor vigor have decreased from 23% down to 9%. Overall leader growth was low in 1990, but now appears to be average. This would be expected because of the extended drought. The mountain mahogany had been heavily used in 1990 and also had poor vigor (20%) related to the drought, currently it is down to 5%. Low rabbitbrush and broom snakeweed are fairly common on the more shallow soils. Low rabbitbrush is not currently increasing, but broom snakeweed has the characteristics of an expanding population with high biotic potential (46%) along with a high proportion of the population that is classified as young (41%).

Sandberg bluegrass and cheatgrass are the most common grasses. A wide variety and high diversity of perennial forbs occupy the site, yet together they only provide about 4% total cover. Yarrow, silvery lupine, and redroot buckwheat are the most prevalent of the 37 species encountered.

1990 APPARENT TREND ASSESSMENT

There is a large amount of rock exposed, but the remaining soil on the site is well protected and currently appears stable. The populations of the key browse species also appear stable with respect to age class structures. However, continued heavy use and the resulting increased decadence could lead to downward vegetative trends. Quality winter range is limited in the area due to past and current management practices on the private land. An end to the drought would help mitigate these downward changes.

1996 TREND ASSESSMENT

Soil trend is slightly improving with percent bare ground decreasing from 13% to 7%. Litter cover has also increased. Also, the ratio of the nested bare ground value to the nested litter and vegetation nested frequency value is 1:4.7 which is good. Usually any value > 1:3 shows little problem with erosion from high

intensity summer storms. The key browse species is mountain big sagebrush which contributes 64% of the total browse cover. Its population has gone down slightly, but what is more important is the low proportion of dead plants in the population (17%). Moderate to heavy use has increased from 66% to 85% of the population, but there appears to be a turn around in the data because percent decadency has gone from 41% to 36%. Additionally, the proportion of the decadent plants that were classified as having poor vigor or dying has also decreased from 55% to 23% indicating that it has turned the corner and the loss of plants has now stopped. The other key browse species would include: serviceberry, true mountain mahogany, and mountain snowberry all appear to have stable populations while providing another 14% of the browse cover. Trend for browse, where the key species is mountain big sagebrush (64% of the browse cover) is currently stable. Trend for the herbaceous perennial understory is slightly down with a significantly lower sum of nested frequency for grasses which make up 79% of the herbaceous cover.

TREND ASSESSMENT
soil - slightly improving
browse - stable at this time, with expected improvements with normal precipitation
herbaceous understory - slightly down for perennial species, where grasses make up 79% of the herbaceous cover

HERBACEOUS TRENDS --
Herd unit 06, Study no: 8

Type	Species	Nested Frequency '90	'96	Quadrat Frequency '90	'96	Average Cover % '96
G	Agropyron spicatum	137	*56	52	24	.81
G	Bromus tectorum (a)	-	155	-	47	3.54
G	Carex spp.	29	*57	14	26	1.71
G	Poa fendleriana	104	119	41	48	2.19
G	Poa pratensis	2	1	1	1	.00
G	Poa secunda	301	*223	93	72	7.41
G	Sitanion hystrix	12	14	6	8	.14
G	Stipa columbiana	4	6	1	2	.18
G	Stipa lettermani	-	5	-	3	.07
G	Vulpia octoflora (a)	-	4	-	2	.01
Total for Grasses		589	640	208	233	16.09
F	Achillea millefolium	63	73	29	29	1.25
F	Agoseris glauca	8	4	3	3	.01
F	Alyssum alyssoides (a)	-	54	-	19	.24
F	Allium spp.	2	-	2	-	-
F	Antennaria rosea	33	*19	19	8	.19
F	Arabis spp.	5	15	3	7	.03
F	Astragalus beckwithii	-	2	-	1	.03
F	Astragalus convallarius	17	*5	9	2	.03
F	Astragalus utahensis	6	8	4	4	.23

Type	Species	Nested Frequency '90	'96	Quadrat Frequency '90	'96	Average Cover % '96
F	Castilleja linariaefolia	11	19	7	11	.13
F	Calochortus nuttallii	1	1	1	1	.00
F	Cirsium spp.	-	*15	-	9	.29
F	Collinsia parviflora (a)	-	29	-	9	.07
F	Crepis acuminata	24	*9	12	4	.02
F	Cruciferae	3	-	1	-	-
F	Cryptantha spp.	-	1	-	1	.00
F	Cymopterus spp.	1	-	1	-	-
F	Epilobium paniculatum	-	3	-	1	.00
F	Erigeron pumilus	38	*16	19	8	.14
F	Eriogonum racemosum	34	*42	18	20	.35
F	Erigeron strigosus	-	*23	-	11	.13
F	Eriogonum umbellatum	12	*2	6	1	.03
F	Gayophytum ramosissimum	-	10	-	4	.02
F	Hackelia patens	5	4	3	4	.02
F	Heuchera parvifolia	1	-	1	-	-
F	Holosteum umbellatum (a)	-	8	-	3	.01
F	Lupinus argenteus	3	*18	2	10	.39
F	Machaeranthera canescens	3	3	1	2	.04
F	Orthocarpus spp. (a)	-	5	-	4	.19
F	Penstemon spp.	-	4	-	2	.03
F	Phlox longifolia	24	25	13	11	.15
F	Polygonum douglasii (a)	-	53	-	30	.14
F	Ranunculus spp.	2	-	1	-	-
F	Senecio integerrimus	1	-	1	-	-
F	Senecio multilobatus	3	-	1	-	-
F	Tragopogon dubius	-	8	-	3	.01
F	Unknown forb-perennial	27	*-	13	-	-
Total for Forbs		327	478	170	222	4.25

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 8

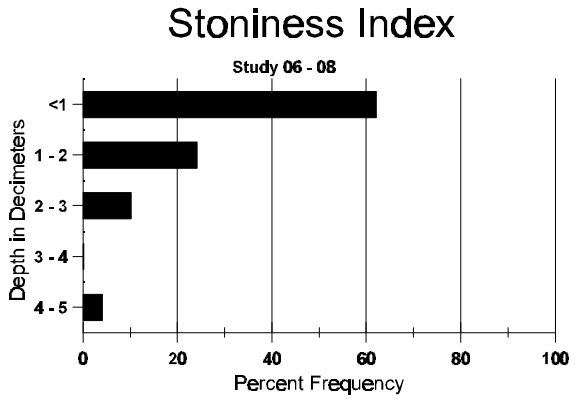
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	19	1.51
B	Artemisia tridentata vaseyana	83	16.14
B	Cercocarpus montanus	20	.86
B	Chrysothamnus nauseosus albicaulis	1	.38
B	Chrysothamnus viscidiflorus viscidiflorus	52	3.02
B	Eriogonum heracleoides	13	.63
B	Gutierrezia sarothrae	23	.61
B	Quercus gambelii	3	.79
B	Symphoricarpos oreophilus	26	1.37
B	Tetradymia canescens	3	-
Total for Browse		243	25.34

BASIC COVER --
Herd unit 06, Study no: 8

Cover Type	Nested Frequency '96	Average Cover % '90	'96
Vegetation	366	13.75	45.09
Rock	303	10.00	18.52
Pavement	218	13.50	6.75
Litter	396	42.50	46.06
Cryptogams	119	7.50	5.89
Bare Ground	162	12.75	7.04

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 8

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.0	71.6 (9.0)	6.2	54.9	23.7	21.4	4.9	14.6	89.6	.4



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 8

Type	Quadrat Frequency '96
Rabbit	2
Elk	8
Deer	38
Cattle	3

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	2	-	-	-	-	-	-	4	2	-	-	120			6
M	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66	13	19	1
	96	2	9	5	-	3	-	-	-	-	9	2	8	-	380	18	28	19
D	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	2	-	-	-	-	-	-	-	-	-	2	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'90		66	Dec:		0%
													'96		540			7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	90	13	-	-	-	-	-	-	-	-	13	-	-	-	866			13
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	90	19	11	-	-	-	-	1	-	-	31	-	-	-	2066			31
	96	5	8	-	-	-	-	-	-	-	13	-	-	-	260			13
M	90	1	10	4	-	-	-	1	-	-	15	1	-	-	1066	18	31	16
	96	13	81	25	1	-	-	-	-	-	119	-	1	-	2400	22	36	120
D	90	5	14	14	-	-	-	-	-	-	15	-	-	18	2200			33
	96	10	47	18	3	-	-	-	-	-	60	-	8	10	1560			78
X	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	840			42
Total Plants/Acre (excluding Dead & Seedlings)													'90		5332	Dec:		41%
													'96		4220			37%
Cercocarpus montanus																		
S	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	7	4	-	-	-	-	-	-	11	-	-	-	220			11
M	90	-	-	2	-	-	-	-	-	-	2	-	-	-	133	13	19	2
	96	-	3	18	4	-	1	-	-	-	22	2	2	-	520	21	27	26
D	90	-	-	1	1	-	-	-	-	-	1	-	-	1	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'90		332	Dec:		40%
													'96		740			0%
Chrysothamnus nauseosus albicaulis																		
Y	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26	45	1
Total Plants/Acre (excluding Dead & Seedlings)													'90		66	Dec:		-
													'96		20			-
Chrysothamnus viscidiflorus viscidiflorus																		
Y	90	21	-	-	-	-	-	-	-	-	18	-	3	-	1400			21
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	90	16	4	-	1	-	-	-	-	-	18	-	3	-	1400	10	14	21
	96	101	1	-	3	-	-	-	-	-	105	-	-	-	2100	13	19	105
D	90	17	-	-	2	1	-	2	-	-	11	-	2	9	1466			22
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
X	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'90		4266	Dec:		34%
													'96		2340			3%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum heracleoides																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	26	3	-	2	-	-	-	-	-	31	-	-	-	620	6	8	31
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		660			-
Gutierrezia sarothrae																		
S	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	52	-	-	-	-	-	-	-	-	52	-	-	-	1040			52
Y	90	4	1	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	46	-	-	-	-	-	-	-	-	46	-	-	-	920			46
M	90	11	-	-	1	-	-	-	-	-	12	-	-	-	800	6	8	12
	96	66	-	-	-	-	-	-	-	-	66	-	-	-	1320	8	9	66
Total Plants/Acre (excluding Dead & Seedlings)													'90		1133	Dec:		-
													'96		2240			-
Quercus gambelii																		
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180	37	41	9
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		180			-
Symphoricarpos oreophilus																		
S	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	12	-	-	2	-	-	-	-	-	14	-	-	-	280			14
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	21	10	-	6	-	-	-	-	-	36	-	1	-	740	15	21	37
D	90	-	1	1	1	2	-	4	-	-	6	-	-	3	600			9
	96	1	-	-	-	-	-	-	-	-	-	-	1	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'90		600	Dec:		100%
													'96		1040			2%
Tetradymia canescens																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	10	15	1
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		60			-

TREND STUDY 6-9-96 (old 20-2)

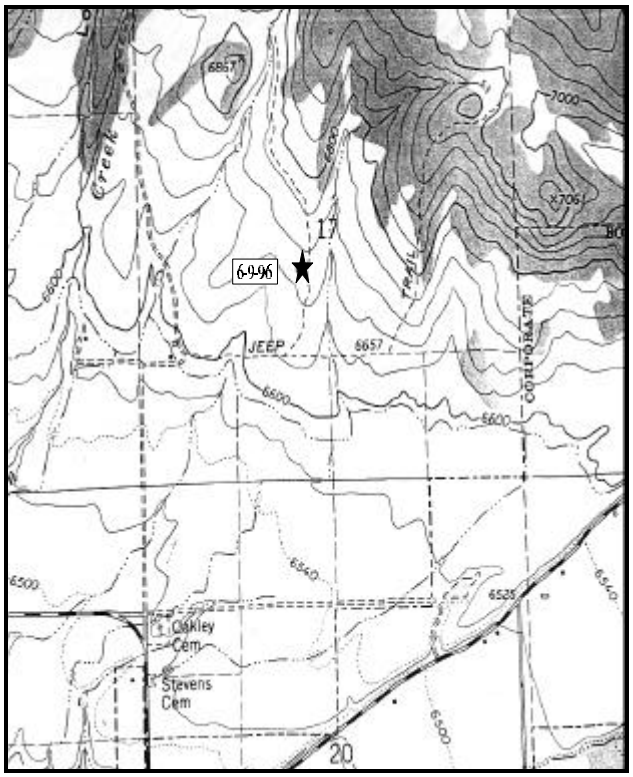
Study site name: North Oakley Bench. Range type: Big sage/grass.

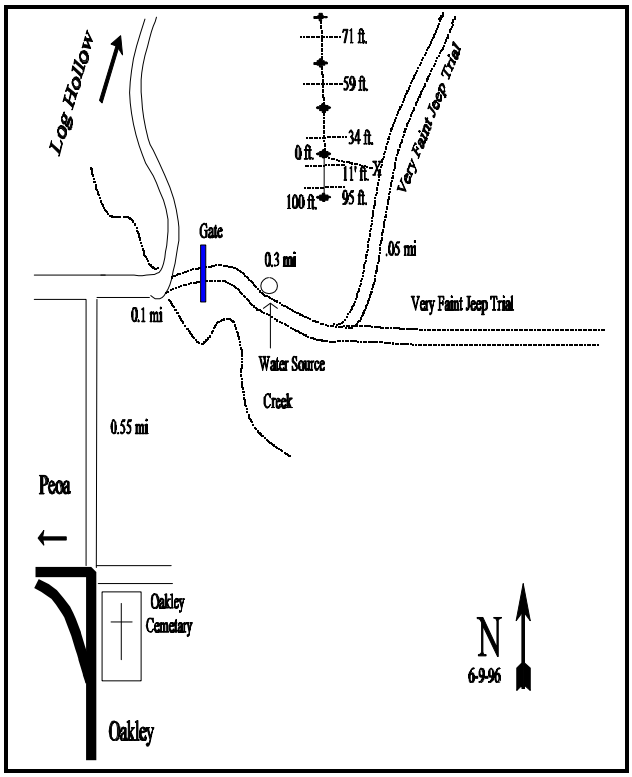
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Oakley cemetery, just north of Oakley, proceed north 0.55 miles to an intersection and turn right. Proceed east 0.1 miles to a gate, pass through gate (private land; key needed) with creek on immediate right. Continue on a faint road for 0.3 miles to a fork. Turn left and proceed 0.05 miles to a witness post. From the witness post walk 14 paces at 248 degrees magnetic to the 0-foot baseline stake. The first 100 feet of the baseline runs 180 degrees magnetic. The remaining 300 feet run off the 0-foot baseline stake at 343 degrees magnetic.





Map Name: Kamas Diagrammatic Sketch

Township 1S, Range 6E, Section 17, UTM COOR: 4-75-070E 45 09-535N

DISCUSSION

Trend Study No. 6-9 (20-2)

The North Oakley Bench study site is the lower of two originally established on the bench north of Oakley (old study numbers 20-2 and 20-3). Study number 20-3 has been discontinued because it was a duplication of 20-2. The study area is a relatively uniform mountain big sagebrush/grass type with a mixture of mountain brush on a gently sloping (5%-10%) south facing exposure. There is no very useful escape or thermal cover close to the study site. Elevation is approximately 6,690 feet. The area is privately owned, which means that the winter range is also used by domestic livestock most of the year. Judging from pellet group frequency and forage utilization, the level of use from both game and livestock varies from moderate to heavy. Currently, pellet-group frequency data indicates that deer use is moderate, with light use by elk and cattle. This area, because of its location, has high potential for residential homes.

Soil is alluvially deposited from sedimentary parent material. Soil depth should not be limiting, but it has a large amount of rock in the profile. It could be classified as an exceptionally "cobbly" soil which probably has rather poor water holding capability in the upper horizon. Effective rooting depth was about 10 inches with a clay-loam soil texture. Soil pH is 7.0 which is rated as neutral. Some trampling damage and soil compaction was evident from livestock use in the past during the height of the drought, but it is not as evident at this time. Protective ground cover is above average currently. Erosion is minimal, primarily because of the gentle terrain and high proportion of cover contributed by the herbaceous understory.

The key preferred browse species are mountain big sagebrush, mountain snowberry, serviceberry, and antelope bitterbrush. The most abundant key browse species is mountain big sagebrush which provides 36% of the browse cover. It was initially (1984) decadent in appearance and heavily browsed. On this study site, the sagebrush is in much poorer condition than it is over most of the area. Mountain big sagebrush is the shrub that has been most effected by the prolonged drought even though currently it is not being utilized that heavily, as only 22% were classified with heavy use in 1996. Yet, 29% of the population is dead, indicating that within the last few years almost one-third of the population has died. At this time it appears that the population has stabilized and is starting to recover with a decrease in the number of decadent plants and an increase in its density. Another 30% of the browse cover is contributed by three other preferred species, mountain snowberry, serviceberry, and bitterbrush. All three of these preferred species have improved vigor with no decadent plants encountered. Even low rabbitbrush, which usually shows no use, provides some forage value with 95% of the population showing light use. Stickyleaf low rabbitbrush as an increaser is not showing characteristics of a shrub that is increasing, with an age structure that is becoming more mature and its density is going downward.

Grass and forb composition is remarkably diverse but includes many biennial and perennial weeds or species of poor forage value. Many also act as indicators of heavy livestock use. Thistle, false aster, aster, western yarrow, common dandelion, bulbous bluegrass, Letterman needlegrass, yellow salsify, flannel mullein, deathcamas, and wild onion are all examples of increaser species with heavy livestock use. Overall, the grasses appear to be slightly increasing in numbers, while the forbs are down slightly. The grasses provide 82% of the herbaceous cover. Production (cover) for herbaceous understory and total vegetative cover is above average for this management unit. There are 54 species of herbs on the site, but most of them would be classified as increaser species.

1984 APPARENT TREND ASSESSMENT

Soil, although subject to some trampling and compaction from livestock, is not seriously eroded. Ground cover appears to be adequate for protection and has shown no significant change over the past seven years. Trend is estimated as stable. Vegetative trend is not clearly indicated by the data, however, there are a few clues that when used with judgment permit some preliminary assessments. While overall density of mountain big sagebrush has not definitely declined, but there are some indicators pointing in that direction. Furthermore, it is more evident that age and form class structure has deteriorated. There is evidence that increaser grasses, forbs, and shrubs have increased in density and dominance. An overall assessment of vegetative trend from a big game standpoint would be stable to slightly down.

1990 TREND ASSESSMENT

It was noted in the 1984 report that this study was a rather poor site. There may be less sagebrush on this particular spot, but overall it appears representative of the south-facing slope of the foothills above Oakley. It is privately owned land, managed for cattle grazing by the Oakley Cattlemen's Association. It is also used as winter range by elk and deer. As predicted, mountain big sagebrush had declined on this site and has decreased significantly in numbers between 1984 and 1990. The density plot data indicates that most of the decrease came in the mature age class. Now, there are abundant seedling and young sagebrush. A majority of the sagebrush are lightly hedged, and have good vigor and fair growth in 1990. The other browse on the site have stable or increased numbers. The only shrubs to be uniformly heavily utilized are the large bitterbrush plants. They are browsed year-round, but still display good vigor. Low rabbitbrush increased on the density plots due to the addition of a large seedling and young population. It is the most numerous browse species.

The seeded and native grasses had a high nested frequency value. The nested frequency of crested wheatgrass increased significantly, while bluebunch wheatgrass displays a large decrease in frequency. There have also been some shifts in forb composition, but the most common species remain hoary aster, thistle and yarrow, all increasers indicating excessive grazing. Ants, often associated with overgrazing and a large amount of bare soil, are very common on the site. Many of these ants attend aphids that have infested the sagebrush. The site has adequate ground cover and soil protection, but does have an increased percentage of bare soil. But, erosion is not a current problem on this level site.

TREND ASSESSMENT
soil - stable
browse - stable for all browse , but slightly down for sagebrush even with the establishment of seedling sagebrush
herbaceous understory - slightly improving

1996 TREND ASSESSMENT

The trend for soil is slightly upward with a significant decrease in percent bare ground and with 63% of the vegetative cover being contributed by herbaceous species which protects the soils much better than browse cover. The trend for browse, especially preferred browse is slightly up with decreases in percent decadency for all species, and an increase in density for mountain big sagebrush which provides 36% of the preferred browse cover. The nested frequency value for the perennial grasses has increased, but that of the perennial forbs has decreased. However, forbs contribute only 18% of the total herbaceous cover. The biggest problem for this site is that the majority of the cover for the herbaceous species is contributed by increasers through excessive grazing. The

composition is not ideal for a stable plant community. Trend for herbaceous understory is stable, but of poor composition.

TREND ASSESSMENT
soil - slightly up
browse - slightly up
herbaceous understory - stable, but poor composition with too many increasers

HERBACEOUS TRENDS --
Herd unit 06, Study no: 9

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	a132	b216	c71	49	80	22	2.39
G	Agropyron dasystachyum	a80	b17	a72	29	6	30	.74
G	Agropyron intermedium	-	-	2	-	-	1	.15
G	Agropyron spicatum	a47	b14	a68	18	7	28	1.48
G	Bromus inermis	a-	b13	ab7	-	4	3	.18
G	Bromus tectorum (a)	-	-	18	-	-	6	.22
G	Koeleria cristata	-	-	4	-	-	2	.03
G	Poa bulbosa	-	-	135	-	-	44	6.46
G	Poa fendleriana	-	4	8	-	2	3	.21
G	Poa pratensis	a116	b182	b182	45	63	59	4.97
G	Poa secunda	a10	b25	ab17	4	12	6	.42
G	Stipa columbiana	a133	b221	c18	52	80	6	.27
G	Stipa lettermani	a-	a-	b165	-	-	58	5.61
Total for Grasses		518	692	767	197	254	268	23.18
F	Achillea millefolium	52	46	30	19	22	13	.29
F	Agoseris glauca	-	-	7	-	-	2	.01
F	Allium acuminatum	a29	b6	ab14	12	3	7	.08
F	Alyssum alyssoides (a)	-	-	6	-	-	2	.01
F	Arabis spp.	a-	b13	ab7	-	5	3	.01
F	Astragalus beckwithii	-	-	2	-	-	1	.03
F	Aster chilensis	a9	b34	a9	5	13	3	.18
F	Astragalus convallarius	13	12	5	6	7	2	.04
F	Calochortus nuttallii	3	11	13	2	7	8	.04
F	Cirsium spp.	a137	b73	c38	63	41	23	.61
F	Comandra pallida	a15	a22	b50	8	10	26	.38
F	Crepis acuminata	6	-	-	3	-	-	-
F	Cruciferae	-	2	-	-	1	-	-
F	Cryptantha spp.	4	-	-	2	-	-	-
F	Cynoglossum officinale	-	2	2	-	1	1	.03
F	Delphinium bicolor	-	-	3	-	-	1	.00
F	Erigeron pumilus	a2	b34	b41	1	17	21	.30

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Eriogonum racemosum	4	15	5	3	8	2	.01
F	Eriogonum umbellatum	-	-	3	-	-	3	.01
F	Gayophytum ramosissimum	-	-	15	-	-	6	.05
F	Gilia aggregata	-	2	1	-	2	1	.03
F	Hackelia patens	-	-	6	-	-	2	.30
F	Holosteum umbellatum (a)	-	-	6	-	-	2	.01
F	Lactuca serriola	-	3	-	-	1	-	-
F	Lithospermum ruderale	-	2	4	-	1	2	.03
F	Lupinus argenteus	$_{a}$2	$_{a}$4	$_{b}$22	2	2	10	.74
F	Machaeranthera canescens	$_{a}$70	$_{b}$128	$_{a}$74	31	57	38	.51
F	Orthocarpus spp. (a)	-	-	5	-	-	2	.06
F	Penstemon spp.	-	2	-	-	1	-	-
F	Phlox longifolia	$_{a}$-	$_{b}$22	$_{c}$10	-	11	5	.05
F	Polygonum douglasii (a)	-	-	81	-	-	34	.22
F	Ranunculus testiculatus (a)	-	-	3	-	-	1	.00
F	Senecio multilobatus	3	-	-	1	-	-	-
F	Sphaeralcea coccinea	$_{a}$4	$_{b}$18	$_{ab}$14	2	8	5	.31
F	Taraxacum officinale	$_{a}$6	$_{b}$34	$_{b}$26	3	16	12	.21
F	Tragopogon dubius	$_{a}$7	$_{b}$56	$_{a}$25	4	28	14	.27
F	Unknown forb-annual	-	-	12	-	-	5	.07
F	Verbascum thapsus	11	9	2	4	4	1	.03
F	Vicia americana	$_{a}$-	$_{b}$15	$_{a}$-	-	6	-	-
F	Viguiera multiflora	1	-	-	1	-	-	-
F	Zigadenus paniculatus	-	3	1	-	1	1	.03
Total for Forbs		378	568	542	172	273	259	5.02

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 9

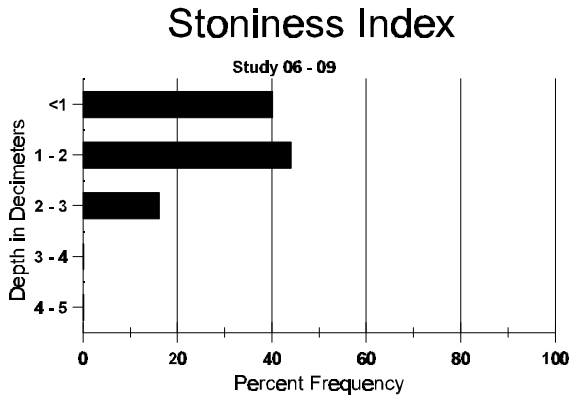
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier utahensis	13	.97
B	Artemisia tridentata vaseyana	55	5.86
B	Chrysothamnus viscidiflorus viscidiflorus	85	3.79
B	Mahonia repens	21	.93
B	Opuntia spp.	4	.91
B	Purshia tridentata	11	.30
B	Symphoricarpos oreophilus	28	3.65
B	Tetradymia canescens	3	-
Total for Browse		220	16.44

BASIC COVER --
Herd unit 06, Study no: 9

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	376	7.75	12.00	46.85
Rock	62	2.00	1.50	1.37
Pavement	152	.25	1.50	.91
Litter	389	60.50	47.00	39.72
Cryptogams	70	1.25	4.25	.97
Bare Ground	296	28.25	33.75	21.67

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 9

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.6	64.4 (19.7)	7.0	38.9	33.1	28.0	4.2	43.8	217.6	.7



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 9

Type	Quadrat Frequency '96
Sheep	1
Rabbit	3
Elk	5
Deer	15
Cattle	6

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	2	-	-	-	-	-	-	-	1	-	1	-	133			2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66	25	31	1
	96	-	4	7	2	-	-	-	-	-	13	-	-	-	260	25	30	13
D	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		100%
													'90		199			0%
													'96		280			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	37	-	-	-	-	-	-	-	-	37	-	-	-	2466			37
	96	6	1	-	-	-	-	-	-	-	7	-	-	-	140			7
Y	84	10	5	-	-	-	-	-	-	-	15	-	-	-	1000			15
	90	6	-	1	1	-	-	-	-	-	8	-	-	-	533			8
	96	14	5	-	-	-	-	-	-	-	19	-	-	-	380			19
M	84	4	16	1	-	-	-	-	-	-	21	-	-	-	1400	13	7	21
	90	6	5	-	1	-	-	-	-	-	9	2	1	-	800	14	17	12
	96	22	39	19	-	-	-	-	-	-	73	-	7	-	1600	20	28	80
D	84	-	10	9	-	-	-	-	-	-	16	-	3	-	1266			19
	90	1	1	-	-	1	-	-	-	-	2	1	-	-	200			3
	96	-	6	4	-	-	-	-	-	-	7	-	3	-	200			10
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	880			44
Total Plants/Acre (excluding Dead & Seedlings)													'84		3666	Dec:		35%
													'90		1533			13%
													'96		2180			9%
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	17	-	-	-	-	-	-	-	-	17	-	-	-	1133			17
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	22	4	-	-	-	-	-	-	-	25	-	1	-	1733			26
	96	38	-	-	-	-	-	-	-	-	38	-	-	-	760			38
M	84	77	-	-	-	-	-	-	-	-	77	-	-	-	5133	16	15	77
	90	57	29	7	5	-	-	-	-	-	77	-	21	-	6533	9	10	98
	96	276	-	-	14	-	-	-	-	-	290	-	-	-	5800	11	16	290
D	84	27	-	-	-	-	-	-	-	-	27	-	-	-	1800			27
	90	17	7	-	1	-	-	-	-	-	15	-	7	3	1666			25
	96	4	1	-	-	-	-	-	-	-	5	-	-	-	100			5
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		6933	Dec:		26%
													'90		9932			17%
													'96		6660			2%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320			16
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	18	2	-	-	-	-	-	-	-	20	-	-	-	1333			20
	96	252	-	-	-	-	-	-	-	-	252	-	-	-	5040			252
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	1	2	-	6	-	-	-	-	-	9	-	-	-	600	3	4	9
	96	65	-	-	-	-	-	-	-	-	65	-	-	-	1300	3	5	65
Total Plants/Acre (excluding Dead & Seedlings)														'84	66	Dec:		-
														'90	1933			-
														'96	6340			-
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	7	20	4
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	80			-
Purshia tridentata																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	2	1	-	-	-	-	-	-	3	-	-	-	200	30	34	3
	90	-	-	3	-	-	-	-	-	-	3	-	-	-	200	22	41	3
	96	-	1	7	-	4	1	-	-	-	13	-	-	-	260	14	40	13
Total Plants/Acre (excluding Dead & Seedlings)														'84	266	Dec:		-
														'90	266			-
														'96	260			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	6	-	1	-	-	-	-	-	-	7	-	-	-	140			7
M	84	1	2	-	-	-	-	-	-	-	3	-	-	-	200	11	15	3
	90	-	3	1	-	-	-	-	-	-	4	-	-	-	266	12	14	4
	96	11	19	12	1	-	-	-	-	-	38	5	-	-	860	24	42	43
D	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	1	-	-	-	-	-	-	-	-	-	-	1	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		25%
													'90		465			14%
													'96		1000			0%
Tetradymia canescens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	13	14	1
	96	-	2	-	-	-	-	-	-	-	2	-	-	-	40	11	19	2
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		66			-
													'96		60			-

TREND STUDY 6-10-96 (old 20-4)

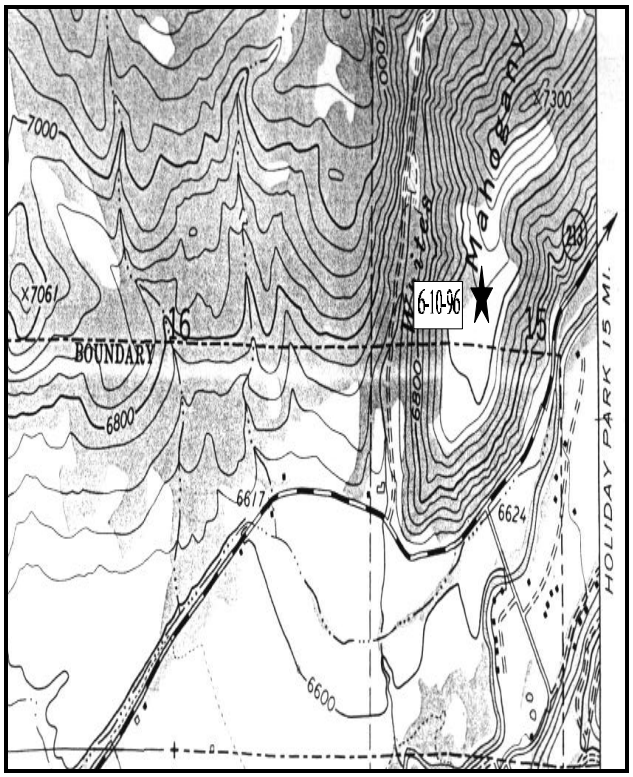
Study site name: Mahogany Hills. Range type: Mixed mountain brush.

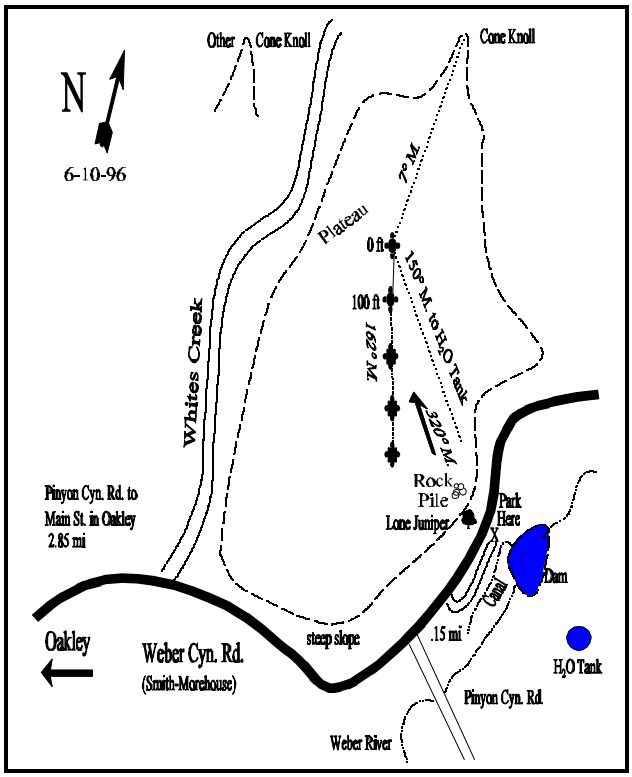
Compass bearing: frequency baseline 162 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Oakley, proceed up Weber Canyon watching for Pinion Canyon Road which is a right turn. From this road proceed 0.15 miles farther up Weber Canyon and park opposite a small irrigation canal dam. The main river dam to supply the canal is 100 yards upstream. From the river diversion walk up the steep slope at 273 degrees magnetic to a large lone juniper. From the lone juniper, a rock pile can be found 55 paces at 320 degrees magnetic. From the rock pile, the 0-foot baseline stake is approximately 80 paces at a bearing of 320 degrees magnetic. The 0-foot stake of the is marked by with browse tag #7952. To triangulate on the 0-foot stake when in the middle of plateau: from the stake to a cone-knoll to the north is 7 degree magnetic, from the stake to a water tank on the right at the mouth of Pinion Canyon is 150 degrees magnetic.





Map Name: Kamas Diagrammatic Sketch

Township 1S, Range 6E, Section 15, UTM COOR: 4-78-432E 45-09-440N

DISCUSSION

Trend Study No. 6-10 (20-4)

This study was initiated in 1984 to sample critical big game winter range on the Mahogany Hills at the mouth of the upper Weber River canyon. This study is on a gentle (5%) south facing slope located on top of the southern most part of Mahogany Hills. The range type is mountain big sagebrush/grass which also contains strong components of the mountain brush community. Deer and elk use of the study area is relatively light to moderate and there appears to be little or no livestock use.

Soil has a reddish color, and is moderately deep and well-drained. Effective rooting depth (see methods) is estimated at almost 13 inches. The soil texture is classified as a loam. Soil pH was 6.7 which is neutral in reaction. This site had the highest vegetative and litter cover and lowest soil temperature of all sites within the management unit. It has the best potential for productivity of all the sites on the unit. This area has a diverse plant composition, especially among grasses, and ground cover is excellent. No significant erosion can be detected.

The browse composition is dominated by mountain big sagebrush which contributes 44% of the browse cover. Characteristically, it has gone through periods of high decadency (82%-44%-40%), a loss in population (4,133-3,265-2,780 plants/acre), and moderately high use (80-90% with moderate to heavy use). Currently 21% of the population is dead. Even with these obvious decreases in number and vigor, it still provides 44% of the total browse cover. The population appears to be recovering from the extended drought and seems to be stable.

The site also contains significant numbers of other valuable browse species, which includes mountain snowberry, serviceberry, true mountain mahogany, and antelope bitterbrush. These preferred species contribute to an additional 45% of the browse cover. Also present are some less desirable shrubs such as stickyleaf low rabbitbrush and grey horsebrush. The grey horsebrush is in very small numbers and shows no signs of increasing at this time. Stickyleaf low rabbitbrush has shown some large changes in its density but these are not because of actual increases in the population for there have been no seedlings and very few young found through the years. The fact is that with the larger sample size utilized in 1996, this poorly distributed species now has a much better estimate of its total numbers.

Grasses are a very prominent component on this site, for they provide 85% of the herbaceous understory cover and 44% of the total vegetative cover. It should be noted that these grasses are all perennial species. There were actually 15 species of grass identified on this site. This is a high number, of which at least four are seeded species more commonly found in meadows and pastures. Smooth brome is the most obvious example and also the most prevalent grass on the area. As good as smooth brome can be, it also has a bad side. It has shown steady increase in abundance since 1984. It now accounts for 60% of the grass cover and 51% of the herbaceous understory cover. Within the mountain brush zone, smooth brome can totally dominate other herbaceous species and exert a great deal of competition on the shrubs because it is a sod-former that is highly shade tolerant. On many sites in the state and within the mountain brush zone, smooth brome has excluded many species, and excluded most all shrubs after 15 to 20 years. It is far too competitive for the browse seedlings to become established, especially sagebrush.

Forbs also have a diverse composition and include several palatable and valuable species. Species such a arrowleaf balsamroot, one-flowered helianthella, low

penstemon, and redroot eriogonum are preferred forbs in many locations.

1984 APPARENT TREND ASSESSMENT

This is a good quality site in good condition. Soil trend is stable with little apparent erosion. A vigorous plant community provides good protection. Vegetative trend is judged as stable. In upcoming years the most important parameter to monitor will be age form and class structure of mountain big sagebrush.

1990 TREND ASSESSMENT

Compared to the wet years when this trend study was established in 1984, the data shows the effects of drought on the site. From the photographic comparisons, there is obviously less production of sagebrush and grass in 1990. The density of sagebrush has decreased, with the number of mature sagebrush increasing due to a decline in decadence. A majority of the population is moderately hedged, compared to 61% which was heavily browsed in 1984. Populations of the other palatable, but less common browse are unchanged. Most are now moderately hedged. This site has excellent vegetative and litter cover from the high grass frequency and density. There is only 7% bare soil. Smooth brome is thick in the understory. There is a large diversity of forbs. They are a significant forage component, including several palatable species for the deer that use the area year round, especially this year due to its proximity to water. Elk use appears to be moderate in the winter.

TREND ASSESSMENT
soil - stable
browse - stable for sagebrush
herbaceous understory - stable

1996 TREND ASSESSMENT

This site has some of the highest vegetation cover of any site in the area. Litter cover is very high at 75% with percent bare ground going down again to less than 6%. Trend for soil is stable and in excellent condition. The browse trend is slightly down for mountain big sagebrush. This is a continuing trend that has occurred since 1984. This would appear to be the result primarily from the very competitive and extremely abundant smooth brome, which is a sod-forming, shade tolerant grass. No seedlings were encountered on any reading and there are basically no safe sites for sagebrush seedlings to become established. The population is becoming more decadent and dying off. Twenty-one percent of the population is currently dead. The other browse species are doing much better on the site. The herbaceous understory is improved since 1990 with values for nested frequency increasing for both grasses and forbs.

TREND ASSESSMENT
soil - stable
browse - slightly down for the key browse species (mountain big sagebrush) and stable for the other species of browse
herbaceous understory - slightly up

HERBACEOUS TRENDS --
Herd unit 06, Study no: 10

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	11	7	8	5	3	4	.27
G	Agropyron dasystachyum	13	8	2	6	4	1	.00
G	Agropyron spicatum	97	120	85	43	47	29	2.52
G	Bromus inermis	a159	b217	c278	54	70	79	19.99
G	Dactylis glomerata	1	-	5	1	-	2	.15
G	Koeleria cristata	a-	a-	b33	-	-	12	.82
G	Melica bulbosa	-	-	7	-	-	2	.01
G	Phleum pratense	2	-	-	1	-	-	-
G	Poa bulbosa	a-	ab8	b9	-	3	4	.33
G	Poa fendleriana	ab55	a35	b65	23	17	24	2.61
G	Poa nevadensis	38	57	33	17	24	16	.44
G	Poa pratensis	80	76	115	31	37	43	3.40
G	Poa secunda	91	76	84	37	31	33	2.23
G	Stipa columbiana	a40	a25	b-	18	10	-	-
G	Stipa comata	8	12	22	4	9	8	.58
Total for Grasses		595	641	746	240	255	257	33.41
F	Achillea millefolium	7	2	1	3	2	1	.00
F	Alyssum alyssoides (a)	-	-	14	-	-	6	.05
F	Allium spp.	a-	b28	a3	-	18	3	.01
F	Antennaria rosea	1	-	1	1	-	1	.03
F	Arabis spp.	ab8	a1	b17	4	1	9	.04
F	Arenaria spp.	-	4	-	-	2	-	-
F	Artemisia ludoviciana	-	-	3	-	-	1	.38
F	Astragalus convallarius	a4	b32	c61	3	16	29	1.10
F	Balsamorhiza sagittata	10	4	5	6	3	3	.57
F	Castilleja linariaefolia	6	3	11	2	2	6	.52
F	Calochortus nuttallii	-	5	-	-	4	-	-
F	Cirsium spp.	3	4	6	2	3	3	.07
F	Comandra pallida	a-	a2	b10	-	1	5	.08
F	Collinsia parviflora (a)	-	-	24	-	-	10	.12
F	Crepis acuminata	a-	b97	c59	-	50	26	.56
F	Erigeron pumilus	3	4	5	1	2	3	.04
F	Eriogonum racemosum	7	11	10	4	5	5	.24
F	Eriogonum umbellatum	-	-	6	-	-	3	.12
F	Hackelia patens	a88	b38	b22	45	22	13	.24
F	Helianthus spp.	-	-	29	-	-	9	1.39
F	Holosteum umbellatum (a)	-	-	11	-	-	5	.05

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Lithospermum ruderale	3	-	7	2	-	3	.21
F	Orthocarpus spp. (a)	-	-	1	-	-	1	.00
F	Penstemon humilis	11	13	5	5	5	2	.06
F	Phlox longifolia	-	3	-	-	1	-	-
F	Polygonum douglasii (a)	-	-	15	-	-	9	.04
F	Schoencrambe linifolia	-	-	2	-	-	1	.00
F	Zigadenus paniculatus	-	-	3	-	-	2	.01
Total for Forbs		151	251	331	78	137	159	6.01

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06, Study no: 10

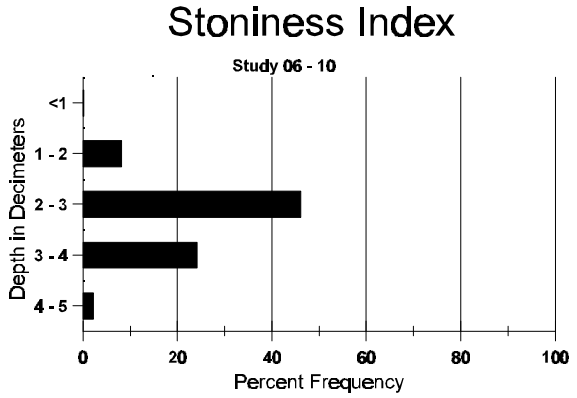
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	24	3.34
B	Artemisia tridentata vaseyana	80	16.30
B	Cercocarpus montanus	1	1.31
B	Chrysothamnus greenei	4	.30
B	Chrysothamnus viscidiflorus viscidiflorus	39	2.55
B	Purshia tridentata	9	1.49
B	Quercus gambelii	7	.91
B	Symphoricarpos oreophilus	54	10.48
B	Tetradymia canescens	4	.18
Total for Browse		222	36.89

BASIC COVER --
Herd unit 06, Study no: 10

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	384	5.00	16.50	61.87
Rock	13	.50	0	.05
Pavement	27	.50	0	.09
Litter	400	80.50	76.00	75.13
Cryptogams	53	.50	.75	.74
Bare Ground	98	13.00	6.75	5.88

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 10

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.7	58.4 (14.5)	6.7	38.9	35.1	26.0	3.7	32.5	195.2	.6



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 10

Type	Quadrat Frequency '96
Elk	22
Deer	12

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	9	6	1	1	-	-	-	-	13	5	1	-	380	33	39	19
D	84	-	-	5	-	-	-	-	-	-	1	-	4	-	333			5
	90	-	2	1	-	-	-	-	-	-	2	-	1	-	200			3
	96	-	6	1	-	2	-	-	-	-	3	6	-	-	180			9
Total Plants/Acre (excluding Dead & Seedlings)													'84		399	Dec:		83%
													'90		266			75%
													'96		560			32%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata vaseyana																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	3	2	-	-	-	-	-	-	-	3	-	2	-	100			5
M	84	1	4	6	-	-	-	-	-	-	10	-	1	-	733	32	41	11
	90	2	20	2	2	-	-	-	-	-	25	-	1	-	1733	27	30	26
	96	-	50	22	4	2	-	-	-	-	75	-	3	-	1560	28	39	78
D	84	2	17	32	-	-	-	-	-	-	35	-	13	3	3400			51
	90	5	17	-	-	-	-	-	-	-	15	-	1	6	1466			22
	96	3	30	17	-	-	6	-	-	-	35	2	14	5	1120			56
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	720			36
Total Plants/Acre (excluding Dead & Seedlings)													'84		4133	Dec:		82%
													'90		3265			45%
													'96		2780			40%
Cercocarpus montanus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	54	63	1
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	-	-	-	1	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		132			50%
													'96		20			0%
Chrysothamnus greenei																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220	7	10	11
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		220			-
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	10	13	1
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66	13	3	1
	96	72	-	-	14	-	-	-	-	-	85	-	-	1	1720	14	16	86
D	84	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		398	Dec:		67%
													'90		66			0%
													'96		1740			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	9	0
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	0			-
Purshia tridentata																		
M	84	-	-	7	-	-	-	-	-	-	4	-	3	-	466	23	39	7
	90	1	3	-	-	-	-	-	-	-	4	-	-	-	266	25	40	4
	96	-	4	5	2	1	-	-	-	-	12	-	-	-	240	16	36	12
Total Plants/Acre (excluding Dead & Seedlings)														'84	466	Dec:		-
														'90	266			-
														'96	240			-
Quercus gambelii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	19	1	-	-	-	-	-	-	23	-	-	-	460	32	22	23
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	460			-
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	3	2	-	-	-	-	5	-	-	-	333			5
	96	19	3	-	4	-	-	-	-	-	26	-	-	-	520			26
M	84	16	1	-	-	-	-	-	-	-	17	-	-	-	1133	20	30	17
	90	4	1	-	1	-	-	-	-	-	4	-	2	-	400	22	37	6
	96	101	26	-	15	-	-	-	-	-	142	-	-	-	2840	19	32	142
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	2	1	5	-	-	-	-	-	4	1	-	3	533			8
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)														'84	1265	Dec:		5%
														'90	1266			42%
														'96	3380			1%
Tetradymia canescens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	1	-	-	-	-	-	-	-	4	-	-	-	80	17	18	4
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	80			-

DISCUSSION

Trend Study No. 6-11 (19-9)

*** This site was not read in 1996. Discussions from the 1990 report remain below. Maps and data tables from previous readings can be found in the 1990 Utah Big Game Range Trend Study Report.

The Upper Chalk Creek study area is on normal winter range located in the Chalk Creek drainage about three miles east of Upton. Elevation is approximately 6,760 feet in an area characterized by gently sloping or rolling south facing terrain. Vegetatively, the entire area is open mountain big sagebrush/grass intermixed with mountain brush. The mountain brush community type becomes increasingly more prevalent at higher elevations.

Big game use of the study area is moderate and includes deer, elk, and occasionally moose. Pellet groups of all three species were observed with deer being the most numerous. Other past evidence confirming winter use includes four winter-killed deer carcasses from the winters of 1982-83 and 1983-84 and three antler drops. Browse utilization is generally moderate. The study area is privately-owned and grazed by domestic cattle and possibly even sheep.

Soil is alluvial in origin and appears moderately deep and fine textured. Species such as mountain big sagebrush, mountain snowberry, serviceberry, and antelope bitterbrush exhibit good size and vigor. The area exhibits a very good grass understory and demonstrates relatively few signs or erosion. Soil condition was considered fair to good in 1984.

The key browse species are mountain big sagebrush, serviceberry, mountain snowberry, and antelope bitterbrush. Mountain big sagebrush is easily the most abundant shrub and will continue to be so. It is also the shrub most effected by the prolonged drought even though it is not utilized that heavily. Browsing use is moderate to occasionally heavy. Serviceberry, mountain snowberry, and antelope bitterbrush provide needed forage variety and good palatability.

The most abundant and productive perennial grass is Kentucky bluegrass. This species may be increasing, but should not seriously effect shrub reproduction. This study site probably has less annual grass than was indicated in the old 1977 line intercept study. Forb density and production are about average for this plant community and this range site. Several palatable forbs provide a good variety of spring and summer forage.

1984 APPARENT TREND ASSESSMENT

Soil trend is stable. This soil is moderately deep and productive and is only minimally eroded. With respect to vegetation, no clear trend is apparent. In spite of some localized sites where utilization of mountain big sagebrush may be temporarily excessive, overall condition of this dominant shrub is satisfactory. Reproduction appears adequate to maintain the stand and the community in its present state. It will, however, be advisable to monitor the abundance of Kentucky bluegrass, a species which may be increasing and which has real competitive properties.

1990 TREND ASSESSMENT

This study was not done in 1990 because we could not get permission to get onto the land.

1996 TREND ASSESSMENT

We still could not get permission to get onto the land again in 1996.

TREND STUDY 6-12-96 (old 19-20)

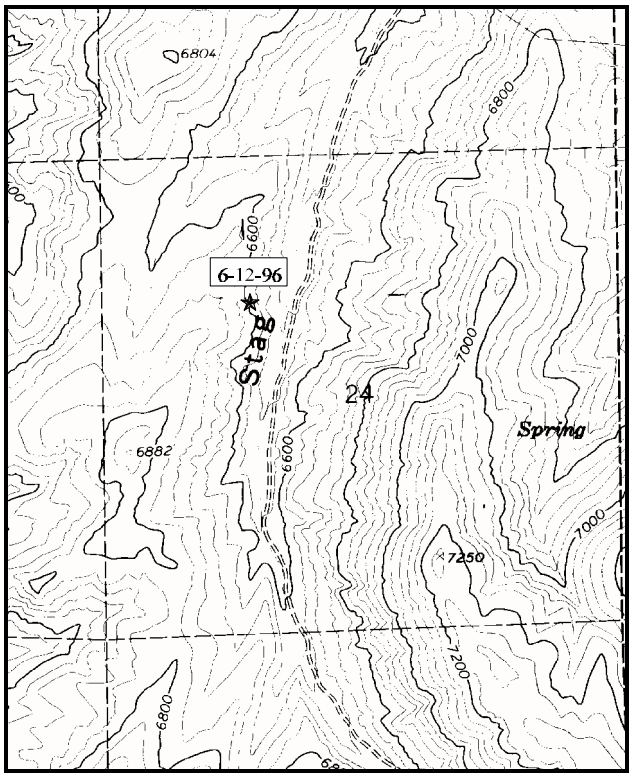
Study site name: Stag Canyon. Range type: Big sagebrush.

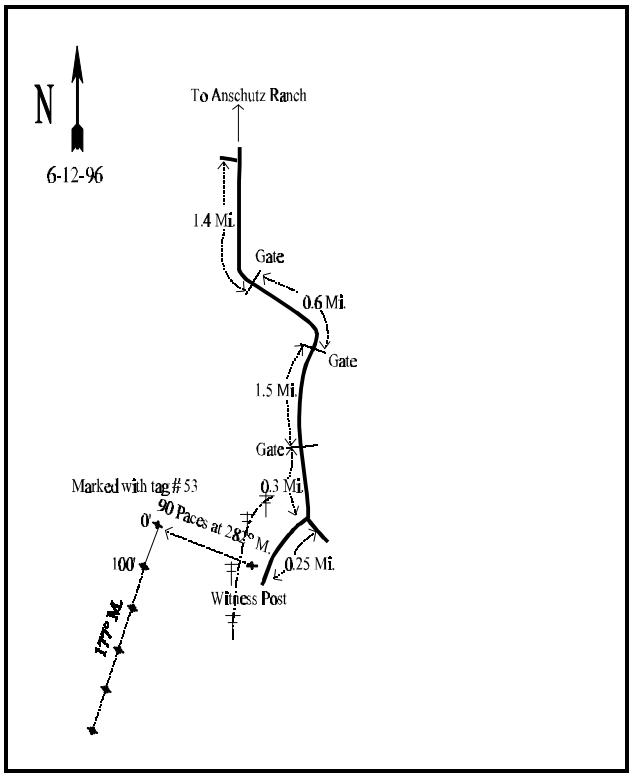
Compass bearing: frequency baseline 177 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Take exit # 185 on I-80, up Echo Canyon and turn right on the frontage road (west). Drive 1.4 miles, turn left, and go through the locked gate (combo from Anshutz Ranch). Go 0.6 miles and turn off to the right through the gate next to the corral. Go 1.5 miles to a gate and proceed 0.3 miles from the gate to a fork. Turn right and drive 0.25 miles to a witness post on the right hand (west) side of the road. From the witness post walk 90 paces at 282 degrees magnetic to the 0-foot baseline stake. The baseline runs 177 degrees magnetic.





Map Name: Castle Rock Diagrammatic Sketch

Township 4N, Range 6E, Section 24, UTM COOR 4-81-297E 45-46-043N

DISCUSSION

Trend Study No. 6-12 (19-20)

The Stag Canyon site was a new study that was initiated in 1996 because of concerns of elk use on an old burn. The site is on an easterly aspect at about 6,600 feet in elevation, with slope varying from about 10-15%. The location of the site was determined by the number elk pellet groups. The study area had a pellet group quadrat frequency of 47% for elk, while deer had 10%, and cattle had a frequency of 6%. Adequate juniper cover is a short distance up the ridge from the site. The plant community can best be described as a sagebrush/grass type.

The soil texture is classified as a sandy-clay-loam with a pH of 7.4 which is slightly alkaline in reaction. There is little surface rock (<4%), but there is considerable rock throughout the profile. Soil temperature (71^0F at about 12 inches) would indicate that the site is quite dry and warm during the summer. Litter and vegetative cover values are below average when compared to other sites within the management unit. There are some signs of minor sheet erosion, but it is limited by the moderately gentle slopes and protective plant and litter cover.

The browse composition is made up primarily of mountain big sagebrush which makes up 57% of the browse cover. The sagebrush population are now exhibiting characteristics of an expanding population with a biotic potential of 38% (percentage of seedlings to the population) and a young age class that makes up 71% of the population. None of the sagebrush were classified as decadent. Increaser species make up the remainder of the browse, these include stickyleaf low rabbitbrush, broom snakeweed, and prickly pear. Stickyleaf low rabbitbrush, with its current age structure, appears to be stable with the majority of its population classified as mature (92%). Broom snakeweed also has an age structure that is largely mature (81%), as does prickly pear where 100% are mature.

The total herbaceous understory cover is below the average for this management unit and percent bare ground in quite high at 35%. The major problem on this old burn is that three species, cheatgrass, thistle, and flannel mullein contribute 63% of the total herbaceous cover. The herbaceous understory can be basically characterized as weedy. Elk will tend to congregate in the areas with weedy forbs and select them in the spring. Without any further data, this site would be considered stable, but the composition is very poor or weedy.

1996 APPARENT TREND ASSESSMENT
soil - stable, but only fair condition with quite high percentage of bare ground and moderately low amounts of litter cover
browse - stable to slightly upward with an apparently expanding population of mountain big sagebrush
herbaceous understory - stable, but very poor composition of mostly weedy species

HERBACEOUS TRENDS --
Herd unit 06, Study no: 12

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron dasystachyum	78	18	2.58
G	Agropyron spicatum	11	6	.18
G	Bromus tectorum (a)	272	80	4.43
G	Elymus cinereus	5	1	.03
G	Oryzopsis hymenoides	57	21	2.05
G	Poa nevadensis	3	1	.03
G	Poa pratensis	14	4	.45
G	Poa secunda	7	3	.09
G	Stipa comata	15	6	.34
Total for Grasses		462	140	10.21
F	Alyssum alyssoides (a)	103	39	.27
F	Arabis spp.	2	1	.00
F	Astragalus convallarius	3	1	.00
F	Astragalus utahensis	2	2	.03
F	Cirsium spp.	144	59	4.98
F	Collinsia parviflora (a)	18	10	.07
F	Epilobium paniculatum	1	1	.00
F	Erigeron spp	3	1	.00
F	Holosteum umbellatum (a)	5	2	.01
F	Orthocarpus spp. (a)	1	1	.03
F	Phlox longifolia	42	18	.19
F	Polygonum douglasii (a)	26	11	.05
F	Ranunculus testiculatus (a)	5	3	.01
F	Sisymbrium altissimum (a)	1	1	.00
F	Sphaeralcea coccinea	26	12	.28
F	Tragopogon dubius	6	2	.01
F	Unknown forb-perennial	2	1	.03
F	Verbascum thapsus	59	28	2.33
Total for Forbs		449	193	8.34

BROWSE TRENDS --
Herd unit 06, Study no: 12

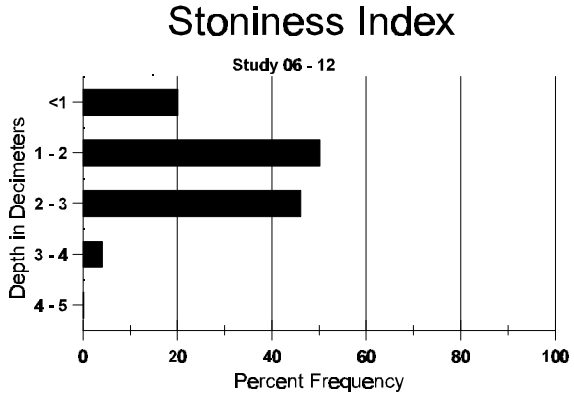
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	66	9.56
B	Chrysothamnus viscidiflorus viscidiflorus	59	5.48
B	Gutierrezia sarothrae	35	1.61
B	Opuntia spp.	3	.15
Total for Browse		163	16.80

BASIC COVER --
Herd unit 06, Study no: 12

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	405	33.05
Rock	202	1.72
Pavement	264	2.63
Litter	494	40.31
Cryptogams	4	.04
Bare Ground	386	34.56

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 12

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.8	70.8 (9.7)	7.4	47.3	26.7	26.0	2.9	11.9	169.6	.7



PELLET GROUP FREQUENCY --
Herd unit 06, Study no: 12

Type	Quadrat Frequency '96
Rabbit	3
Elk	47
Deer	10
Cattle	6

BROWSE CHARACTERISTICS --
Herd unit 06, Study no: 12

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	96	98	-	-	-	-	-	-	-	-	98	-	-	-	1960			98
Y	96	182	-	-	-	-	-	-	-	-	182	-	-	-	3640			182
M	96	68	4	1	-	-	-	-	-	-	72	-	1	-	1460	33	40	73
D	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	660			33
Total Plants/Acre (excluding Dead & Seedlings) '96															5120	Dec:		0%
Chrysothamnus viscidiflorus viscidiflorus																		
S	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	96	111	3	1	8	-	-	-	-	-	123	-	-	-	2460	11	23	123
D	96	3	3	-	-	-	-	-	-	-	6	-	-	-	120			6
Total Plants/Acre (excluding Dead & Seedlings) '96															2660	Dec:		5%
Gutierrezia sarothrae																		
Y	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560			28
M	96	126	-	-	-	-	-	-	-	-	126	-	-	-	2520	7	10	126
D	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings) '96															3120	Dec:		1%
Opuntia spp.																		
M	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	5	8	5
Total Plants/Acre (excluding Dead & Seedlings) '96															100	Dec:		-

SUMMARY

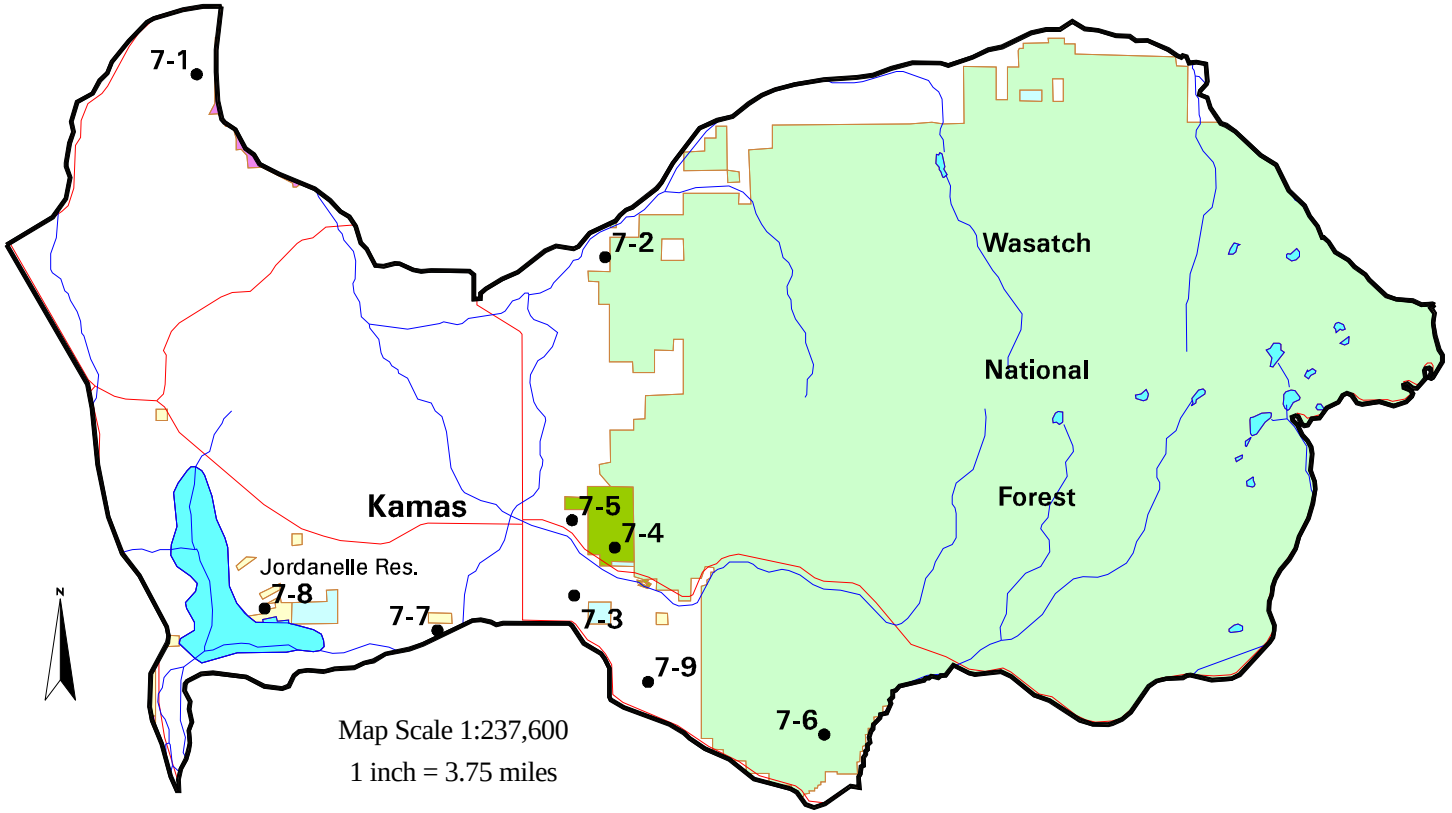
HERD UNIT - 6 - COALVILLE

Trend study data comparisons have led to downward trend assessments for browse on all sites except Anshutz Ranch (#6-1), Crandall Canyon (#6-7) and North Oakley Bench (#6-9). There is a prevalence of increaser species and especially cheatgrass and many sites lack perennial grasses. Downward trends continue on the two juniper sites due to the lack of desirable browse plants. At Echo Reservoir (#6-4), the increased grass component indicates a fair site potential, but most slopes in the area would be limited to burns to reduce the pinyon and juniper trees which compete with the limited browse. A trend summary table is included below.

TREND SUMMARY UNIT - 6 - Chalk Creek

Site	1990			1996		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
6-1 Anshutz Ranch	stable	stable	stable	up	up slightly	up slightly
6-2 Echo Canyon Reservoir	Moved in 1996			stable	down slightly	stable
6-3 Spring Hollow Burn	down	down	stable	could not get permission to read site in 1996		
6-4 Echo Reservoir	down slightly	down	up	up slightly	down	down slightly
6-5 Spring Canyon	down slightly	down	down	down slightly	down	stable
6-6 Hixon Canyon	down	down	up slightly	stable	down	down
6-7 Crandall Canyon	down	down	stable	up slightly	up	stable
6-8 South Fork Chalk Creek	new in 1990			up slightly	stable	down slightly
6-9 North Oakley Bench	stable	stable	up slightly	up slightly	up slightly	stable
6-10 Mahogany Hills	stable	stable	stable	stable	down slightly	up slightly
6-11 Upper Chalk Creek	could not get permission to read site in 1990 or 1996					
6-12 Stag Canyon	New site in 1996			stable	up slightly	poor

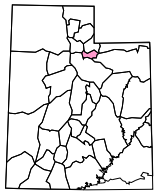
Kamas Management Unit



Legend

- Forest Service
- Bureau of Land Management
- State of Utah
- Private Land
- State Wildlife Ref.
- Water Body
- Transect Location
- Road
- Water Course

Unit Location



UDAF GIS May, 2000

WILDLIFE MANAGEMENT UNIT - 7 (20) - KAMAS

Boundary Description

> **Summit** and **Wasatch Counties** - Boundary begins at the junction of I-80 and SR-32 (Wanship); south on SR-32 to the Weber Canyon Road at Oakley; east on this road to Holiday Park and the Weber river Trail; east on the Weber River Trail to SR-150 near Pass Lake; south on SR-150 to the North Fork of the Provo river; south along this river to the Provo river; south along the river to SR-35; west on SR-35 to Francis and SR-32; west on SR-32 to US40 to I-80; north on I-80 to SR-32 and Wanship and beginning point.

The Kamas herd unit is located between the Uinta and Wasatch mountains in the north-central part of the state. The 1977 inventory of the Kamas unit, known as Herd Unit 20 at that time, included a total of 377,532 acres (Guinta 1979). About 10% of the range at that time was classified as winter range. Boundary changes in 1985 reduced the total acreage and shifted a portion of the winter range north of the Weber River into Herd Unit 6 (19). There was another realignment of the herd unit boundaries again in 1996, reducing the total acreage by approximately 25%. Even with these changes, the ratio of winter to summer range has stayed basically the same, with about 10% of the area being classified as winter range. The obvious limiting factor for big game in this management unit is the lack of adequate quantities of good quality winter range. With severe winters, the available range is reduced even further. A fairly current example of this problem can be illustrated by the large winter losses which occurred during the winter of 1992-93.

As with Herd Management Unit 6 (19), there is a prevalence of privately-owned land, especially in the most critical low elevation wintering areas. For deer, over 67% of the winter range is under private ownership. The Forest Service manages another 28% of the normal winter range. There is abundant summer range in the Uinta Mountains to the east. These mountains contain the headwaters of the Weber and Provo Rivers, which flow west through the Rhodes and Heber Valleys. The south and west exposures along these rivers, in addition to land along beaver Creek and the mountain face east and north of Kamas, provide the major deer wintering areas.

Because of the varying topography, the deer winter range is separated into several distinct areas. The upper limits vary considerably, but lower limits generally follow the canyon bottoms, roads and the upper limits of cultivated land. As more knowledge is gained on patterns of deer use and migration, the boundaries will become more clearly defined. Three of the winter range areas; north of the Weber River, Kamas Face, Beaver Creek, and the Provo River, have long been recognized as critical to the deer herd on the western edge of the Uinta mountains. However, there has been a controversy regarding which deer use the Weber River winter range. Apparently, new data on migration patterns has led to the boundary change which shifted this important winter range into Management Unit 6 (19). An area south of Wanship that was surveyed as winter range in 1977 was not considered winter range on the 1984 herd unit map, but the area was sampled with study 7-1 (20-1). For a complete and detailed description of all the winter range areas and vegetation types sampled, consult the 1977 Range Inventory (Guinta 1979). The report includes an acreage breakdown by vegetation type and geographic area.

Fourteen different vegetation types were classified, but only nine of the more important types were sampled in the 1977 inventory. Of those, two emerge as the dominant and most valuable types. Together, the oakbrush and sagebrush/grass types occupy more than 70% of the normal winter range. The oakbrush type, dominated by Gambel oak with big sagebrush, serviceberry, and snowberry as the subdominant associates, is often found at the more mesic, higher elevations. The

oakbrush range condition, in 1977, was considered generally satisfactory and exhibited light to moderate deer use. Sagebrush/grass is the second most abundant type and often occurs interspersed with the oak type. It normally occupies the lower, especially critical portions of the winter range. Much of the lower areas have been converted to cropland or are heavily grazed by livestock. Other important types are the rather depleted sagebrush type and a significant mountain brush stand on the south-facing slope of Pinyon Canyon.

Herd Unit 7 (20) has 10 study sites which were all sampled as important deer wintering areas. Many are located on private land where there is intense competition for the range by livestock, roads, housing, and agriculture. Some sites were noted to have a high potential for development. The big sagebrush-grass type is represented by four of the studies, while the remainder of the sites sample mixed mountain brush, where conditions were generally fair. Some of the rereading of study sites was where old line intercept transects were located. These readings of areas that had old line intercept transects revealed increased decadence and hedging on key browse species. Overall, condition of the range appears to be correlated to elevation, with the lowest slopes being in the most depleted condition.

The lack of winter range is the major limiting factor for the deer herd in Unit 7 (20) (Parkin 1983). A major concern is the continuing loss of habitat to housing and agriculture located on private lands. Other management problems listed in the herd unit management plan include increases in road building, livestock grazing, timber harvests, oil drilling, and oil line developments. The Jordanelle Reservoir has inundated several thousand acres of wildlife habitat, some of which was important deer winter range. Overuse by both livestock and big game has led to a deteriorating range condition in many critical locations.

The key solution to the deer problems on the herd unit is the protection of the remaining critical winter range. The Division has made purchases of critical land east of Kamas in which improvements should be made to enhance the quality of the range. It has been estimated that 7,300 acres are necessary to perpetuate the deer herd at current levels. Therefore, the Division needs to acquire and manage 6,086 additional acres. Land purchase in this unit is a high priority of the Division's land acquisition program. It will be necessary to work with private landowners to discourage overgrazing, and insure hunter access and adequate depredation protection. Current management objectives for deer are to keep the herd in balance with the available range, this would include a yearly harvest of 1,300 bucks with normal conditions. The number of antlerless deer permits would depend on targeted population goals (12,000 wintering deer, computer modeled number) and condition and trend of the winter range. Management objectives for elk are to achieve a target population size of 800 wintering elk (computer modeled number) under normal conditions. The expected bull harvest when target population is met would be for 115 animals a year under normal conditions. To maintain these target populations, antlerless and either sex permits and a variety of harvest methods and seasons would be used.

TREND STUDY 7-1-97 (old 20-1)

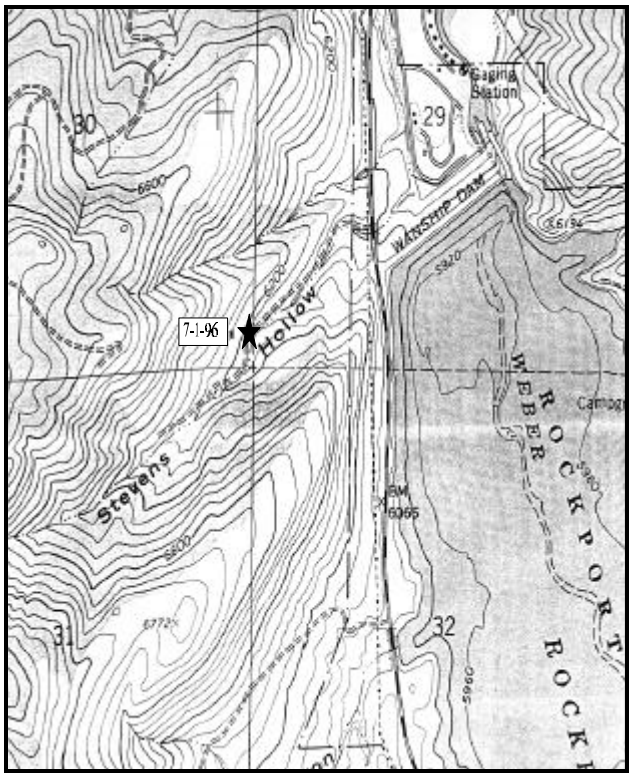
Study site name: Steven's Hollow. Range type: Mixed mountain brush.

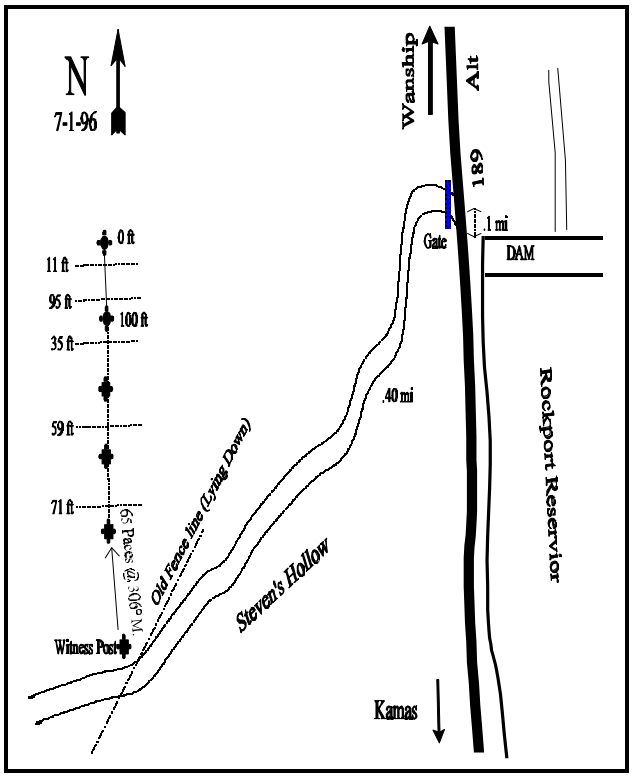
Compass bearing: frequency baseline 167 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the west side of Wanship dam, travel 0.1 miles, and turn left to a gated dirt road. Pass through the gate, and continue 0.4 miles to a witness post on the right hand side of the road. From the witness post, walk on a bearing of 306 degrees magnetic for approximately 65 paces up slope to the 400-foot stake of the baseline. The 0-foot baseline stake is 400 feet to the north at a bearing of 347 degrees magnetic. The 0-foot baseline stake is marked by browse tag #7965. The baseline runs 167 degrees magnetic.





Map Name: Wanship Diagrammatic Sketch

Township 1N, Range 5E, Section 30, UTM COOR: 4-64-750E 45-15-161N

DISCUSSION

Trend Study No. 7–1 (20-1)

This study area is located on a 30-35% southeast facing slope on the north side of Stevens Hollow. Elevation ranges from about 6,240 feet at the beginning of the transect to perhaps 6,500 feet at the upper end. Stevens Hollow is considered an important deer winter range that receives considerable use. Pellet group frequency currently indicates only light to moderate use by deer. The more palatable browse species in the past showed moderate to heavy use. But, there has been a wildfire this last year where all of the sagebrush was lost. The other preferred species, serviceberry and true mountain mahogany, have since begun to resprout vigorously, showing good vigor. This site originally was classified as a typical mixed mountain brush community with the dominating species being true mountain mahogany and mountain big sagebrush. But, since the fire, all the sagebrush was lost. Now the area is dominated by serviceberry, and true mountain mahogany, with nearby resprouting Gambel oak clones. Land ownership is private with current use limited to livestock grazing. There is a high potential for future summer home or recreational subdivision development. Kent Canyon, a comparable canyon located immediately to the south, has already been developed.

The soil is a moderately deep (effective rooting depth of more than 21 inches) brown soil with a texture that is classified as a clay. Soil reaction is neutral with a pH of 7.3. Percent bare ground is just about 17% with percent surface rock cover of almost 8%. The soil surface is moderately rocky (almost 8%) and shows signs of being lightly eroded in the shrub interspaces where vegetative and litter cover is limited. Soil trend appears to be stable even with the recent wildfire.

This particular area had a diverse shrub and grass composition in the past, dominated by two preferred browse, mountain big sagebrush and true mountain mahogany. Now, total browse cover is less than 5%. Currently, the preferred browse is made up of serviceberry, true mountain mahogany and snowberry which together only contribute about 2% of the total cover. Grasses and forbs furnish 42% cover, or 9 times more cover than all the browse put together. The most common herbaceous species is cheatgrass. It now makes up 57% of the total grass cover. Three weedy annual forbs make up 83% of the total forb cover. The herbaceous understory is distinctly characteristic of being dominated by annual weeds making the community more susceptible to a wildfire again.

Although shrub species such as Oregon hollygrape and stickyleaf low rabbitbrush didn’t appear to influence the plant community much in the past, now with the loss of the sagebrush, there are many open niches for them to quickly become establish. With the anticipated increase in the weedy shrubs, they will have a greater influence on what the community will be composed of in the future. Broom snakeweed and prickly-pear cactus will also most likely tend to increase in numbers and frequency. The amount of utilization of the resprouting shrubs will determine their growth form in the future. For in the past, most of the preferred browse showed moderate to heavy use. For now, they are just beginning to resprout after the fire.

The response of grasses after the fire is that the sum of nested frequency has almost increased by a factory of 4, while that of forbs has more than doubled. This increase will have a stabilizing effect on soil condition, but will make it difficult for sagebrush to become as numerous as it was before the fire.

1984 TREND ASSESSMENT

Reviewing the 1977 line intercept data and photo points, it was determined that

soil trend was stable or perhaps even improving. But, vegetative trend may be declining slightly. The most revealing clues are changes in form class structure of the key browse species and some indications that density of mountain big sagebrush and true mountain mahogany may have declined since 1977. While there is some evidence indicating increases in forage production of these species, this is a subjective conclusion. In addition, age structures of almost all the more palatable browse species occurring within the site appeared to be rather heavily utilized, certainly heavier than in 1977.

1990 TREND ASSESSMENT

This trend study samples winter range on property above Rockport Reservoir controlled by the Weber Basin Water Conservancy District. It was noted in the 1984 report that mountain big sagebrush had decreased since the original 1977 line-intercept was read. However, in 1990, density is higher due to an increase in the number of young sagebrush. Canopy cover is less in 1990 and averages only 6%. The sagebrush were classified as heavily hedged in 1984. Although the shrubs appear in worse shape now, it is due more to the drought and lack of leader growth than continued heavy use. The true mountain mahogany is also heavily hedged. Half of the population is decadent. The only real increase came for broom snakeweed, which increased significantly on the density portions of the study.

Grass frequency is similar between years. The most common forb species are undesirable species such as stickseed, thistle and also bastard toadflax. A slight increase in the percentage of bare soil was recorded, however there is good vegetative and litter cover.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - stable

1996 TREND ASSESSMENT

This trend study originally sampled a “critical” winter range, which now has been largely altered by a recent wildfire. The soil trend currently would be considered improving with an increase in herbaceous cover even though it is mostly characterized by weeds. Percent bare ground has decreased from 23% to about 17%. The browse trend would be assessed as down with the loss of all the sagebrush to fire and the other preferred browse which are fire tolerant, now in the first stages of resprouting. Vigor appeared to be good on the resprouting species, but condition for browse will not be know for a few years. The herbaceous understory is greatly improved, but the majority of it is characterized as annuals and weedy increasers which could eventually cause a greater frequency of possibly destructive fires.

TREND ASSESSMENT
soil - improving
browse - down with the loss of sagebrush to the wildfire
herbaceous understory - up, but composition at this time is poor with mostly annuals

HERBACEOUS TRENDS --
Herd unit 07, Study no: 1

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	$_{a}$38	$_{a}$49	$_{b}$114	21	22	40	7.90
G	Bromus tectorum (a)	-	-	302	-	-	89	16.48
G	Oryzopsis hymenoides	$_{ab}$43	$_{a}$27	$_{b}$46	19	14	27	2.84
G	Poa fendleriana	2	4	1	1	2	1	.03
G	Poa nevadensis	$_{a}$15	$_{b}$-	$_{c}$41	9	-	24	.95
G	Poa pratensis	-	-	3	-	-	2	.06
G	Poa secunda	$_{a}$17	$_{b}$65	$_{a}$31	11	27	16	.46
Total for Grasses		115	145	538	61	65	199	28.73
F	Agoseris glauca	-	-	2	-	-	1	.00
F	Allium acuminatum	$_{a}$2	$_{b}$13	$_{a}$-	1	8	-	-
F	Alyssum alyssoides (a)	-	-	277	-	-	90	5.80
F	Camelina microcarpa (a)	-	-	25	-	-	16	.38
F	Calochortus nuttallii	-	-	1	-	-	1	.00
F	Chaenactis douglasii	$_{a}$14	$_{a}$17	$_{b}$-	7	7	-	-
F	Cirsium spp.	$_{a}$67	$_{a}$71	$_{b}$19	30	34	14	1.55
F	Comandra pallida	$_{a}$97	$_{b}$18	$_{b}$19	39	12	10	.08
F	Crepis acuminata	-	2	-	-	1	-	-
F	Cryptantha spp.	$_{a}$72	$_{b}$20	$_{c}$-	36	8	-	-
F	Cymopterus spp.	-	1	-	-	1	-	-
F	Descurainia pinnata (a)	-	-	20	-	-	13	.21
F	Gayophytum ramosissimum (a)	-	-	3	-	-	2	.01
F	Hackelia patens	$_{a}$-	$_{b}$73	$_{b}$59	-	36	29	3.34
F	Hedysarum boreale	$_{a}$7	$_{a}$-	$_{b}$24	3	-	12	1.43
F	Lactuca serriola	-	-	3	-	-	2	.01
F	Lithospermum ruderale	3	-	-	2	-	-	-
F	Lomatium spp.	-	-	3	-	-	1	.03
F	Penstemon spp.	$_{a}$23	$_{a}$17	$_{b}$-	11	6	-	-
F	Phlox longifolia	$_{a}$-	$_{a}$3	$_{b}$15	-	2	9	.04
F	Ranunculus testiculatus (a)	-	-	13	-	-	5	.02
F	Schoencrambe linifolia	-	-	3	-	-	2	.01
F	Sisymbrium altissimum (a)	-	-	2	-	-	1	.00
F	Tragopogon dubius	-	-	1	-	-	1	.01
Total for Forbs		285	235	489	129	115	209	13.00

Values with different subscript letters are significantly different at % = 0.10
(annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 1

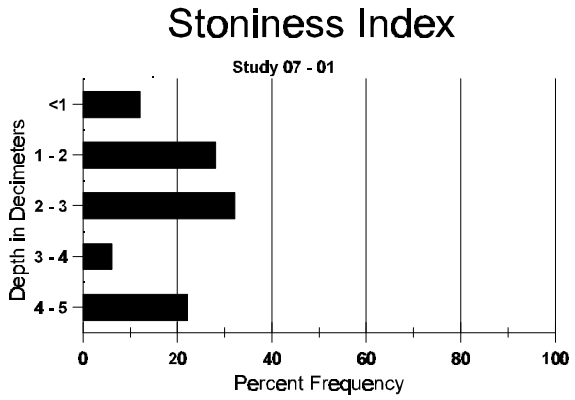
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	13	.81
B	Cercocarpus montanus	13	.72
B	Chrysothamnus viscidiflorus viscidiflorus	48	1.67
B	Gutierrezia sarothrae	29	.72
B	Mahonia repens	8	.25
B	Opuntia spp.	10	.06
B	Symphoricarpos oreophilus	4	.15
B	Tetradymia canescens	9	.39
Total for Browse		134	4.80

BASIC COVER --
Herd unit 07, Study no: 1

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	377	4.25	11.50	48.95
Rock	208	11.00	11.00	7.28
Pavement	75	4.50	3.00	.27
Litter	391	62.75	51.00	52.07
Cryptogams	1	0	.25	.00
Bare Ground	248	17.50	23.25	17.20

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 1

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
21.3	67.2 (45.4)	7.3	29.3	26.4	44.4	2.6	6.9	115.2	.5



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 1

Type	Quadrat Frequency '96
Rabbit	5
Deer	17

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	30	-	-	-	-	-	-	-	-	30	-	-	-	600			30
M	84	-	-	1	-	-	-	-	-	-	-	-	1	-	66	28	24	1
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66	12	6	1
	96	4	-	-	1	-	-	-	-	-	5	-	-	-	100	25	35	5
D	84	-	2	1	-	-	-	-	-	-	1	2	-	-	200			3
	90	-	2	1	-	-	1	-	-	-	3	-	-	1	266			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		75%
													'90		398			67%
													'96		700			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	4	5	-	-	-	-	-	-	10	-	-	-	666	25	31	10
	90	2	2	-	-	-	-	-	-	-	4	-	-	-	266	19	32	4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	-	11	-	-	-	-	-	-	9	-	1	1	733			11
	90	2	5	6	-	-	1	-	-	-	8	-	-	6	933			14
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		1399	Dec:		52%
													'90		1399			67%
													'96		0			0%
Cercocarpus montanus																		
Y	84	1	1	2	-	-	-	-	-	-	3	-	1	-	266			4
	90	1	1	-	-	-	1	-	-	-	3	-	-	-	200			3
	96	6	2	-	4	-	-	-	-	-	12	-	-	-	240			12
M	84	-	2	7	-	-	1	-	-	-	3	7	-	-	666	53	43	10
	90	-	-	3	-	-	-	-	-	-	3	-	-	-	200	35	35	3
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	21	26	3
D	84	-	-	3	-	-	-	-	-	-	1	1	1	-	200			3
	90	-	-	6	-	-	-	-	-	-	6	-	-	-	400			6
	96	1	1	-	-	-	-	-	-	-	1	-	1	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	260			13
Total Plants/Acre (excluding Dead & Seedlings)													'84		1132	Dec:		18%
													'90		800			50%
													'96		340			12%
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	96	26	-	-	-	-	-	-	-	-	26	-	-	-	520			26
M	84	34	2	-	-	-	-	-	-	-	36	-	-	-	2400	14	14	36
	90	33	-	-	-	-	-	-	-	-	33	-	-	-	2200	11	12	33
	96	120	2	-	-	-	-	-	-	-	122	-	-	-	2440	11	15	122
D	84	19	-	-	-	-	-	-	-	-	15	-	-	4	1266			19
	90	16	-	-	-	-	-	-	-	-	12	-	-	4	1066			16
	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		3432	Dec:		34%
													'90		3799			28%
													'96		2980			1%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	21	-	-	-	-	-	-	-	-	21	-	-	-	1400			21
	96	38	-	-	-	-	-	-	-	-	38	-	-	-	760			38
M	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333	16	17	5
	90	8	-	-	-	-	-	-	-	-	8	-	-	-	533	6	5	8
	96	50	-	-	-	-	-	-	-	-	50	-	-	-	1000	9	10	50
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	-	1	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		333	Dec:		0%
													'90		1999			3%
													'96		1760			0%
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	83	-	-	-	-	-	3	-	-	86	-	-	-	5733			86
	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560			28
M	84	381	-	-	-	-	-	-	-	-	381	-	-	-	25400	4	4	381
	90	104	-	-	-	-	-	3	-	-	107	-	-	-	7133	3	4	107
	96	34	-	-	4	-	-	-	-	-	38	-	-	-	760	4	8	38
Total Plants/Acre (excluding Dead & Seedlings)													'84		25400	Dec:		-
													'90		12866			-
													'96		1320			-
Opuntia spp.																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333	6	13	5
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66	7	10	1
	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	5	12	15
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	-	1	66			1
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17
Total Plants/Acre (excluding Dead & Seedlings)													'84		333	Dec:		0%
													'90		265			25%
													'96		380			11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	2	2	1	-	-	-	-	-	-	5	-	-	-	333	23	23	5
	90	1	1	-	4	-	-	-	-	-	6	-	-	-	400	15	9	6
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	12	18	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		333	Dec:		-
													'90		400			-
													'96		140			-
Tetradymia canescens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	84	4	-	-	-	-	-	-	-	-	4	-	-	-	266	6	15	4
	90	-	10	-	-	-	-	-	-	-	10	-	-	-	666	12	22	10
	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	12	19	15
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		-
													'90		666			-
													'96		480			-

TREND STUDY 7-2-96 (old 20-5)

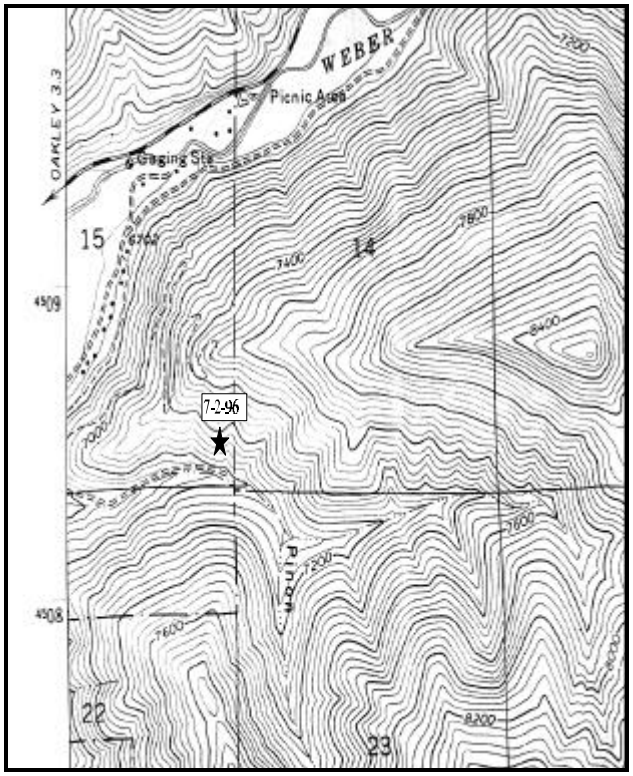
Study site name: Pinyon Canyon . Range type: Mixed mountain brush .

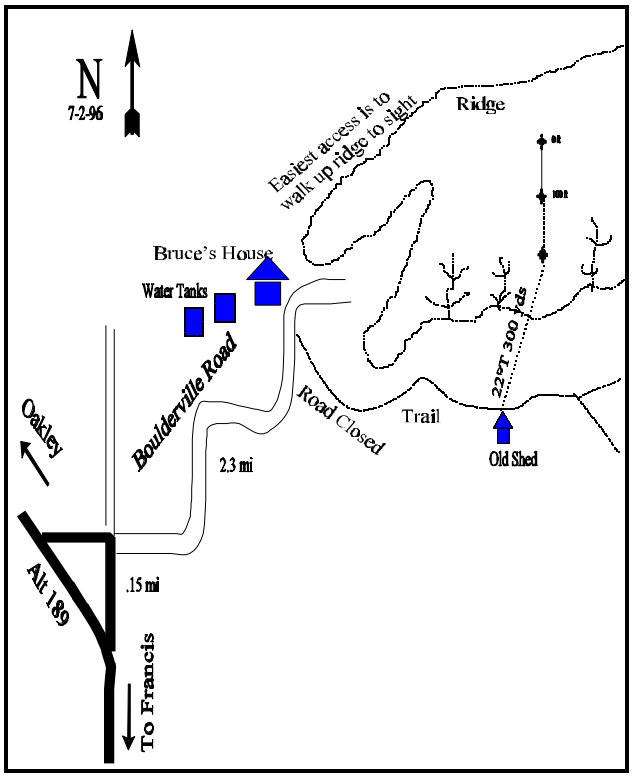
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11, 59, & 95 (34 & 71ft).

LOCATION DESCRIPTION

Where ALT 189 turns northwest between Francis and Oakley, proceed north for 0.15 miles. At this intersection turn right (east) onto Boulderville Road and travel 2.8 miles. Turn right onto a dirt road proceeding up Pinyon Canyon. After 0.5 miles (will pass two water storage tanks) stop with an old shed on the slope on a bearing of 22 degrees true to the 100-foot stake of the baseline. Note position of large curlleaf mountain mahogany on diagram as an aid to study location. The 0-foot stake is marked by browse tag #7957.





Map Name: Hoyt Peak Diagrammatic Sketch

Township 1S , Range 6E , Section 15 , UTM COOR: 4-79-322E 45-08-637N

DISCUSSION

Trend Study No. 7-2 (20-5)

This study is located in Pinyon Canyon, a drainage containing one of the better and more important mixed mountain brush big game wintering areas on the herd unit. The study extends up a moderately steep (35-40%) south to southwest facing slope with an elevation of 7,100 feet. This site is rather high for winter range, but with the favorable aspect and slope, the area remains available to big game during all except the most severe winters. Forage utilization appears moderate to heavy. Currently pellet group frequencies indicate that elk utilize the area about three times more than deer. The study area also had significant numbers of moose pellet groups which were out of the sampling area. The predominant range type is mixed mountain brush that exhibits considerable variation in overstory dominance. The mixture of shrubs includes varying densities of true mountain mahogany, serviceberry, mountain big sagebrush, antelope bitterbrush, Gambel oakbrush, mountain snowberry, and a few scattered curlleaf mountain mahogany.

Soil is moderately rocky (surface rock cover is 24%), well-drained and basically residually deposited, with some colluvially deposited rock. Parent material appears to be limestone, sandstone, and shale. In places, the soil has a reddish color, indicating a high iron oxide content. Effective soil depth (see methods) is about 12 inches, and should not be a limiting factor. Soil texture is classified as a loam. Soil is slightly alkaline with a pH of 7.7. Permeability would be moderately slow, when combined with a steep slope and high surface rock cover. There is a moderately high potential for runoff and erosion. There is fairly good litter cover and good vegetative cover, which under most conditions, will prevent erosion from most high intensity summer rain events.

The mountain brush community is characterized by large shrubs. These would include Gambel oak, mountain snowberry, Saskatoon serviceberry, true mountain mahogany, mountain big sagebrush, and antelope bitterbrush. These latter five species contribute 94% of the total browse cover. Trend appears fairly stable to improving at this time for percent decadence has declined markedly since 1990. The level of use on serviceberry, mountain big sagebrush, and true mountain mahogany was very heavy in the past, but has steadily declined since 1984. Mountain big sagebrush was the species most preferred with 100% showing heavy use in 1984, now use is only light to moderate.

Herbaceous composition consists of an excellent grass cover, dominated by bluebunch wheatgrass. Cheatgrass is the second most abundant grass on the site. Forbs occur occasionally, while providing only 11% of the herbaceous cover. None of the forbs provide significant amounts of forage or ground cover except for rock goldenrod. Species such as yellow salsify, thistle and rock goldenrod are typical and are indicative of rather poor soils.

1984 APPARENT TREND ASSESSMENT

Soil condition varies widely and depends on small differences in site quality. Although the entire study area is steep and has a basic south or southwest exposure, there are many smaller slopes where exposures are more westerly or easterly. These sub-sites have better vegetative cover and appear less eroded. Erosion is obvious within the shrub interspaces on the remaining area. On this site, soil trend is probably only marginally stable. Vegetative trend also seems stable but may vary slightly. The mixed mountain brush community can be expected to maintain itself. Composition, however, may change slightly. Species such as Gambel oak can be expected to increase while more palatable and/or less browsing resistant shrubs such as true mountain mahogany and mountain big sagebrush may decline. Although examination of the data summary indicates a population of

Oregon hollygrape composed totally of young plants, it is doubtful that this species is a reliable trend indicator or will ever be important as forage.

1990 TREND ASSESSMENT

The moderately steep, southwest-facing slope is available to big game in most winters. The true mountain mahogany is heavily to severely hedged. Its density has slightly decreased since 1984. The density of young and mature plants also declined slightly, while decadent mahogany shrubs increased to 35% of the population. Contrasting data was found for the serviceberry population. These palatable shrubs are moderately to heavily hedged and have normal vigor. They maintained a high density (1,267 plants/acre) and the percentage of plants classified as decadent decreased from 61% to 11% of the population. Oregon grape is still the most numerous woody species. Mountain big sagebrush continues on the downward trend noted in 1984 in comparison with the 1977 line-intercept transect data from the same site. The moderately dense grass understory of bluebunch wheatgrass and small bluegrasses is almost unchanged. Protective soil cover remains adequate.

TREND ASSESSMENT
soil - stable
browse - slightly down
herbaceous understory - improving slightly

1996 TREND ASSESSMENT

The soil trend for this site has improved, with percent bare ground decreasing to only 15%. There is good herbaceous understory and litter cover which are well dispersed. The key browse for the site are: serviceberry 14% cover, mountain big sagebrush 7% cover, true mountain mahogany 39% cover, bitterbrush 11% cover, and mountain snowberry 23% cover. Together these species provide 94% of the total browse cover. Overall, there has been a decrease in those plants classified as heavily browsed, vigor has improved, and percent decadence has decreased for all key species. Overall, the trend for browse is improving. The herbaceous understory is improved from 1990. The trend for cheatgrass should be monitored closely.

TREND ASSESSMENT
soil - slightly improved
browse - slightly improved
herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 07, Study no: 2

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron dasystachyum	5	-	-	2	-	-	-
G	Agropyron spicatum	a275	a266	b322	93	98	99	19.45
G	Bromus tectorum (a)	-	-	274	-	-	88	6.51
G	Poa fendleriana	a107	b65	b50	46	37	21	.67
G	Poa secunda	a93	b172	b175	47	73	69	3.40
Total for Grasses		480	503	821	188	208	277	30.05

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Allium acuminatum	$_{a}$34	$_{a}$37	$_{b}$5	18	21	2	.01
F	Alyssum alyssoides (a)	-	-	28	-	-	12	.16
F	Astragalus spp.	-	1	-	-	1	-	-
F	Balsamorhiza sagittata	3	-	-	1	-	-	-
F	Camelina microcarpa (a)	-	-	117	-	-	44	.61
F	Calochortus nuttallii	6	3	-	3	2	-	-
F	Chaenactis douglasii	$_{a}$6	$_{b}$28	$_{a}$13	2	14	5	.05
F	Cirsium spp.	$_{a}$41	$_{a}$40	$_{b}$9	19	20	4	.10
F	Comandra pallida	24	21	26	8	9	12	.23
F	Crepis acuminata	-	3	1	-	2	1	.03
F	Cymopterus spp.	-	-	2	-	-	1	.03
F	Erigeron pumilus	-	-	2	-	-	1	.15
F	Erigeron strigosis	-	-	2	-	-	1	.00
F	Gayophytum ramosissimum	-	-	6	-	-	3	.01
F	Helianthus spp.	-	-	7	-	-	3	.06
F	Holosteum umbellatum (a)	-	-	8	-	-	3	.09
F	Lomatium spp.	-	-	1	-	-	1	.01
F	Penstemon humilis	14	22	19	7	10	9	.43
F	Petradoria pumila	$_{ab}$41	$_{a}$61	$_{b}$38	19	25	15	1.62
F	Phlox longifolia	-	-	1	-	-	1	.00
F	Polygonum douglasii (a)	-	-	3	-	-	1	.00
F	Ranunculus testiculatus (a)	-	-	8	-	-	5	.02
F	Streptanthus cordatus	-	3	-	-	1	-	-
F	Tragopogon dubius	$_{ab}$4	$_{a}$-	$_{b}$7	2	-	4	.09
F	Unknown forb-perennial	-	2	-	-	1	-	-
F	Viguiera multiflora	2	3	-	1	2	-	-
F	Zigadenus paniculatus	-	1	-	-	1	-	-
Total for Forbs		175	225	303	80	109	128	3.75

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 2

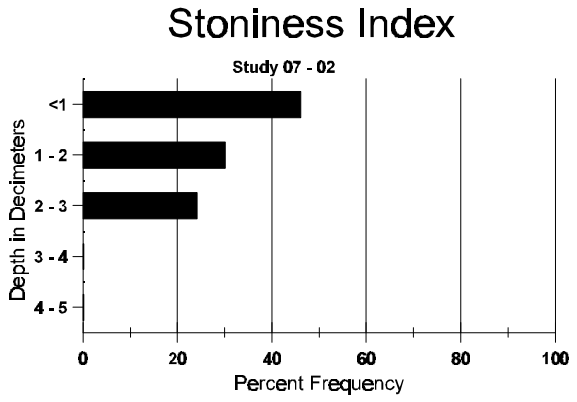
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	27	1.41
B	Artemisia tridentata vaseyana	17	.68
B	Cercocarpus montanus	35	3.99
B	Gutierrezia sarothrae	3	.18
B	Mahonia repens	3	.15
B	Purshia tridentata	4	1.14
B	Quercus gambelii	1	.33
B	Symphoricarpos oreophilus	19	2.37
Total for Browse		109	10.26

BASIC COVER --
Herd unit 07, Study no: 2

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	375	3.50	9.50	43.43
Rock	284	23.00	25.25	17.19
Pavement	222	8.25	4.00	6.61
Litter	393	45.75	40.00	41.18
Cryptogams	33	1.75	0	.39
Bare Ground	249	17.75	21.25	14.82

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 2

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.9	60.3 (11.0)	7.7	40.6	32.4	27.0	3.8	8.4	89.6	.8



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 2

Type	Quadrat Frequency '96
Elk	32
Deer	11

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	1	-	2	-	-	-	-	-	-	2	-	1	-	200			3
	90	4	-	-	2	-	-	2	-	-	8	-	-	-	533			8
	96	11	10	-	-	-	-	-	-	-	21	-	-	-	420			21
M	84	-	1	2	-	-	-	-	-	-	2	-	1	-	200	27	21	3
	90	-	3	3	-	-	-	2	-	1	9	-	-	-	600	22	22	9
	96	-	7	4	5	8	1	-	-	-	25	-	-	-	500	29	37	25
D	84	-	-	11	-	-	-	-	-	-	2	-	7	2	733			11
	90	-	-	1	-	1	-	-	-	-	2	-	-	-	133			2
	96	-	-	1	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		1133	Dec:		65%
													'90		1266			11%
													'96		940			2%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Artemisia tridentata vaseyana																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	6	1	-	-	-	-	-	-	-	7	-	-	-	140			7
M	84	-	-	1	-	-	-	-	-	-	1	-	-	-	66	24	20	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	4	-	-	1	-	-	-	-	8	-	-	-	160	21	31	8
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	2	-	1	1	-	-	-	-	2	-	-	2	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	160			8
Total Plants/Acre (excluding Dead & Seedlings)														'84	132	Dec:		50%
														'90	66			100%
														'96	380			21%
Cercocarpus montanus																		
Y	84	7	-	-	-	-	-	-	-	-	7	-	-	-	466			7
	90	3	2	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	6	3	-	-	1	-	-	-	-	10	-	-	-	200			10
M	84	-	-	5	-	-	1	-	-	-	6	-	-	-	400	46	28	6
	90	-	-	4	-	-	-	-	-	-	4	-	-	-	266	42	27	4
	96	-	9	12	-	4	3	-	-	-	23	5	-	-	560	34	40	28
D	84	-	-	3	-	-	-	-	-	-	3	-	-	-	200			3
	90	-	-	5	-	-	-	-	-	-	5	-	-	-	333			5
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)														'84	1066	Dec:		19%
														'90	932			36%
														'96	780			3%
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	14	21	0
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	0			-
Gutierrezia sarothrae																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140	7	10	7
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	140			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	129	-	-	-	-	-	-	-	-	129	-	-	-	8600			129
	90	72	-	-	-	-	-	-	-	-	72	-	-	-	4800			72
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	83	-	-	-	-	-	2	-	-	85	-	-	-	5666	4	4	85
	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	4	5	15
Total Plants/Acre (excluding Dead & Seedlings)													'84		8600	Dec:		-
													'90		10466			-
													'96		380			-
Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	9	3	-	-	-	-	-	-	12	-	-	-	240	19	47	12
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		240			-
Quercus gambelii																		
Y	84	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	90	8	9	-	-	-	-	1	-	-	18	-	-	-	1200			18
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	2	5	12	-	-	2	-	-	-	21	-	-	-	1400	47	19	21
	90	1	10	-	-	-	-	-	-	-	11	-	-	-	733	43	29	11
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	64	65	0
D	84	-	-	3	-	-	3	-	-	-	6	-	-	-	400			6
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		2200	Dec:		18%
													'90		1933			0%
													'96		20			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
Y	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	96	7	-	-	1	-	-	-	-	-	8	-	-	-	160			8
M	84	2	12	1	-	-	-	-	-	-	15	-	-	-	1000	22	23	15
	90	7	8	-	2	-	-	-	-	-	17	-	-	-	1133	21	26	17
	96	12	8	-	2	-	-	-	-	-	22	-	-	-	440	18	33	22
D	84	-	3	2	-	-	-	-	-	-	5	-	-	-	333			5
	90	3	6	-	-	-	-	1	-	-	9	-	-	1	666			10
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		1533	Dec:		22%
													'90		2199			30%
													'96		600			0%

TREND STUDY 7-3-96 (old 20-7)

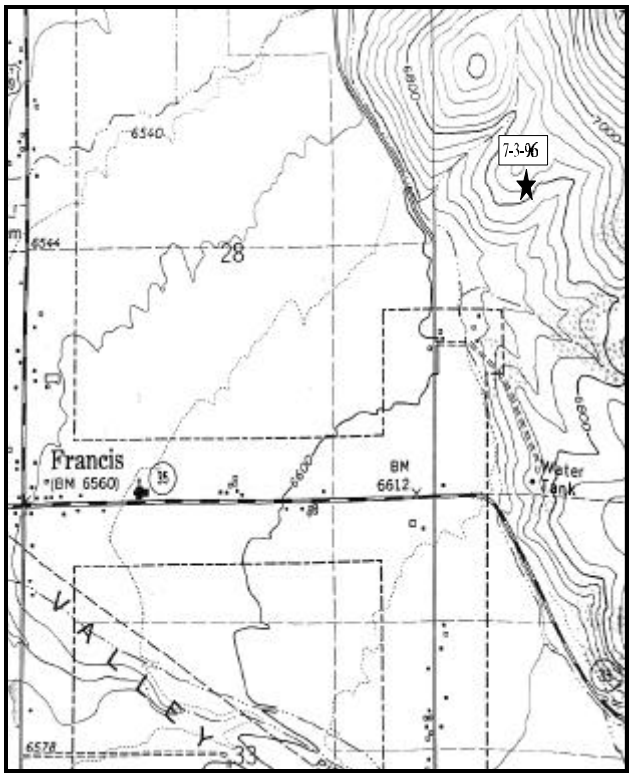
Study site name: Foothill Drive. Range type: Sagebrush/grass.

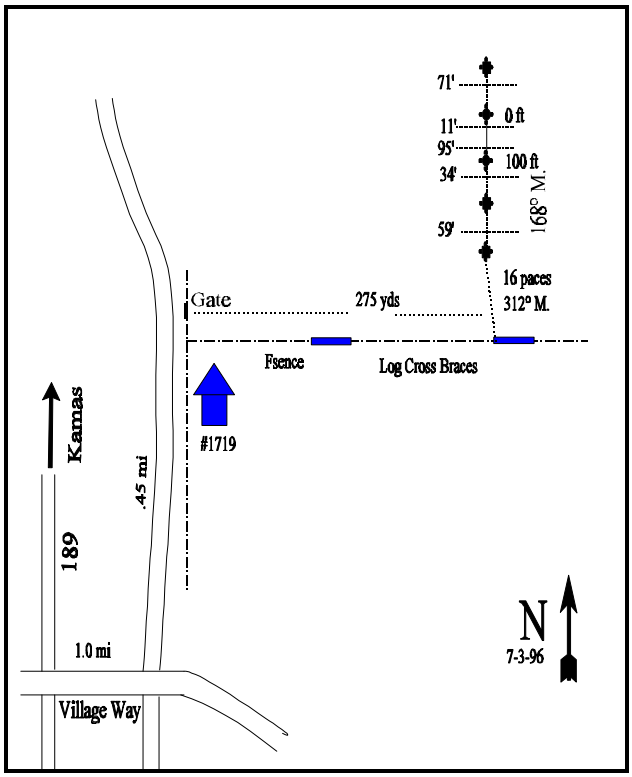
Compass bearing: frequency baseline 168 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

At the junction of 189 and Village Way in Francis, proceed east for 1.0 miles. Turn left (north) onto Foothill Drive, and proceed 0.45 miles to house #1719 on the right. Park here and walk east along the east-west running fence, just north of the house, for approximately 275 yards to the second large log cross-brace on the fence. Walk 16 paces at 312 degrees magnetic to the 300-foot baseline stake. Three hundred feet to the north at a bearing of 348 degrees magnetic is the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7958. The first 300 feet of the baseline runs 168 degrees magnetic. Line 4 runs off the 0-foot baseline stake at a bearing of 348 degrees magnetic.





Map Name: Francis Diagrammatic Sketch

Township 2S, Range 6E, Section 27, UTM COOR: 4-78-219E 44-96-564N

DISCUSSION

Trend Study No. 7-3 (20-7)

The Foothill Drive study site lies southeast of Kamas on critical deer winter range located north of the Provo River. This is an area that extends from Kamas to the southeast to where the river branches into north and south forks. The vegetational aspect is mixed mountain brush. The site samples a more open mountain big sagebrush/grass ridge, that is surrounded by adjacent ridges dominated by Gambel oakbrush. The intermix of sagebrush/grass and Gambel oakbrush dominants the Kamas area. Slopes in the study area are south facing and are moderately (35%) steep with an elevation of 6,680 feet to 6,880 feet.

Animal use during winter comes from deer and to a lesser extent elk. Domestic cattle use the area in spring and summer. The overall intensity of forage use has been heavy in the past and the impact of grazing and browsing animals is evident, along with drought since 1986. The field crew in 1984 observed seven winter-killed deer in the immediate study area.

Soil appears moderately shallow, with a very rocky surface (34% cover) and profile which is well drained. Effective rooting depth is about 9 inches (refer to methods section). Soil texture is classified as a clay-loam with a slightly acidic pH of 6.4. Vegetative and litter cover are moderate to good. As noted earlier, exposed rock is a significant cover category. At the bottom of the slope, protective cover is poor and there is noticeable trampling damage from cattle. Soil erosion is not a problem because of the moderate slopes and the rocky, permeable character of the soil.

This area initially contained a moderately dense stand of heavily utilized and decadent mountain big sagebrush. In 1984, 84% of the population was classified as heavily browsed. Currently, only 2% are heavily utilized. Vigor has greatly improved and percent decadence has decreased from 89% to 20%. The population has obviously thinned out (36% are dead) with the extended drought (1985-1994), but appears to have stabilized at almost 1,200 plants per acre. Other browse includes broom snakeweed, Oregon hollygrape, Woods rose, dwarf rabbitbrush, and isolated plants of Saskatoon serviceberry. Mountain big sagebrush appeared to be on the way out in 1984 and 1990 with increasers such as snakeweed and hollygrape appearing to become more dominant. This has not occurred.

Grasses and forbs are currently abundant and could become the dominant vegetative component with further drought and/fire. Species such as Kentucky bluegrass, annual owlclover, cheatgrass brome, thistle, low fleabane daisy, and storksbill are all very abundant with some of the more weedy species showing increases since 1984.

1984 APPARENT TREND ASSESSMENT

Although some erosion is discernible in the area, it is within acceptable limits. Erosion is not a significant factor affecting the potential plant community. Soil trend is basically stable. Vegetative trend on the lower parts of the site and the more favorable exposures is down. This is part of the site that was sampled by the 1977 line intercept and the newer frequency-density study. This area is very quickly losing it's mountain big sagebrush component. Photo point comparisons, line intercept comparisons and the frequency-density data all point to a continuing decline of mountain big sagebrush and a concurrent increase of herbaceous plants, especially Kentucky bluegrass and a variety of forbs. On the upper areas (i.e., above 6,800 feet) this trend is not so noticeable and deer use is markedly less. Presumable, snow depth is great enough to discourage the heavier use occurring on the upper slope.

1990 TREND ASSESSMENT

This study is located on a sagebrush slope above a privately-owned pasture. Mountain big sagebrush is the key species for deer on this critical winter range. The 1984 reading on the site found a highly decadent (85%) and declining population. In 1990, although there are still dying shrubs, it appears that the sagebrush population is stabilizing. There is an abundance of sagebrush seedlings (43%). There was an increase in the number of moderately hedged mature shrubs and 44% were classified as decadent. In 1984, 84% of the mature sagebrush were classified as heavily hedged with 89% classified as decadent. The 1990 classifications put a majority of the sagebrush in form class 1, lightly hedged, and only 8% in form class 3. Sagebrush cover is variable, but averages 6% across the site. One negative change since 1984 is the great increase in the frequency and density of broom snakeweed. Nested frequency of Kentucky bluegrass declined significantly with the extended drought. There was an increase in forb nested frequency for thistle and showy goldeneye. The percentage of surface rock cover has increased, indicating some continued soil movement.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slight decline

1996 TREND ASSESSMENT

The soil trend is stable to improving with decreased values for percent bare ground and with almost 75% of the vegetative cover coming as herbaceous species which is more protective for the soil. The major drawback is that most of the herbaceous cover is provided by “weedy species.” These species provide high amounts of fine fuel that could provide the impetus for a destructive wildfire where all the sagebrush could be lost. The browse trend is limited to only one species, mountain big sagebrush. It has decreased significantly in height and numbers, but it now appears to have stabilized with improved vigor and decreased decadence. All these parameters indicate a now stable population. The herbaceous understory is basically made up of weedy increasers. Annuals and biennials dominate this site. Trend for perennial grasses and forbs is slightly down with continued drought.

TREND ASSESSMENT
soil - improving
browse - stable
herbaceous understory - slightly down for perennial species

HERBACEOUS TRENDS --
Herd unit 07, Study no: 3

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % ‘96
G	Agropyron spicatum	14	17	19	5	9	7	.30
G	Bromus japonicus (a)	-	-	150	-	-	46	2.35
G	Bromus tectorum (a)	-	-	298	-	-	88	10.20
G	Poa pratensis	[a]138	[b]91	[b]54	50	36	25	1.06
G	Poa secunda	48	41	59	24	18	25	1.25
Total for Grasses		200	149	580	79	63	191	15.17

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
F	Antennaria rosea	-	3	-	-	1	-	-
F	Artemisia ludoviciana	$_{a}$10	$_{ab}$28	$_{b}$36	4	12	15	2.03
F	Aster spp.	5	-	3	3	-	1	.03
F	Astragalus spp.	$_{a}$9	$_{b}$-	$_{b}$-	4	-	-	-
F	Cirsium spp.	$_{a}$51	$_{b}$94	$_{a}$47	30	43	20	1.09
F	Comandra pallida	3	-	-	1	-	-	-
F	Crepis acuminata	1	-	-	1	-	-	-
F	Cryptantha spp.	10	3	1	5	2	1	.00
F	Draba spp. (a)	-	-	2	-	-	1	.00
F	Epilobium paniculatum	-	-	164	-	-	61	2.44
F	Erodium cicutarium (a)	$_{a}$18	$_{b}$-	$_{a}$20	7	-	10	.27
F	Erigeron pumilus	$_{a}$-	$_{b}$37	$_{c}$11	-	18	7	.40
F	Eriogonum racemosum	9	6	9	4	2	5	.13
F	Heterotheca villosa	$_{a}$-	$_{b}$15	$_{b}$31	-	8	13	1.60
F	Holosteum umbellatum (a)	-	-	59	-	-	23	.44
F	Lactuca serriola	$_{a}$-	$_{b}$7	$_{b}$22	-	4	9	.07
F	Lepidium spp. (a)	-	-	38	-	-	18	.16
F	Lupinus sericeus	$_{a}$15	$_{a}$12	$_{b}$-	7	8	-	.00
F	Machaeranthera canescens	2	-	-	2	-	-	-
F	Polygonum douglasii (a)	-	-	17	-	-	9	.04
F	Potentilla spp.	-	-	2	-	-	1	.00
F	Sphaeralcea grossulariaefolia	-	-	1	-	-	1	.00
F	Tragopogon dubius	3	2	11	3	2	6	.05
F	Verbascum thapsus	-	-	5	-	-	2	.33
F	Viguiera multiflora	$_{a}$3	$_{b}$63	$_{c}$115	3	31	51	3.50
Total for Forbs		139	270	594	74	131	254	12.64

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 3

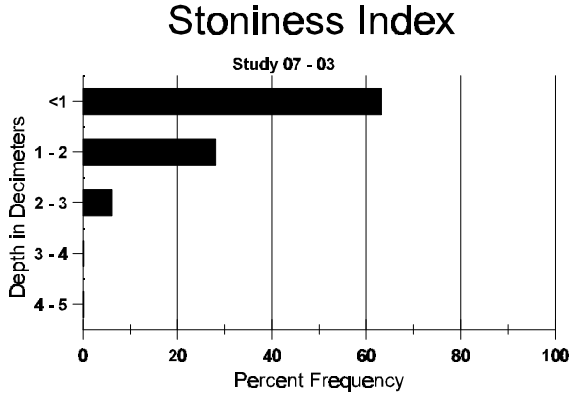
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	1	.15
B	Artemisia tridentata vaseyana	42	5.77
B	Chrysothamnus depressus	3	.03
B	Gutierrezia sarothrae	52	2.41
B	Mahonia repens	28	.42
B	Opuntia spp.	13	.21
B	Rosa woodsii	6	.59
Total for Browse		145	9.60

BASIC COVER --
Herd unit 07, Study no: 3

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	368	3.00	5.50	40.96
Rock	336	29.00	34.25	32.87
Pavement	145	1.00	2.50	1.21
Litter	377	52.50	50.50	41.41
Cryptogams	28	.75	.75	.31
Bare Ground	129	13.75	6.50	1.34

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 3

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.0	57.4 (9.8)	6.4	42.2	29.1	28.7	5.0	27.4	243.2	.6



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 3

Type	Quadrat Frequency '96
Deer	23
Cattle	7

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	19	29	1
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		33	Dec:		100%
													'90		33			0%
													'96		20			0%
Artemisia tridentata vaseyana																		
S	84	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	90	25	-	-	-	-	-	-	-	-	25	-	-	-	833			25
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	6	-	-	-	-	-	-	-	-	6	-	-	-	200			6
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	-	1	4	-	-	-	-	-	-	5	-	-	-	166	15	13	5
	90	13	12	1	-	-	-	-	-	-	25	1	-	-	866	27	28	26
	96	27	13	1	-	-	-	-	-	-	41	-	-	-	820	18	34	41
D	84	-	7	37	-	-	-	-	-	-	28	-	8	8	1466			44
	90	6	17	3	-	-	-	-	-	-	18	4	-	4	866			26
	96	6	6	-	-	-	-	-	-	-	12	-	-	-	240			12
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	660			33
Total Plants/Acre (excluding Dead & Seedlings)													'84		1632	Dec:		90%
													'90		1932			45%
													'96		1180			20%
Chrysothamnus depressus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	1	-	-	-	-	-	-	-	4	-	-	-	80	9	18	4
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		80			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	110	-	-	-	-	-	-	-	-	110	-	-	-	3666			110
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	84	33	-	-	-	-	-	-	-	-	33	-	-	-	1100	9	12	33
	90	208	-	-	-	-	-	-	-	-	208	-	-	-	6933	9	13	208
	96	209	-	-	-	-	-	-	-	-	209	-	-	-	4180	9	12	209
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		1100	Dec:		-
													'90		10599			-
													'96		4360			-
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	1	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	28	-	-	-	-	-	-	-	-	28	-	-	-	933			28
	90	34	-	-	-	-	-	-	-	-	11	23	-	-	1133			34
	96	18	-	-	-	-	-	-	-	-	18	-	-	-	360			18
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	133	4	3	4
	96	143	-	-	2	-	-	-	-	-	145	-	-	-	2900	5	8	145
Total Plants/Acre (excluding Dead & Seedlings)													'84		933	Dec:		-
													'90		1266			-
													'96		3260			-
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	8	-	-	-	-	-	-	-	-	8	-	-	-	266	4	6	8
	90	4	-	-	-	-	-	-	-	-	4	-	-	-	133	4	9	4
	96	17	-	-	-	-	-	-	-	-	17	-	-	-	340	5	11	17
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		366	Dec:		0%
													'90		166			20%
													'96		400			5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Rosa woodsii																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	25	-	-	-	-	-	-	-	-	25	-	-	-	500			25
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560	16	18	28
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		1060			-

TREND STUDY 7-4-96 (old 20-9)

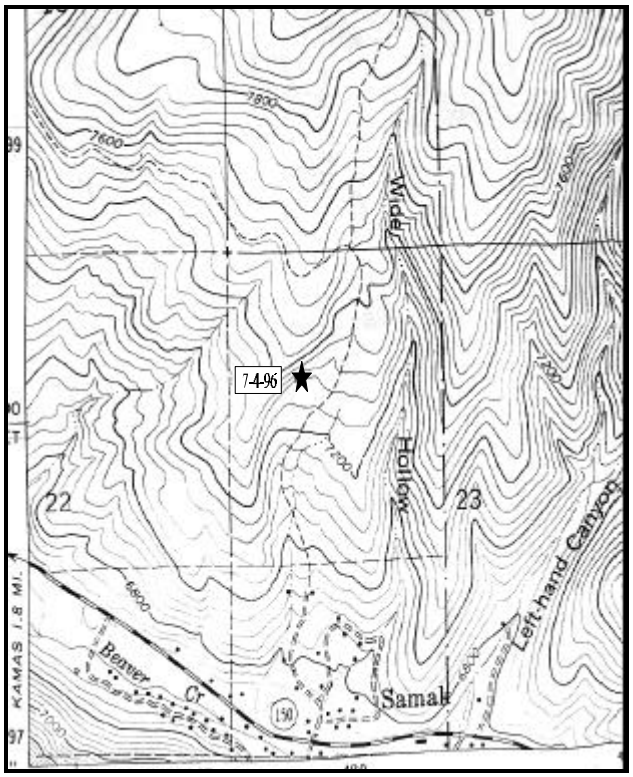
Study site name: Above Samak. Range type: Mixed mountain brush.

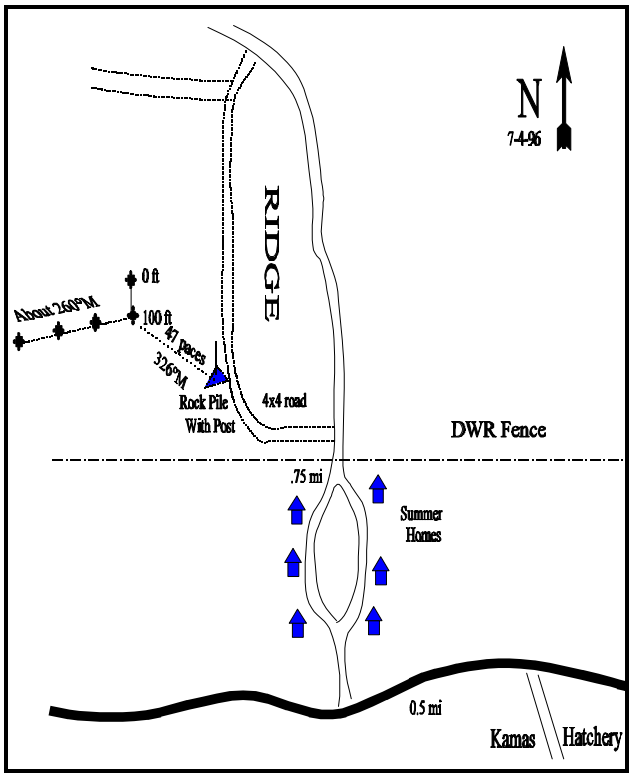
Compass bearing: frequency baseline 180 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

From the Kamas fish hatchery proceed west for 0.5 miles, turn right onto a dirt road and proceed north. The road will split (go left) around the summer houses and reunite in 0.2 miles. After passing the homes, you will come to a DWR fence and gate. Proceed 0.1 miles past the gate and turn left, proceeding up a very steep hill (4X4 recommended). After reaching the top, proceed north until you see a green steel stake in a rock pile on the left. The rock pile is 0.75 miles from the highway. From the rock pile, walk 47 paces at 326 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7959. The rest of the baseline doglegs at the 100-foot baseline stake and runs 260 degrees magnetic.





Map Name: Hoyt Peak Diagrammatic Sketch

Township 2S, Range 6E, Section 22, UTM COOR: 4-79-666E 44-98-277N

DISCUSSION

Trend Study No. 7-4 (20-9)

This study site is located on Division of Wildlife Resources property above Samak in Beaver Creek Canyon. The site is at a moderately high elevation (7,200-7,400 feet) with a slope of 35%. It was a deer and elk winter range that was burned and seeded in the early 1960's. Originally the community was dominated by Gambel oakbrush with some mixed mountain brush species and little herbaceous cover. The site is now made up of scattered openings of mixed mountain brush and grass within Gambel oak clones. The seeded wheat grasses, smooth brome, and alfalfa together still dominate the herbaceous understory by contributing 87% of the total herbaceous cover. The root-sprouting and/or fire-tolerant shrub, Gambel oak, have regained much of their former vigor, but the interspersed openings still remain somewhat open because the competitive, sod-forming, shade tolerant grasses which provide 74% of the herbaceous cover. Animal use is quite variable, depending on wintering conditions. There was moderate to heavy use on all browse species in 1984. Use included deer, elk, and domestic cattle. With the milder winters since then, use is more light to moderate. The two low density key species, serviceberry and bitterbrush, still show signs of heavy use.

Soil is very rocky and well-drained with high permeability. Surface rock cover is moderately high at 21%, but percent bare ground is low at 10%. Effective rooting depth is almost 16 inches (see methods section). The soil texture is classified as a clay loam with a neutral pH of 6.8. With the high amounts of rock in the upper soil profile, slope (35%), and aspect, this site could get rather dry during the summer. Litter and vegetative cover are good which can help prevent serious erosion. Some "trailing" and trampling damage associated with livestock use is apparent but is not serious.

Browse composition consists of a mix of Gambel oakbrush, mountain snowberry, mountain big sagebrush, Saskatoon serviceberry and several less numerous shrubs. Although Oregon hollygrape is easily the most numerous species, it only makes up 6% of the total browse cover. Gambel oakbrush could eventually become the ecological dominant species with suppression of fire or excessive grazing. The oak population consists of a preponderance of seedling and young plants which in the future could become more dominant. Other shrub populations are also vigorous and expanding, but at much slower rates. Browse utilization is heaviest on serviceberry and bitterbrush. Mountain big sagebrush currently only shows light to moderate use with good vigor and low decadence (6%), while providing 39% of the total browse cover. Gambel oakbrush shows relatively light use, some of which is current summer use.

Herbaceous composition is dominated by seeded grasses. Smooth brome, crested wheatgrass and intermediate wheatgrass are all very common contributing to 76% of the total herbaceous cover. Grasses showed evidence of rather heavy grazing in the past, but currently show little use. It also helps that this summer (1996) was above average for precipitation. In spite of grazing pressure, the grasses appear to be quite stable and show that they are slowly increasing in the oak interspaces. Alfalfa and low penstemon are the most abundant forbs.

1984 APPARENT TREND ASSESSMENT

Soil trend is stable or even improving. This area has a very rocky, well-drained soil with a good cover of vegetation, litter, and rock. During the period 1977 to 1984, there appears to have been some improvement in vegetative cover. The apparent erosion rate is minimal. Depending upon location, vegetative trend is stable to improving. On previously unburned sites, mature oakbrush prevails over a good grass-forb understory. These sites will likely remain much as they are today. The burned areas still have developing oak and other browse populations.

Oak, however, is the likely dominant. Grasses and forbs seem relatively stable. Seeded grasses seem especially persistent and will continue to provide the bulk of livestock and early spring big game forage.

1990 TREND ASSESSMENT

The data indicates several changes in the mountain big sagebrush population on the Division land above Samak. There has been a significant decline in sagebrush abundance (from 2,399 plants/acre to 1,665 plants/acre). There are few seedlings and young. It appears that hedging is generally lighter. The reduced vigor and increased percentage of decadent plants is most likely related to moisture stress (extended drought) and competition. Sagebrush cover averages about 9%. Oakbrush has not expanded, although there are a large number of young sprouts. Grass abundance is high due to the abundance of seeded grasses. Grass species identification was difficult due to heavy utilization before the study reading date in mid-September. Total sum of nested frequency for grasses was higher. Misidentified as clover in 1984, the frequency and density of alfalfa is unchanged and it remains, along with low penstemon, the most common perennial forb. There were slight shifts in the relative percentages of litter and basal vegetative cover, but the percentage of bare soil is unchanged.

TREND ASSESSMENT
soil - stable
browse - declining for sagebrush
herbaceous understory - stable

1996 TREND ASSESSMENT

The trend for soil is greatly improved with percent bare ground now less than 10% and the nested frequency for grasses and forbs showing substantial increases. As on other sites, the key browse species (mountain big sagebrush) is now stable at a lower density because of the prolonged drought. Vigor is improved and percent decadence is only 6%. Browse trend in stable at this time. The herbaceous understory has improved slightly with increased sum of nested frequency values for both grasses and forbs. There is no cheatgrass on this site.

TREND ASSESSMENT
soil - improving
browse - stable
herbaceous understory - up slightly

HERBACEOUS TRENDS --
Herd unit 07, Study no: 4

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron cristatum	$_{ab}$117	$_{a}$100	$_{b}$145	55	45	51	5.53
G	Agropyron intermedium	$_{a}$55	$_{a}$47	$_{b}$103	28	28	39	4.07
G	Agropyron spicatum	26	20	16	10	9	9	.46
G	Bromus inermis	243	267	249	85	85	78	12.64
G	Poa bulbosa	-	-	3	-	-	1	.00
G	Poa fendleriana	$_{a}$-	$_{b}$20	$_{a}$1	-	8	1	.00
G	Poa pratensis	-	4	-	-	1	-	-
G	Poa secunda	3	8	7	2	4	5	.10
G	Stipa lettermani	-	7	-	-	3	-	-
Total for Grasses		444	473	524	180	183	184	22.83
F	Achillea millefolium	5	4	1	2	3	1	.06
F	Allium acuminatum	$_{ab}$10	$_{a}$18	$_{b}$6	6	11	3	.04
F	Arabis spp.	-	4	4	-	3	3	.04
F	Astragalus convallarius	3	2	6	1	1	2	.06
F	Chaenactis douglasii	-	-	1	-	-	1	.00
F	Cirsium spp.	1	6	-	1	2	-	-
F	Collinsia parviflora (a)	-	-	31	-	-	14	.14
F	Cryptantha spp.	$_{a}$20	$_{b}$-	$_{b}$-	8	-	-	-
F	Erigeron pumilus	15	10	15	7	5	7	.13
F	Machaeranthera canescens	$_{a}$35	$_{b}$6	$_{b}$4	17	3	3	.04
F	Medicago sativa	42	40	55	18	19	29	2.96
F	Penstemon humilis	55	55	55	23	25	23	1.02
F	Petradoria pumila	$_{a}$-	$_{a}$-	$_{b}$25	-	-	10	1.08
F	Phlox longifolia	-	8	2	-	3	1	.00
F	Polygonum douglasii (a)	-	-	21	-	-	8	.04
F	Ranunculus testiculatus (a)	-	-	21	-	-	9	.07
F	Senecio spp.	-	2	-	-	1	-	-
F	Veronica biloba (a)	-	-	117	-	-	47	.46
F	Zigadenus paniculatus	-	2	4	-	2	4	.09
Total for Forbs		186	157	368	83	78	165	6.27

Values with different subscript letters are significantly different at % = 0.10
(annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 4

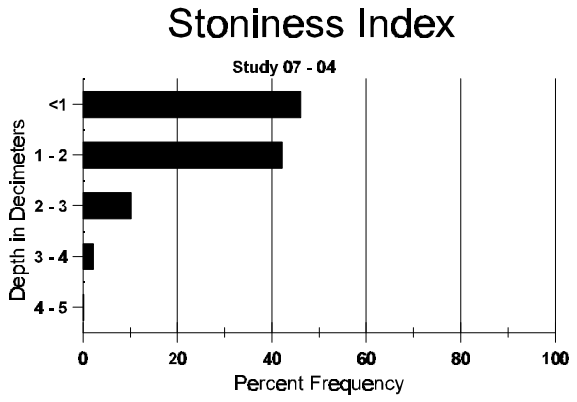
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	13	1.27
B	Artemisia tridentata vaseyana	39	6.27
B	Chrysothamnus viscidiflorus viscidiflorus	3	.12
B	Mahonia repens	34	.90
B	Purshia tridentata	1	.03
B	Quercus gambelii	19	3.82
B	Symphoricarpos oreophilus	29	3.82
Total for Browse		138	16.25

BASIC COVER --
Herd unit 07, Study no: 4

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	366	5.00	11.00	44.96
Rock	254	12.50	13.25	16.81
Pavement	177	9.25	15.00	3.97
Litter	393	54.75	40.50	45.09
Cryptogams	38	0	.75	.66
Bare Ground	221	18.50	19.50	9.90

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 4

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.6	N/A (N/A)	6.8	25.3	38.7	36.0	4.7	13.4	147.2	0.57



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 4

Type	Quadrat Frequency '96
Elk	8
Deer	12
Cattle	3

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	2	-	-	2	-	-	-	133			2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	1	1	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	1	5	-	-	-	-	-	-	6	-	-	-	400	40	37	6
	90	-	-	2	-	-	-	-	-	-	2	-	-	-	133	34	30	2
	96	1	-	7	1	1	1	-	-	-	11	-	-	-	220	31	43	11
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	2	-	1	-	-	-	-	2	-	-	1	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		466	Dec:		0%
													'90		332			20%
													'96		280			21%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	10	-	-	-	-	-	-	-	10	-	-	-	666			10
	90	-	1	-	1	-	-	-	-	-	2	-	-	-	133			2
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	10	11	-	-	-	-	-	-	21	-	-	-	1400	20	29	21
	90	6	10	-	-	-	-	-	-	-	13	1	2	-	1066	19	23	16
	96	19	36	4	-	-	-	-	-	-	59	-	-	-	1180	21	35	59
D	84	-	2	3	-	-	-	-	-	-	5	-	-	-	333			5
	90	3	2	2	-	-	-	-	-	-	6	-	-	1	466			7
	96	-	4	-	-	-	-	-	-	-	4	-	-	-	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	280			14
Total Plants/Acre (excluding Dead & Seedlings)													'84		2399	Dec:		14%
													'90		1665			28%
													'96		1320			6%
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	12	17	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		60			-
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	59	-	-	3	-	-	1	-	-	63	-	-	-	4200			63
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	84	237	-	-	-	-	-	-	-	-	237	-	-	-	15800	4	6	237
	90	5	-	-	6	-	-	1	-	-	12	-	-	-	800	4	5	12
	96	139	-	-	-	-	-	-	-	-	139	-	-	-	2780	3	5	139
Total Plants/Acre (excluding Dead & Seedlings)													'84		15800	Dec:		-
													'90		5000			-
													'96		2880			-
Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20	11	41	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	84	46	-	-	-	-	-	-	-	-	46	-	-	-	3066			46
	90	47	2	-	11	-	-	3	-	-	59	2	2	-	4200			63
	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
Y	84	32	118	-	-	-	-	-	-	-	150	-	-	-	10000			150
	90	90	13	-	23	-	-	-	-	-	115	11	-	-	8400			126
	96	29	6	-	-	-	-	-	-	-	35	-	-	-	700			35
M	84	-	23	16	-	-	-	-	-	-	39	-	-	-	2600	47	37	39
	90	2	9	-	2	-	-	-	-	-	13	-	-	-	866	58	29	13
	96	21	10	-	-	-	-	-	-	-	31	-	-	-	620	31	25	31
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	19	3	-	1	-	-	-	-	-	17	1	3	2	1533			23
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	200			10
Total Plants/Acre (excluding Dead & Seedlings)													'84		12600	Dec:		0%
													'90		10799			14%
													'96		1360			3%
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	-	14	-	-	-	-	-	-	-	14	-	-	-	933	18	29	14
	90	3	4	2	11	-	-	-	-	-	17	-	3	-	1333	14	15	20
	96	17	21	1	7	-	-	-	-	-	46	-	-	-	920	16	31	46
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	3	2	-	3	-	-	-	-	-	1	-	3	4	533			8
	96	-	2	6	-	-	-	-	-	-	4	-	-	4	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'84		1066	Dec:		0%
													'90		1999			27%
													'96		1200			13%

TREND STUDY 7-5-96 (old 20-10)

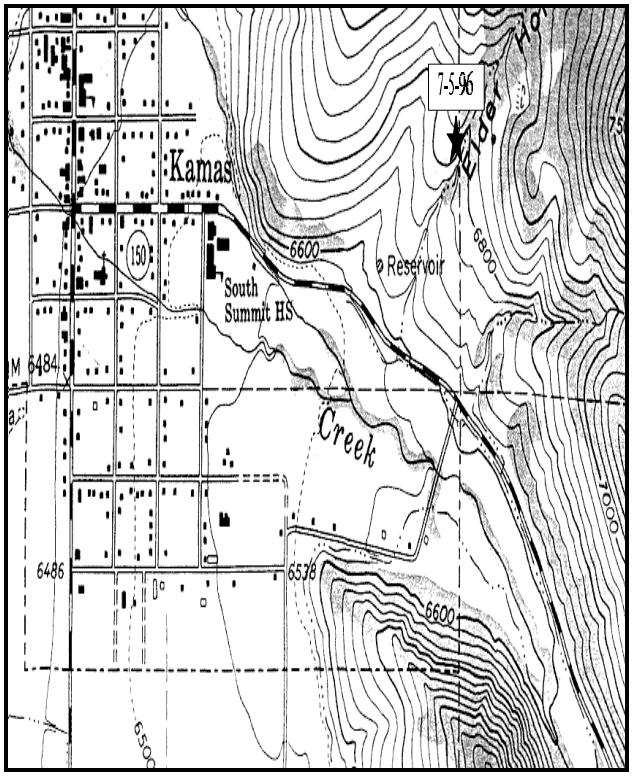
Study site name: Kamas Water Tanks. Range type: Sagebrush/grass.

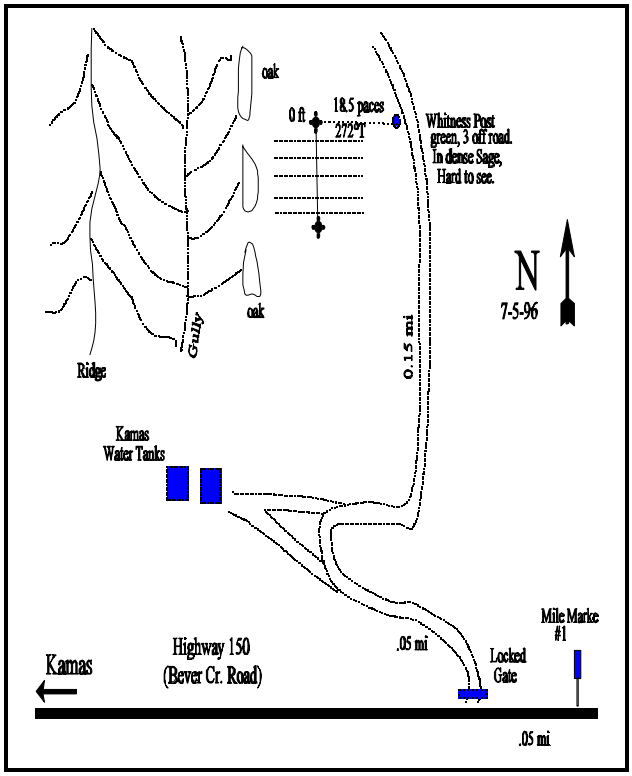
Compass bearing: frequency baseline 190 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11, 34, 59, 71, & 95ft).

LOCATION DESCRIPTION

From mile marker 1 on Highway 150 (Beaver Creek) east of Kamas, proceed 0.05 miles to a locked gate on the right. Contact the Wildlife Biologist in the area to obtain a key. The site can also be reached by walking. Proceed through the gate, turn left, travel 0.05 miles, turn right, travel 0.05 miles, bear right, and travel 0.15 miles to green steel stake on the left. The post is in dense sagebrush 3 feet from road. From the post, walk 18.5 paces at 272 degrees true to the 0-foot stake of the baseline marked with browse tag #7963. All five belts were read on the 100 foot baseline. After the site was read, the site was moved to the other side of the road in a better location.





Map Name: Kamas Diagrammatic Sketch

Township 2S, Range 6E, Section 15, UTM COOR: 4-78-144E 44-99-257N

DISCUSSION

Trend Study No. 7-5 (20-10)

The Kamas Water Tank site samples critical deer winter range located immediately east of Kamas. This is a privately owned site that for many years has been intensively grazed by sheep, cattle and horses. The range type is mountain big sagebrush/grass that also contains a scattering of other shrub species. Elevation is approximately 6,880 feet. Deer use is reportedly heavy, however, few pellet groups are present and form class analysis of the key browse species indicates only light to moderate use at this time. Slope is gentle (10%) and faces west. When this site was revisited in 1996, it was for sale. Knowing that this area is important as critical winter range, the study site was moved up the ridge so that the site could be accessed in the future. Furthermore, there was little sign that the site was used by wildlife, whereas the new site had abundant indications of use and is actually a better site. The discussion that follows is on the "old" site data which will be dropped in favor of the new and better site. The "new" site data will be discussed at the end of this section as the Kamas Water Tanks site (7-10).

Soil is a deep alluvial deposit that is moderately rocky but otherwise is fine, sandy texture. Growth potential appears good as sagebrush attains good height and vigor. Rooting depth should not be a limiting factor. Soil erosion is not a serious problem on this site.

The study samples a dense mountain big sagebrush/grass area with an understory dominated by Kentucky bluegrass and patches of cheatgrass brome. This high amount of bluegrass, which has been increasing since 1984, is an indicator of continuous, heavy livestock grazing pressure. Browse composition also includes a fair amount of mountain snowberry, stickyleaf low rabbitbrush, and isolated plants of antelope bitterbrush, Saskatoon serviceberry, black chokecherry, true mountain mahogany, and Gambel oak. The key species for this site is mountain big sagebrush. It's population consists of a variety of age classes, which indicates a rather stable situation. At first glance, there appears to be only mature and decadent plants because these are so large and visible. Closer examination reveals the presence of adequate seedlings and young plants. Previously it was thought that there were excessive numbers of decadent plants, but percent decadency has gone from a high of 48% in 1984 to only 8% in 1996. The years of continuous drought have affected most of the state's sagebrush population. The population is now recovering from drought and appears to be stable at this time. Forage utilization is generally moderate.

Understory growth is limited because of the vigor, size, and density of mountain big sagebrush. Although several grass species occur on the site, easily the most important is Kentucky bluegrass. This aggressive increaser and sod-former has good vigor and will probably fluctuate in abundance inversely with big sagebrush density, cover and drought. Forbs are a minor component on this site and provide very little forage or cover.

1984 APPARENT TREND ASSESSMENT

This area has a stable soil and vegetative trend. Soil erosion is minimal and no great change in cover has occurred since the old line-intercept studies of 1977. There has not been a decline in ground cover. Vegetatively, the site has remained fairly stable and most of the data suggests that it will continue to do so. Keep in mind, however, that this assessment applies only to the study area proper. On nearby steeper and drier sites, our opinion is that big sagebrush is in much poorer shape. From our data, the clearest trends to emerge were a slight loss of big sagebrush on one sampling line of the line intercept and an apparent increase of Kentucky bluegrass.

1990 TREND ASSESSMENT

There have been no significant deviations from the trends assessed in 1984. Data on the key browse species, mountain big sagebrush, still illustrates a dense stand with an abnormally high turnover. Total sagebrush density is less than in 1984, due to a 25% decline in the numbers of mature sage. However, there is an increase in seedling and young plants. The sagebrush retain a moderately hedged growth form. The 44% decadent plants in the population are related more to intraspecific competition and the continuing drought. Due to decadence and competition, the site potential is not being reached for sagebrush production and herbaceous forage. Sagebrush canopy cover on the site is 36%, higher than on most of the area. The 1990 reading found an increased frequency and density of Kentucky bluegrass, and also a higher diversity of other grasses and forbs. The herbaceous understory provides excellent soil protection along with good litter cover.

TREND ASSESSMENT
soil - stable
browse - declining
herbaceous understory - stable

1996 TREND ASSESSMENT

The soil trend is stable with increased nested frequency values for both grasses and forbs which protect the soils better than cover from shrubs and trees. The key browse species for the site is mountain big sagebrush which still provides more than 70% of the browse cover even with the losses in numbers. The population appears stable at this time with good vigor, lower percent decadence, and with only 11% being classified as receiving heavy use. The herbaceous understory is greatly improved. This improvement has mostly been shown by the forb component.

TREND ASSESSMENT
soil - stable
browse - stable for sagebrush after a reduction in numbers from intraspecific competition and extended drought
herbaceous understory - improving

HERBACEOUS TRENDS --
Herd unit 07, Study no: 5

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96
G	Agropyron cristatum	-	1	-	-	1	-
G	Agropyron dasystachyum	7	13	5	3	5	2
G	Agropyron intermedium	-	-	13	-	-	4
G	Agropyron trachycaulum	6	12	1	2	4	1
G	Bromus carinatus	3	-	4	1	-	2
G	Bromus tectorum (a)	-	-	24	-	-	9
G	Carex spp.	[a]-	[b]11	[a]-	-	5	-
G	Poa bulbosa	-	-	7	-	-	3
G	Poa fendleriana	-	1	-	-	1	-
G	Poa pratensis	[a]215	[a]248	[b]319	72	87	93
G	Poa secunda	8	8	7	3	4	3

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96
G	Sitanion hystrix	4	5	-	2	2	-
G	Stipa columbiana	$_{a}$2	$_{b}$8	$_{a}$1	1	6	1
Total for Grasses		245	307	381	84	115	118
F	Achillea millefolium	$_{a}$5	$_{b}$19	$_{ab}$14	2	8	5
F	Agoseris glauca	-	1	-	-	1	-
F	Alyssum alyssoides (a)	-	-	4	-	-	2
F	Arabis spp.	-	-	1	-	-	1
F	Aster chilensis	-	3	3	-	1	1
F	Astragalus tenellus	-	-	4	-	-	2
F	Calochortus nuttallii	4	3	3	2	2	1
F	Collinsia parviflora (a)	-	-	39	-	-	18
F	Crepis acuminata	$_{a}$-	$_{b}$12	$_{a}$-	-	4	-
F	Cryptantha spp.	1	-	-	1	-	-
F	Cynoglossum officinale	-	-	2	-	-	1
F	Epilobium paniculatum	-	-	80	-	-	32
F	Eriogonum racemosum	-	1	-	-	1	-
F	Hackelia patens	-	2	-	-	2	-
F	Holosteum umbellatum (a)	-	-	8	-	-	3
F	Lappula occidentalis (a)	-	-	6	-	-	3
F	Lepidium spp.	-	-	6	-	-	3
F	Lupinus argenteus	$_{a}$-	$_{a}$2	$_{b}$39	-	1	17
F	Machaeranthera canescens	-	3	3	-	1	1
F	Melilotus officinalis	-	1	-	-	1	-
F	Microsteris gracilis (a)	-	-	5	-	-	3
F	Penstemon humilis	2	-	-	1	-	-
F	Plantago major	5	-	-	3	-	-
F	Polygonum douglasii (a)	-	-	4	-	-	1
F	Ranunculus testiculatus (a)	-	-	29	-	-	13
F	Senecio integerrimus	-	2	-	-	2	-
F	Senecio multilobatus	-	1	-	-	1	-
F	Tragopogon dubius	3	8	9	1	6	6
F	Veronica biloba (a)	-	-	86	-	-	32
F	Viguiera multiflora	1	7	2	1	3	2
F	Zigadenus paniculatus	-	9	3	-	3	1
Total for Forbs		21	74	350	11	37	148

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS--
Herd unit 07, Study no: 5

Species	Strip Frequency '96
Amelanchier alnifolia	5
Artemisia tridentata vaseyana	59
Chrysothamnus viscidiflorus viscidiflorus	14
Mahonia repens	5
Prunus virginiana	1
Quercus gambelii	2
Symphoricarpos oreophilus	24
Tetradymia canescens	1

BASIC COVER --
Herd unit 07, Study no: 5

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	361	2.25	10.75	41.71
Rock	213	5.25	5.25	6.12
Pavement	239	10.00	12.50	10.45
Litter	392	60.75	60.00	41.94
Cryptogams	2	0	0	.03
Bare Ground	253	21.75	11.50	11.76

PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 5

Type	Quadrat Frequency '96
Rabbit	2
Deer	10
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	4	-	3	-	-	-	-	-	8	-	-	-	160	20	23	8
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		66			-
													'96		160			-
Artemisia tridentata vaseyana																		
S	84	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	90	3	-	-	6	-	-	-	-	-	9	-	-	-	600			9
	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
Y	84	17	-	-	-	-	-	-	-	-	16	-	-	1	1133			17
	90	14	6	1	1	-	-	-	-	-	21	-	1	-	1466			22
	96	17	1	-	-	-	-	-	-	-	18	-	-	-	360			18
M	84	15	27	27	-	-	-	-	-	-	64	-	5	-	4600	23	19	69
	90	16	31	4	1	-	-	-	-	-	51	1	-	-	3466	31	37	52
	96	33	66	8	4	-	-	-	-	-	111	-	-	-	2220	26	41	111
D	84	36	12	34	-	-	-	-	-	-	67	4	10	1	5466			82
	90	19	30	8	1	1	-	-	-	-	49	1	-	9	3933			59
	96	-	2	7	1	1	1	-	-	-	8	-	-	4	240			12
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	500			25
Total Plants/Acre (excluding Dead & Seedlings)													'84		11199	Dec:		49%
													'90		8865			44%
													'96		2820			9%
Chrysothamnus viscidiflorus stenophyllus																		
M	84	7	-	-	-	-	-	-	-	-	7	-	-	-	466	15	9	7
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		599	Dec:		22%
													'90		0			0%
													'96		0			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	11	-	-	-	-	-	-	-	-	11	-	-	-	733	11	12	11
	96	22	1	-	1	-	-	-	-	-	24	-	-	-	480	11	17	24
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		0%
														'90	999			7%
														'96	480			0%
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	1	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	21	-	-	-	-	-	-	-	-	21	-	-	-	420	3	6	21
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	133			-
														'96	420			-
Prunus virginiana																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	20			-
Quercus gambelii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	6	-	-	-	-	-	-	-	6	-	-	-	120	28	44	6
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	120			-
Rosa woodsii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	33	0
Total Plants/Acre (excluding Dead & Seedlings)														'84	0	Dec:		-
														'90	0			-
														'96	0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	4	1	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	6	-	-	-	-	-	-	-	-	6	-	-	-	400	20	32	6
	90	6	8	-	-	-	-	-	-	-	14	-	-	-	933	17	20	14
	96	21	17	-	8	-	-	-	-	-	46	-	-	-	920	19	32	46
Total Plants/Acre (excluding Dead & Seedlings)													'84		400	Dec:		-
													'90		1266			-
													'96		940			-
Tetradymia canescens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		20			-

TREND STUDY 7-6-96 (old 20-15)

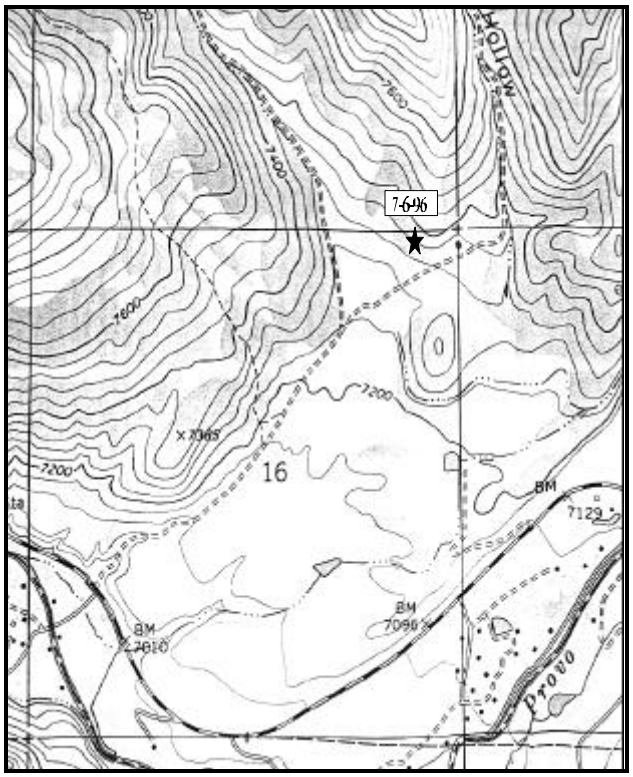
Study site name: Cedar Hollow. Range type: Mixed mountain brush.

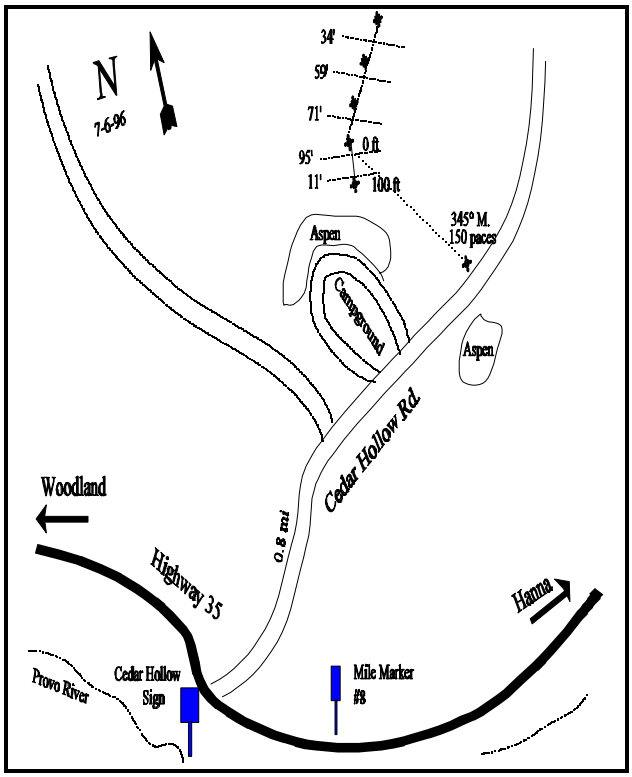
Compass bearing: frequency baseline 166 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (71ft), line 3 (59ft), line 4 (34ft).

LOCATION DESCRIPTION

Eastbound on Highway 35 from Woodland, turn left (north) at the Cedar Hollow sign. If you pass mile-marker 8 you have gone too far. Travel 0.8 miles on the main dirt road passing two left turns, and stop next to a small witness post on the left side of the road. There is a small stand of aspen on the right. From the witness post walk at a bearing of 345 degrees magnetic for 150 paces to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #57.





Map Name: Woodland Diagrammatic Sketch

Township 3S, Range 7E, Section 16, UTM COOR: 4-87-079E 41-91-807N

DISCUSSION

Trend study No. 7-6 (20-15)

This study is located near the top end of normal winter range in Cedar Hollow. The site has an elevation of approximately 7,400 feet with a moderate (30%-40%) slope and southwest aspect. Because of the moderately high elevation, this area probably does not constitute critical range. There are a few signs of heavy or excessive big game use, except on bitterbrush and serviceberry because of their moderately low populations. The range type for this area consists of varying sized clumps of serviceberry, moderately tall Gambel oak, and quaking aspen surrounded by more open areas dominated by mountain big sagebrush/grass, intermixed with mountain snowberry. The overall vegetative appearance is that of mixed mountain brush. Pellet groups of deer, elk, and moose are present, yet none are very abundant. Cattle also graze the area.

Soil appears to be moderately deep and very well-drained. Effective rooting depth (refer to methods) is approaching 11 inches. Soil texture is classified as a clay loam with a neutral pH of 7.0. Surface rock of varying size is common (20%). The parent material is sandstone and limestone. This area probably receives at least 20 inches of annual precipitation and thus has a fairly extensive vegetative cover. There are, however, interspaces where the soil appears compacted and where noticeable sheet and gully erosion has occurred. Overall soil condition is fair to good.

Vegetatively, the site is similar to that of other transitional ranges described earlier. Gambel oak occurs frequently in the study area but consists of small clumps of mature plants that are partially unavailable because of their height. Oak probably has an ecological influence in the area greater than the data summary might indicate. The most important species, based on abundance, cover, and relative palatability, is mountain big sagebrush. This population had a high incidence of decadent plants in 1984 (75%) and 1990 (41%), but has decreased to 20% in 1996. Currently, only 1% are classified as heavily used. Vigor has improved. It is showing similar characteristics of other sagebrush communities where moderately high densities along with prolonged drought have caused problems because of intraspecific competition. These strongly competitive conditions appear to have moderated with more normal precipitation and the subsequent recovery of the sagebrush communities. On lower, more gentle and less rocky sites in the immediate vicinity, sagebrush is in obviously better condition. This entire area is grazed by cattle, but their influence is not clear. Cattle appear to have encouraged the thickening of sagebrush on the swales with deeper soils.

Grasses and forbs are quite productive on this particular site, perhaps more so than on the study area as a whole. A good mix of species, which includes several aggressive increaser grasses, provides an effective ground cover and an important source of livestock forage. Current utilization is light to moderate. The trend for this vegetative component is stable.

1984 APPARENT TREND ASSESSMENT

Almost all of the data and apparent trend parameters suggest a stable or even improving soil trend. Although some bare interspaces persist, they are not serious erosion sources and may in fact be stabilizing. Vegetative trend is more complex, but is also basically stable. The fate of mountain big sagebrush is unclear although there are a few indications of a declining population. Sagebrush density has remained relatively stable, but a decadent age structure may indicate a future change. Grass abundance and production is at least stable and may be increasing. In the future, it will pay to closely observe species such as Kentucky bluegrass and bulbous bluegrass. These increasers will be the

most likely to benefit from a decline in big sagebrush or increased livestock grazing.

1990 TREND ASSESSMENT

Total browse frequency and species composition is basically unchanged. The oakbrush, although it has not greatly expanded, appears to be more productive and have a greater influence in 1990. Mountain big sagebrush shows a slightly lower density and frequency, which was predicted in 1984 based on the highly decadent population (75%) encountered in the initial trend study. Young shrubs have replaced some of the decadent plants, but overall density is down. Vigor is less than optimum on half of the sagebrush. There has been only light to moderate browsing the last several years. Sagebrush cover averages about 10%. Serviceberry has increased in frequency and density. The 1990 data shows an increase in grass frequency and number of species encountered. A larger number of forb species were identified, surprising for late in a dry year. A slightly higher percent cover for rock and pavement was recorded in 1990. Vegetative and litter cover are adequate to minimize soil movement.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

1996 TREND ASSESSMENT

The trend for soil is stable with slightly lower amounts of rock cover and bare ground. The browse trend is still considered stable. The increases density of mountain big sagebrush is primarily a function of a larger sampling design that picked up more plants. It currently makes up 40% of the browse cover, has improved vigor and a significantly lower percentage of decadent plants in the population. Bitterbrush and mountain snowberry are also in good health. Together these preferred species provide respectively 14% and 22% of the browse cover. The herbaceous understory is considered stable, with sum of nested values for both grasses and forbs staying nearly the same.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 07, Study no: 6

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	152	151	145	60	55	55	2.03
G	Bromus carinatus	-	6	-	-	2	-	-
G	Bromus inermis	-	12	-	-	4	-	-
G	Bromus tectorum (a)	-	-	1	-	-	1	.00
G	Carex spp.	73	92	68	22	29	26	4.08
G	Festuca spp.	-	-	3	-	-	1	.00
G	Melica bulbosa	-	-	3	-	-	1	.00
G	Poa bulbosa	[a]-	[b]79	[b]107	-	37	35	3.57

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Poa fendleriana	97	130	105	41	53	41	1.47
G	Poa pratensis	$_{a}$46	$_{b}$83	$_{b}$107	18	31	37	2.80
G	Poa secunda	$_{ab}$31	$_{a}$19	$_{b}$56	16	11	25	.71
G	Stipa columbiana	$_{a}$9	$_{b}$28	$_{a}$9	5	12	4	.09
Total for Grasses		408	600	604	162	234	226	14.80
F	Agoseris glauca	-	4	-	-	2	-	-
F	Allium spp.	-	-	5	-	-	3	.01
F	Aster spp.	$_{a}$105	$_{a}$121	$_{b}$48	39	48	21	.47
F	Astragalus spp.	-	-	2	-	-	2	.01
F	Balsamorhiza sagittata	7	16	11	5	10	6	.54
F	Castilleja linariaefolia	3	1	6	1	1	3	.04
F	Calochortus nuttallii	-	2	3	-	1	1	.00
F	Cirsium spp.	14	17	8	8	10	4	.07
F	Collomia linearis (a)	-	-	12	-	-	4	.02
F	Comandra pallida	$_{ab}$80	$_{a}$83	$_{b}$58	35	33	23	.29
F	Crepis acuminata	-	1	3	-	1	1	.00
F	Eriogonum racemosum	$_{a}$1	$_{ab}$8	$_{b}$12	1	4	7	.16
F	Eriogonum umbellatum	-	4	-	-	3	-	-
F	Hackelia patens	$_{a}$10	$_{b}$-	$_{b}$-	5	-	-	-
F	Holosteum umbellatum (a)	-	-	2	-	-	1	.00
F	Ligusticum spp.	-	5	-	-	2	-	-
F	Lupinus argenteus	-	8	-	-	3	-	.03
F	Machaeranthera canescens	$_{a}$30	$_{b}$6	$_{b}$-	11	3	-	-
F	Microsteris gracilis (a)	-	-	-	-	-	-	.00
F	Penstemon leonardi	$_{a}$-	$_{b}$17	$_{b}$26	-	9	12	.65
F	Phlox longifolia	$_{a}$-	$_{b}$32	$_{c}$15	-	17	9	.04
F	Polygonum douglasii (a)	-	-	8	-	-	3	.01
F	Senecio integerrimus	$_{a}$-	$_{ab}$1	$_{b}$7	-	1	4	.07
F	Solidago spp.	$_{a}$41	$_{b}$-	$_{b}$-	19	-	-	-
F	Streptanthus cordatus	1	2	-	1	1	-	-
F	Tragopogon dubius	-	-	1	-	-	1	.00
F	Zigadenus paniculatus	-	3	-	-	1	-	-
Total for Forbs		292	331	227	125	150	105	2.47

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 6

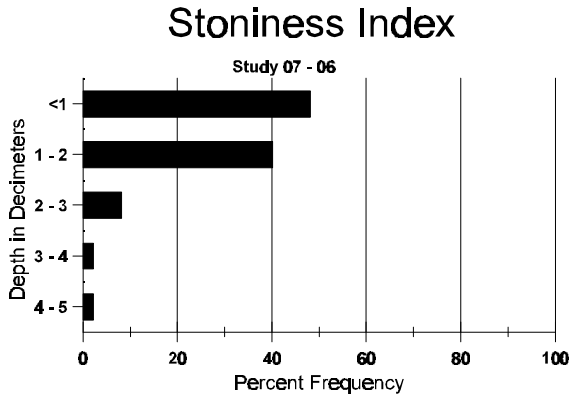
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	19	.22
B	Artemisia tridentata vaseyana	59	8.10
B	Ceanothus velutinus	2	-
B	Chrysothamnus viscidiflorus viscidiflorus	51	1.85
B	Eriogonum microthecum	17	.22
B	Mahonia repens	65	1.16
B	Opuntia spp.	3	.03
B	Pachistima myrsinites	4	.03
B	Purshia tridentata	15	2.93
B	Quercus gambelii	3	1.25
B	Symphoricarpos oreophilus	67	4.55
Total for Browse		305	20.35

BASIC COVER --
Herd unit 07, Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	350	3.75	16.50	39.31
Rock	265	12.00	12.25	15.11
Pavement	213	7.00	11.75	4.56
Litter	384	60.00	46.75	42.47
Cryptogams	28	.25	0	.53
Bare Ground	235	17.00	12.75	11.13

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 6

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.6	53.8 (14.5)	7.0	40.2	30.4	29.4	4.9	11.5	166.4	.6



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 6

Type	Quadrat Frequency '96
Elk	5
Deer	7
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	2	-	-	1	-	-	5	-	-	-	333			5
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	3	1	1	1	-	-	3	-	-	7	-	2	-	600			9
	96	-	2	-	3	-	-	-	-	-	4	1	-	-	100			5
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	1	1	-	-	-	66	89	71	1
	96	1	8	1	2	-	-	-	-	-	6	4	2	-	240	30	32	12
D	84	-	-	-	-	-	1	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	96	-	2	-	-	-	-	-	-	-	1	1	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		100%
													'90		732			9%
													'96		380			11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	1	-	-	-	2	-	-	133			2
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	3	2	-	-	-	-	-	-	5	-	-	-	333	23	35	5
	90	3	3	-	1	-	-	1	-	-	4	3	-	1	533	26	28	8
	96	50	19	-	1	-	-	-	-	-	69	-	1	-	1400	21	33	70
D	84	-	6	9	-	-	-	-	-	-	12	-	2	1	1000			15
	90	5	2	-	-	-	-	-	-	-	5	-	-	2	466			7
	96	6	11	1	-	-	-	-	-	-	14	-	-	4	360			18
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	700			35
Total Plants/Acre (excluding Dead & Seedlings)													'84		1333	Dec:		75%
													'90		1132			41%
													'96		1820			20%
Ceanothus velutinus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40	24	90	2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		40			-
Chrysothamnus viscidiflorus stenophyllus																		
D	84	1	2	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		200	Dec:		100%
													'90		0			0%
													'96		0			0%
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	4	1	-	-	-	-	1	-	-	5	-	1	-	400	12	9	6
	96	89	1	-	9	-	-	-	-	-	99	-	-	-	1980	12	16	99
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	4	-	-	1	-	-	-	-	-	2	-	-	3	333			5
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		799			42%
													'96		2120			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum microthecum																		
Y	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	6	1	-	-	-	-	-	-	-	7	-	-	-	466	5	6	7
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	15	-	-	2	-	-	-	-	-	17	-	-	-	340	7	12	17
Total Plants/Acre (excluding Dead & Seedlings)													'84		666	Dec:		-
													'90		0			-
													'96		360			-
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	50	-	-	3	-	-	-	-	-	53	-	-	-	3533			53
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	296	-	-	-	-	-	-	-	-	296	-	-	-	19733			296
	90	368	-	-	107	-	-	28	-	-	503	-	-	-	33533			503
	96	105	-	-	21	-	-	-	-	-	126	-	-	-	2520			126
M	84	13	-	-	-	-	-	-	-	-	13	-	-	-	866	6	4	13
	90	271	1	-	78	-	-	74	-	-	424	-	-	-	28266	6	4	424
	96	323	-	-	34	-	-	-	-	-	357	-	-	-	7140	4	6	357
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)													'84		20599	Dec:		-
													'90		61799			-
													'96		9660			-
Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	4	11	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		60			-
Pachistima myrsinites																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	3	-	-	-	-	-	4	-	-	-	80			4
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	12	36	6
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		200			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	9	2	-	-	-	-	-	-	15	-	-	-	300	15	60	15
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		320			-
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	2	-	-	2	-	-	5	-	-	-	333			5
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	90	3	1	-	8	-	-	4	-	-	16	-	-	-	1066			16
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	1	-	1	-	2	-	-	-	133	67	57	2
	90	17	-	-	-	-	-	-	2	-	19	-	-	-	1266	72	23	19
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	77	98	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		466	Dec:		0%
													'90		2465			5%
													'96		60			0%
Rosa woodsii																		
Y	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	-	-	-	2	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	2	-	-	-	-	-	-	1	-	1	-	133	25	5	2
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133	18	7	2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		333	Dec:		-
													'90		266			-
													'96		0			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	7	-	-	-	-	-	1	-	-	8	-	-	-	533			8
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	11	9	1	-	-	-	-	-	-	20	-	1	-	1400			21
	90	15	8	-	10	-	-	-	-	-	30	-	3	-	2200			33
	96	17	-	-	1	-	-	-	-	-	18	-	-	-	360			18
M	84	12	5	1	-	-	-	-	-	-	18	-	-	-	1200	23	36	18
	90	13	22	-	25	-	-	8	-	-	53	1	14	-	4533	18	24	68
	96	98	3	-	10	-	-	-	-	-	106	-	5	-	2220	17	28	111
D	84	2	3	-	-	-	-	-	-	-	4	-	1	-	333			5
	90	2	3	1	-	-	-	-	-	-	4	-	-	2	400			6
	96	3	-	-	-	-	-	-	-	-	2	-	-	1	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		2933	Dec:		11%
													'90		7133			6%
													'96		2640			2%

TREND STUDY 7-7-96 (old 20-17)

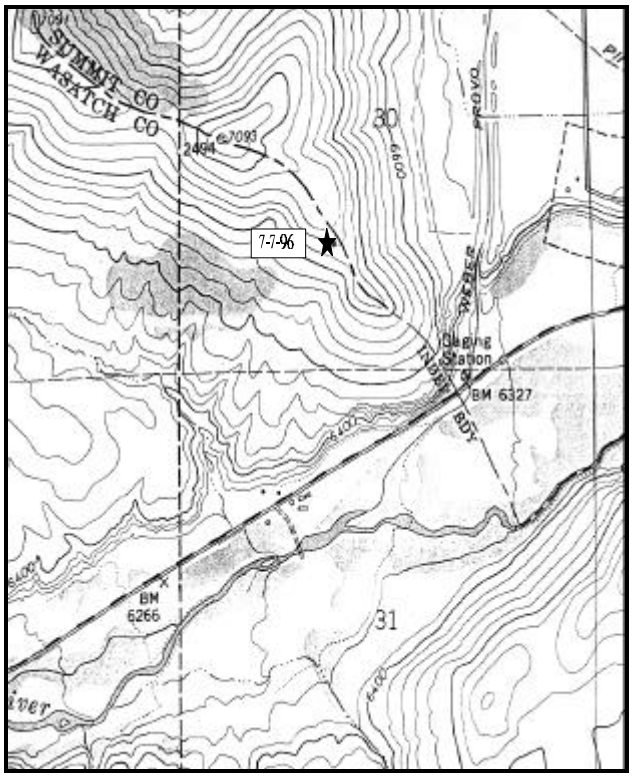
Study site name: Provo River Canyon. Range type: Sagebrush/grass.

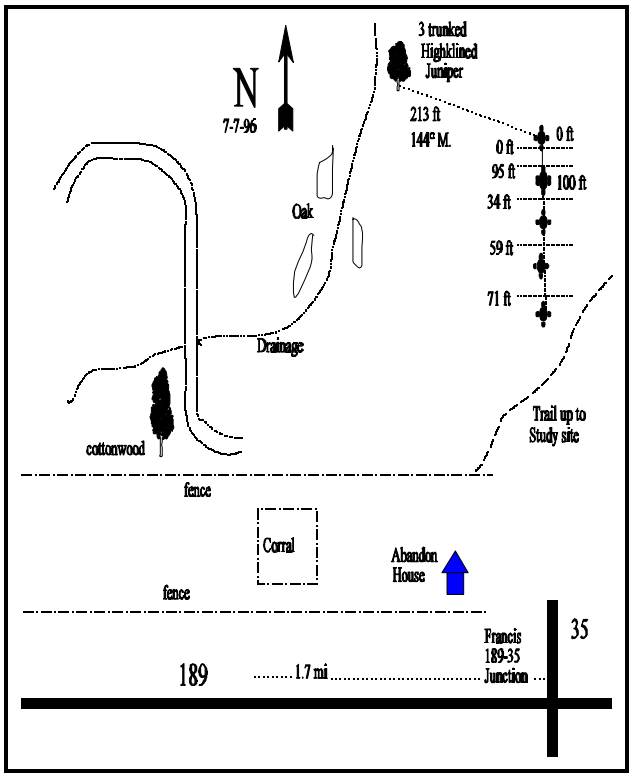
Compass bearing: frequency baseline 160 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the 189/35 junction in Francis, proceed west on 189 for 1.70 miles and stop at an old corral in a marshy pasture on the right (north). Walk to the large, narrow-leaf cottonwood northwest of the corral. The tree is at the mouth of a small canyon. Walk up the canyon approximately 500 feet until reaching the first drainage on the right. A drainage begins where the road crosses the creek for the second time. Walk up this drainage past the oak clumps to a point where the gully flattens out, becomes rocky and is studded with stunted CHVIV plants. To the right locate a 3-trunked, high-lined juniper. From the juniper, walk 213 feet at 144 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7960. The baseline runs in a direction of 160 degrees magnetic.





Map Name: Francis Diagrammatic Sketch

Township 2S, Range 6E, Section 30-31, UTM COOR: 4-73-342E 44-95-320N

DISCUSSION

Trend study No. 7-7 (20-17)

The Provo River Canyon site samples a narrow band of critical deer winter range located north of the Provo River and west of Francis. The physiography of this study area is characterized by steep, sometimes sheer bluffs bordering the Provo river valley. The principal winter range lies on gentle rolling terrain above the bluffs. Apart from isolated patches of Gambel oak and mixed mountain brush, the remaining area is occupied by the big sagebrush/grass type with scattered individual bitterbrush. Most of the area has a southern aspect. The study is on a nearly flat ridge (5% slope) with an elevation of approximately 6,700 feet.

Judging from the frequency of pellet groups and the level of forage utilization, use by grazing and browsing animals is light to moderate. Cattle and sheep alternately use the area in the spring-fall period, but obtain little benefit because of the shortage of herbaceous forage. Winter big game use includes both elk and mostly deer. In 1996 pellet-group quadrat frequency was only 2% for elk, while 30% for deer.

Soil is classified as mountain stoney loam. Permeability is moderate, available water capacity is low and root penetration is somewhat limited. These soils have a moderately low erosion hazard. Effective rooting depth is almost 15 inches with a neutral pH of 6.6. The soil texture is a clay loam with an organic matter content of 3.6% (average for the unit is 4.0%). Percent bare ground has steadily decreased through time from about 13% down to almost 7%. Where limited erosion has occurred in the past, it is now stabilized. Grasses provide about 30% of the total vegetative cover, while forbs are quite scarce.

The most preferred browse is antelope bitterbrush. It tends to be heavily hedged and somewhat decadent because of its relatively low density compared to all other browse species. The sagebrush stand is a dense and often quite tall form of mountain big sagebrush that provides abundant forage, but exhibits only light to moderate hedging. This light use would indicate that there is a large amount of hybridization with basin big sagebrush in this ecotype. This is expressed as a taller and less palatable form of mountain big sagebrush. Even with these obvious of good productivity, four winter-killed deer were found in the immediate vicinity in 1984 from the harsh winter of 1983-84.

This is an area where antelope bitterbrush comprises only 3% of the shrub cover. In the past, bitterbrush would have been much more numerous, but as of 1996, almost 80% of the population has been lost, mostly because of the extensive drought and competition with sagebrush. Mountain big sagebrush currently makes up 96% of the total browse cover. Stickyleaf low rabbitbrush is present but in very small numbers. The sagebrush population is comprised of large mature plants that has a cover of 32%. Percent decadence has been high in the past, but is only at 20% now.

Perennial grasses are down slightly from 1990, forbs still occur only occasionally. Much more numerous are cheatgrass brome and yellow owlclover, both annuals.

1984 APPARENT TREND ASSESSMENT

Soil and vegetative trend are both stable but at a rather low condition rating. Understory composition and production are generally lacking, but have not obviously declined further since 1977 studies. Moreover, soil condition has not greatly changed over such a short period. The poor potential sites are unlikely to improve over any short period of time, while the better, deeper soil sites could erode if shrub cover were to be seriously depleted. The potential for that occurring, however, is not serious.

1990 TREND ASSESSMENT

The slopes above Provo River support extensive stands of dense sagebrush. The site has a southwest exposure. There is a consistent 32% canopy cover of sagebrush. The moderately hedged hybrid sagebrush are moderately tall, nevertheless still identified as *Artemisia tridentata vaseyana*. Since 1984, density has decreased slightly and the proportion of decadent plants in the population increased to 57%. The somewhat scarce bitterbrush are sought out by livestock and deer, and the continued heavy utilization, competition, and extended drought has resulted in a decline in density. There are as many bitterbrush skeletons as living plants, and the remaining plants are severely clubbed and decadent with poor vigor. Due to the extremely low leader growth this year, little forage production is available. Eighty-seven percent of the population was classified as decadent. Rabbitbrush and prickly-pear cactus have not increased. Grass density is low and forbs are still uncommon. Even with the limited perennial understory (cheatgrass is common), there is adequate ground cover and there is no sign of erosion.

TREND ASSESSMENT
soil - stable
browse - down
herbaceous understory - stable

1996 TREND ASSESSMENT

The trend for soil is stable with good litter and vegetative cover and percent bare ground has decreased slightly. Bitterbrush appears to have stabilized at a lower density, with improved vigor. Percent decadence has gone from 87% down to only 11% even though use is about the same as it was in 1990. The key browse species for this site is mountain big sagebrush which makes up 96% of the browse cover. It also has greatly improved vigor, lower use, and percent decadence has decreased from 57% to 20%. The age structure for both species is mostly mature, but both species are long-lived and appear to have “weathered” the extended drought for now. Trend for browse is slightly improving. Trend for the herbaceous understory is slightly down. Perennial grass sum of nested frequency is down, as it is for perennial forbs.

TREND ASSESSMENT
soil - stable
browse - slightly improved
herbaceous understory - slightly down

HERBACEOUS TRENDS --
Herd unit 07, Study no: 7

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % ‘96
G	Agropyron cristatum	8	13	10	3	4	3	.68
G	Agropyron dasystachyum	a87	b34	c3	38	13	1	.00
G	Agropyron spicatum	a25	b79	c124	14	30	39	2.71
G	Bromus tectorum (a)	-	-	276	-	-	84	7.47
G	Elymus cinereus	-	-	7	-	-	2	.03
G	Poa secunda	a38	b141	c84	16	60	35	2.37

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Sitanion hystrix	$_{a}$13	$_{ab}$25	$_{b}$33	6	15	19	.92
Total for Grasses		171	292	537	77	122	183	14.19
F	Agoseris glauca	$_{a}$-	$_{b}$9	$_{ab}$2	-	5	1	.01
F	Allium acuminatum	3	-	-	2	-	-	-
F	Alyssum alyssoides (a)	-	-	18	-	-	8	.04
F	Arabis spp.	-	1	-	-	1	-	-
F	Astragalus convallarius	8	6	3	4	3	1	.00
F	Astragalus spp.	2	-	5	1	-	3	.01
F	Calochortus nuttallii	1	-	-	1	-	-	-
F	Collomia linearis (a)	-	-	18	-	-	8	.09
F	Collinsia parviflora (a)	-	-	15	-	-	5	.02
F	Crepis acuminata	8	13	7	4	9	3	.06
F	Epilobium paniculatum	-	-	1	-	-	1	.00
F	Erigeron pumilus	$_{a}$7	$_{ab}$3	$_{b}$-	4	2	-	-
F	Lomatium triternatum	-	-	3	-	-	1	.00
F	Lupinus argenteus	-	-	2	-	-	2	.15
F	Orthocarpus spp. (a)	-	-	4	-	-	4	.08
F	Phlox longifolia	$_{a}$-	$_{b}$23	$_{a}$2	-	12	1	.00
F	Unknown forb-perennial	16	-	-	8	-	-	-
F	Vicia americana	-	4	-	-	2	-	-
Total for Forbs		45	59	80	24	34	38	0.50

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 7

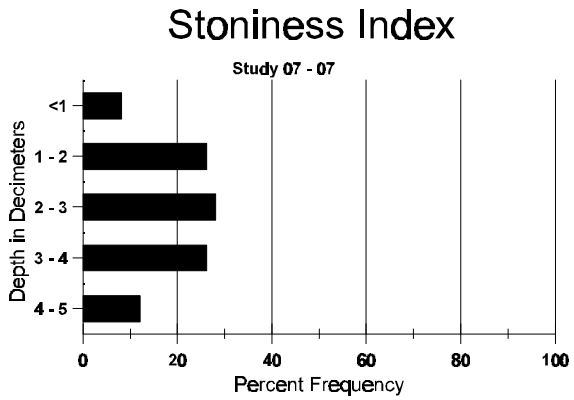
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	94	32.32
B	Chrysothamnus viscidiflorus viscidiflorus	1	.00
B	Opuntia spp.	5	.03
B	Purshia tridentata	9	1.14
Total for Browse		109	33.51

BASIC COVER --
Herd unit 07, Study no: 7

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	350	2.00	6.50	50.12
Rock	91	.25	1.25	1.44
Pavement	106	1.75	3.75	.66
Litter	398	69.50	66.25	58.95
Cryptogams	106	13.25	14.00	4.69
Bare Ground	149	13.25	8.25	7.22

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 7

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.7	55.6 (15.6)	6.6	41.8	27.4	30.7	3.6	23.2	275.2	.4



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 7

Type	Quadrat Frequency '96
Rabbit	9
Elk	2
Deer	30

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 7

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	5	-	-	-	-	-	-	-	-	4	-	1	-	333			5
	90	6	1	1	5	-	-	-	-	-	10	-	3	-	866			13
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	13	28	18	-	-	-	-	-	-	57	-	2	-	3933	33	28	59
	90	4	14	6	2	-	-	-	-	-	22	-	4	-	1733	30	27	26
	96	86	67	4	1	-	-	-	-	-	158	-	-	-	3160	34	51	158
D	84	5	10	16	-	-	-	-	-	-	23	-	8	-	2066			31
	90	14	25	10	2	1	-	-	-	-	31	1	7	13	3466			52
	96	23	9	7	2	1	-	-	-	-	35	-	-	7	840			42
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	920			46
Total Plants/Acre (excluding Dead & Seedlings)													'84		6332	Dec:		33%
													'90		6065			57%
													'96		4120			20%
Chrysothamnus viscidiflorus stenophyllus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133	11	10	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		332	Dec:		40%
													'90		0			0%
													'96		0			0%
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	1	-	-	1	-	-	1	-	-	1	-	2	-	200	12	14	3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'90		266			25%
													'96		20			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Opuntia spp.																		
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	21	1
	90	-	-	-	-	-	-	2	-	-	2	-	-	-	133	6	7	2
	96	8	-	-	1	1	-	-	-	-	10	-	-	-	200	6	22	10
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'90		133			-
													'96		200			-
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	2	-	-	-	-	-	-	3	-	-	-	200	33	34	3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	4	1	1	1	-	-	-	8	-	-	-	160	25	47	8
D	84	-	-	10	-	-	-	-	-	-	5	-	5	-	666			10
	90	-	2	3	-	-	-	1	-	1	1	-	-	6	466			7
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
Total Plants/Acre (excluding Dead & Seedlings)													'84		866	Dec:		77%
													'90		532			88%
													'96		180			11%

TREND STUDY 7-8-96 (old 20-18)

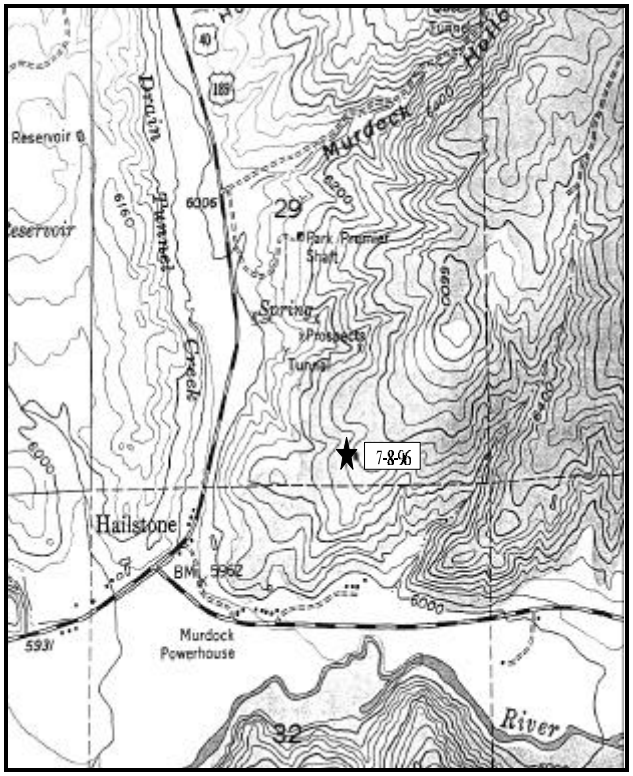
Study site name: Hailstone . Range type: Sagebrush/grass .

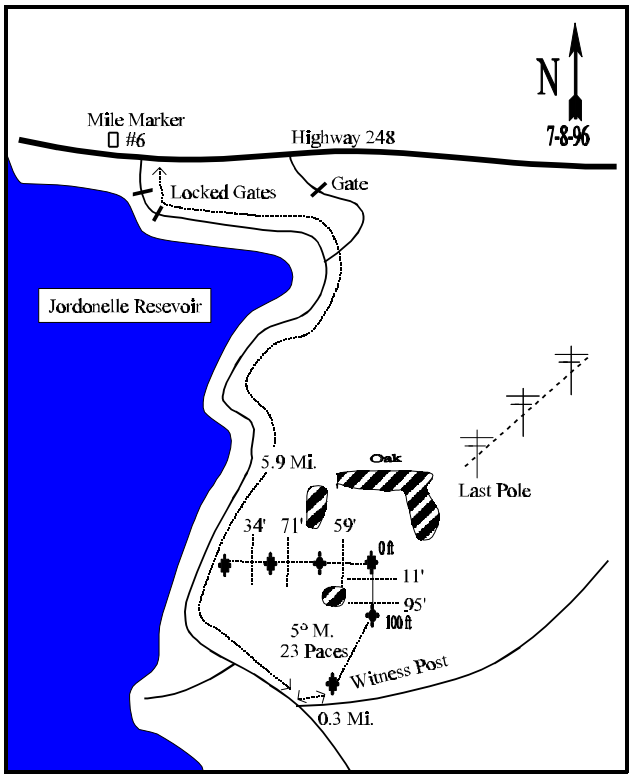
Compass bearing: frequency baseline 159 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

Just past mile marker #6 on highway 248, turn right (south) and follow the road around the east side of Jordanelle Reservoir for 5.9 miles to a fork in the road and a witness post. The fork is 0.3 miles east of a monument on the right side of the road. From the witness post walk 23 paces at 5 degrees magnetic to the 100-foot baseline stake. The 0-foot baseline stake is 100 feet to the north. Line 1 of the baseline runs 159 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake at a bearing of 248 degrees magnetic. If the gates are locked at the beginning, either obtain a key from the regional biologist, find another way around the fence or go up the road and follow the power line road which comes out above the site.





Map Name: Heber
Diagrammatic Sketch

Township 2S , Range 5E , Section 29 , UTM COOR: 4-65-892E 44-95-380N

DISCUSSION

Trend Study No. 7-8 (20-18)

This study is located northeast of Hailstone junction on a site that in 1984 received relatively little deer or elk use, but was thought to become much more important after Jordanelle Reservoir was constructed. When that occurred, north to south movements across the Provo River became impossible, or at least very difficult, and the winter range on the north side of the reservoir became more vital than in 1984. The Jordanelle Reservoir is now in place and full of water, ahead of when it was estimated to become full. Currently pellet-group frequency is low for elk (1%), while for deer it is at 25%. The study area consists of mixed mountain big sagebrush-grass with scattered clumps of Gambel oakbrush that occur on moderately gentle south to west facing slopes (25-30%). Elevation is approximately 6,400 feet.

Soil type is very similar to that described for Study Number 7-7 with a slightly higher surface rock cover. Soil is classified as mountain Stoney loam. Permeability is moderate, available water capacity is low and root penetration is somewhat limited. These soils have a moderately low erosion hazard. Effective rooting depth is almost 12 inches with a slightly acidic pH of 6.5. The soil texture is a clay loam with an organic matter content of 4.6% (average for the unit is 4.0%). Percent bare ground has steadily decreased through time from 9% down to almost 6%. Where limited erosion has occurred in the past, it now appears stabile. Herbaceous understory provides 23% of the total vegetative cover, but most of the cover is contributed by annuals. Erosion is minimal except where roads, power line construction and quarrying activity have occurred. These areas are subject to some active gully formation.

This study is within a mountain big sagebrush-grass opening that is characterized by a moderately dense stand of large mountain big sagebrush, with lesser amounts of mountain snowberry, antelope bitterbrush, and Gambel oak interspersed throughout. Understory vegetation is sparse and consists largely of cheatgrass brome, Kentucky bluegrass, Sandberg bluegrass, and a few forbs. Of the latter, the most important and palatable are showy goldeneye, silky lupine, and redroot eriogonum.

At first glance, the big sagebrush population appears highly decadent, and in fact, many of the largest plants do have appreciable percentages of dead crown material. Utilization, however, is uniformly light, indicating other causes for the high percent decadency, not excessive use. Crown die-back are most likely the result of winter injury, drought and intraspecies competition. The population is comprised primarily of large mature plants that in the past were mostly decadent. Now, percent decadency is down to only 18%. A closer examination reveals the presence of adequate numbers of young and seedlings to maintain the population. Other key shrub species are in relatively low numbers. All show improved vigor with less decadence with the passing of the extended drought. The big sagebrush population will continue to dominant this community and will continue to suppress other shrub and herbaceous species.

1984 TREND ASSESSMENT

Soil trend appears stable. Although there are a few long established gullies in the vicinity, these are not rapidly expanding. Sheet erosion is evident but is of small magnitude. Soil loss does not appear growth limiting. This area, however, does have a shallow soil that has moderate to high erosion potential. Soil trend deserves careful monitoring. Vegetative trend is also stable. The Gambel oakbrush areas are static in terms of the area they occupy. Oak, however, may be growing in height and becoming even more exclusive of other vegetation. Oak clumps customarily have almost no understory and litter provides a nearly complete ground cover. In the mountain big sagebrush areas, there have been very

slight but perhaps temporary improvements in understory diversity and production. Overall trend for these areas is judged stable because no significant signs of change in the dominant sagebrush population can be detected.

1990 TREND ASSESSMENT

Mountain big sagebrush has less growth and seed production, although vigor is normal compared to the wet years when the study was established. The shrubs are moderately to heavily hedged. Sagebrush density shows an slight decrease (15%). A lower percentage (46%) of decadent plants was classified in 1990, which is still high. Sagebrush cover averages almost 30%. Seedlings are abundant this year. Frequencies of the other browse species remain low but stable. Oakbrush has not increased. Oak shows moderate hedging on the available parts, more use than typically observed on oak on this type of site. The grass sum of nested frequency is extremely low at only 15. Density for the sod-forming Kentucky bluegrass is very low. There have been no significant changes in the herbaceous component. Ground cover percentages are also unchanged. There is adequate litter and aerial vegetative cover, and no significant erosion.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable, but still poor condition

1996 TREND ASSESSMENT

Trend for soils is stable with an excellent ratio of protective cover (vegetation and litter) to percent bare ground. The only negative aspect is that most of the vegetative cover is made up of sagebrush which is not as protective as herbaceous cover. The key browse species is obviously sagebrush, which contributes 93% of the browse cover. The age structure is drifting again to a mostly mature population. Percent decadence has decreased from 56% in 1984, to 46% in 1990, and down to 18% in 1996. The population is stable now, with the thinning effect of long-term drought and intraspecific competition. The herbaceous understory is trend for perennial species is slightly improved, but in very poor condition (composition and abundance).

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly improved, but poor abundance and composition for perennial species, mostly annuals

HERBACEOUS TRENDS --
Herd unit 07, Study no: 8

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Agropyron spicatum	-	1	5	-	1	3	.09
G	Bromus japonicus (a)	-	-	2	-	-	1	.00
G	Bromus tectorum (a)	-	-	342	-	-	96	14.50
G	Carex spp.	-	-	-	-	-	-	.03
G	Poa pratensis	[a]4	[a]10	[b]55	1	4	15	2.68
G	Poa secunda	-	-	4	-	-	1	.00
G	Sitanion hystrix	[a]-	[a]2	[b]33	-	1	14	1.06

Type	Species	Nested Frequency '84	'90	'96	Quadrat Frequency '84	'90	'96	Average Cover % '96
G	Stipa spp.	-	2	3	-	1	1	.15
Total for Grasses		4	15	444	1	7	131	18.52
F	Achillea millefolium	-	-	1	-	-	1	.03
F	Alyssum alyssoides (a)	-	-	4	-	-	2	.01
F	Allium spp.	$_{a}$-	$_{a}$-	$_{b}$21	-	-	11	.05
F	Artemisia ludoviciana	6	-	1	2	-	1	.00
F	Aster chilensis	-	-	7	-	-	2	.30
F	Astragalus convallarius	5	3	4	2	1	2	.01
F	Camelina microcarpa (a)	-	-	3	-	-	1	.00
F	Cirsium spp.	10	4	8	6	2	5	.21
F	Collomia linearis (a)	-	-	52	-	-	27	.16
F	Comandra pallida	4	-	2	2	-	1	.04
F	Collinsia parviflora (a)	-	-	5	-	-	3	.01
F	Epilobium paniculatum (a)	-	-	112	-	-	51	.94
F	Erigeron spp	-	-	1	-	-	1	.00
F	Eriogonum racemosum	14	14	11	7	8	6	.11
F	Hedysarum boreale	$_{a}$6	$_{b}$-	$_{b}$1	5	-	1	.00
F	Lithospermum ruderale	-	3	-	-	1	-	-
F	Lomatium spp.	-	-	4	-	-	2	.01
F	Lupinus argenteus	$_{a}$75	$_{b}$15	$_{b}$14	35	7	7	.69
F	Microsteris gracilis (a)	-	-	3	-	-	1	.00
F	Orthocarpus spp. (a)	-	-	43	-	-	19	.95
F	Phlox longifolia	$_{a}$-	$_{a}$4	$_{b}$22	-	2	10	.22
F	Polygonum douglasii (a)	-	-	86	-	-	36	.18
F	Tragopogon dubius	-	-	3	-	-	1	.00
F	Verbascum thapsus	6	3	2	3	1	1	.03
F	Vicia spp.	-	4	-	-	1	-	-
F	Viguiera multiflora	$_{a}$19	$_{b}$51	$_{ab}$27	11	23	15	.28
Total for Forbs		145	101	437	73	46	207	4.30

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 8

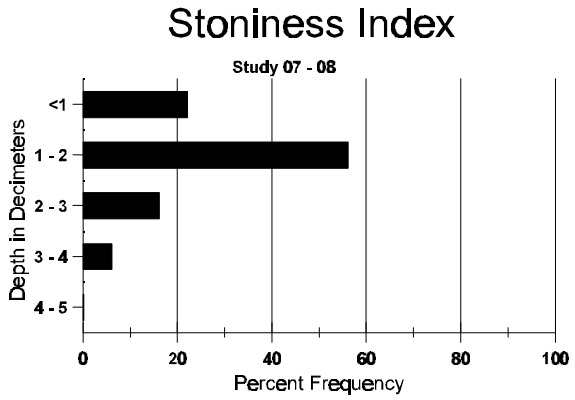
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	99	29.54
B	Chrysothamnus viscidiflorus viscidiflorus	2	.03
B	Mahonia repens	11	.87
B	Opuntia spp.	1	.03
B	Purshia tridentata	4	.68
B	Quercus gambelii	3	.06
B	Symphoricarpos oreophilus	9	.51
Total for Browse		129	31.73

BASIC COVER --
Herd unit 07, Study no: 8

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	376	1.50	5.00	47.30
Rock	209	11.00	5.50	3.26
Pavement	210	8.75	15.50	5.63
Litter	397	70.25	66.75	56.90
Cryptogams	9	0	0	.12
Bare Ground	174	8.50	7.25	6.07

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 8

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.6	53.0 (13.8)	6.5	40.2	29.1	30.7	4.6	41.6	377.6	.6



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 8

Type	Quadrat Frequency '96
Rabbit	5
Elk	1
Deer	25

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133	19	14	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19	14	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	1	-	-	-	-	1	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		133	Dec:		0%
													'90		66			100%
													'96		0			0%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Artemisia tridentata vaseyana																		
S	84	10	-	-	-	-	-	-	-	-	10	-	-	-	666			10
	90	47	-	-	-	-	-	16	-	-	63	-	-	-	4200			63
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	84	23	-	-	-	-	-	-	-	-	23	-	-	-	1533			23
	90	15	2	1	2	-	-	2	-	-	22	-	-	-	1466			22
	96	25	-	-	-	-	-	-	-	-	25	-	-	-	500			25
M	84	22	7	-	-	-	-	-	-	-	29	-	-	-	1933	23	25	29
	90	11	17	5	-	-	-	-	-	-	32	-	1	-	2200	28	35	33
	96	131	28	-	2	-	-	-	-	-	161	-	-	-	3220	24	48	161
D	84	47	21	-	-	-	-	-	-	-	67	-	-	1	4533			68
	90	12	20	12	2	1	-	-	-	-	30	-	1	16	3133			47
	96	26	12	3	1	-	-	-	-	-	26	-	-	16	840			42
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	820			41
Total Plants/Acre (excluding Dead & Seedlings)													'84		7999	Dec:		57%
													'90		6799			46%
													'96		4560			18%
Chrysothamnus viscidiflorus stenophyllus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133	9	4	2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		199	Dec:		-
													'90		0			-
													'96		0			-
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	1	-	-	2	-	-	-	133			2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	12	11	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		133			-
													'96		40			-
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	20	-	-	-	-	-	-	-	-	20	-	-	-	400			20
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	44	-	-	-	-	-	-	-	-	44	-	-	-	880	28	31	44
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'90		0			-
													'96		1280			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	9	-	-	-	-	-	-	-	-	9	-	-	-	600	4	5	9
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133	6	13	2
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	5	24	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		600	Dec:		0%
													'90		799			8%
													'96		60			0%
Purshia tridentata																		
S	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	1	-	-	2	-	-	2	-	1	-	200			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	2	1	-	-	-	-	-	-	4	-	-	-	266	14	18	4
	90	-	1	2	-	1	-	-	-	-	4	-	-	-	266	7	23	4
	96	-	-	2	1	-	-	-	-	-	3	-	-	-	60	22	41	3
D	84	-	3	4	-	-	-	-	-	-	7	-	-	-	466			7
	90	-	-	2	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		798	Dec:		58%
													'90		599			22%
													'96		80			25%
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	90	-	3	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	1	-	-	2	-	-	-	-	-	3	-	-	-	60			3
M	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66	43	25	1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	57	19	1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	48	47	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		399	Dec:		-
													'90		266			-
													'96		80			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Symphoricarpos oreophilus																		
S	84	36	-	-	-	-	-	-	-	-	36	-	-	-	2400			36
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	1	-	-	2	-	-	-	-	-	3	-	-	-	200			3
	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133	14	16	2
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66	5	4	1
	96	4	-	-	8	-	-	-	-	-	12	-	-	-	240	16	20	12
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	-	-	-	-	-	1	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		199	Dec:		0%
													'90		332			20%
													'96		280			0%

TREND STUDY 7-9-96 (old 20-12)

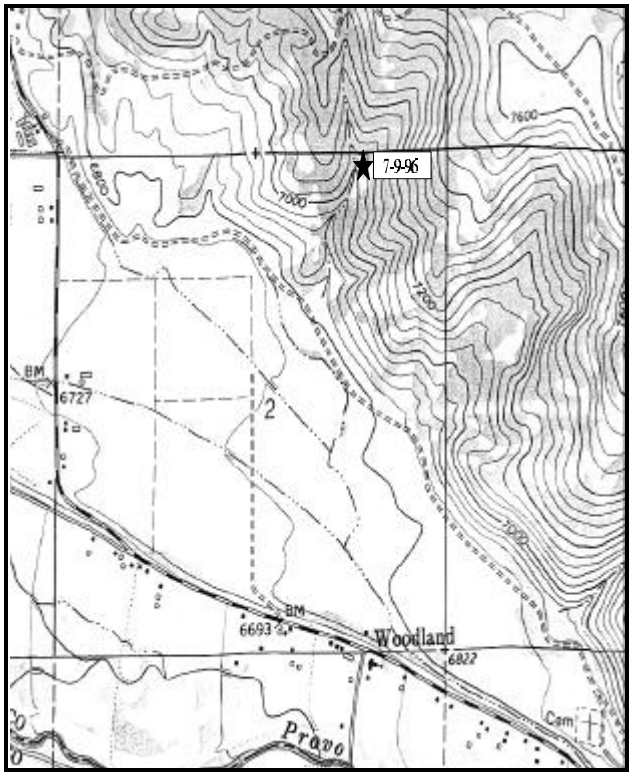
Study site name: Above Woodland. Range type: Gambel's oak.

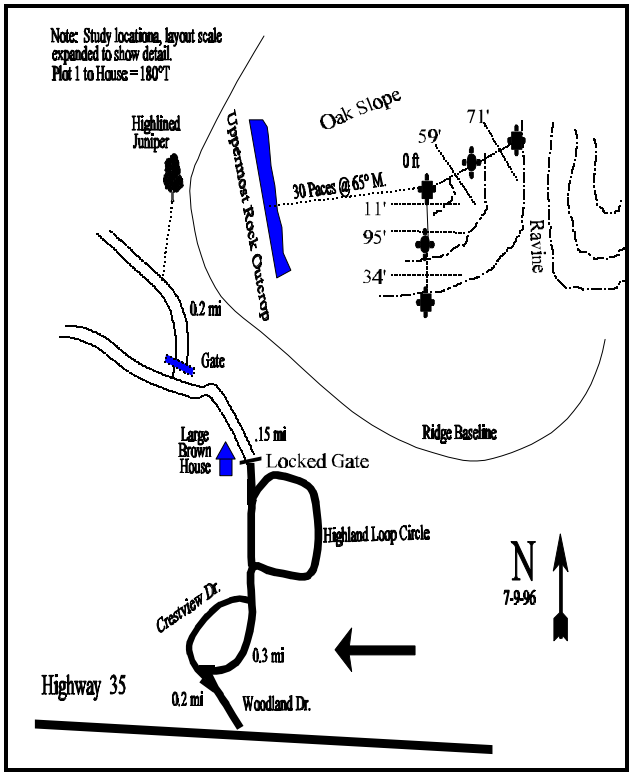
Compass bearing: frequency baseline 163 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of Highway 35 and Woodland Drive, west of Woodland, turn onto Woodland Drive and proceed 0.2 miles. Turn onto Crestview Drive and proceed 0.3 miles to Highland Loop Circle. Turn left and follow the circle 0.1 miles to a dirt road. Travel along the road past a large brown house to a fork after 0.15 miles. Take the right fork through the gate for 0.2 miles. Look for the uppermost rock outcrop on the ridge to the north. From the uppermost rock outcrop walk approximately 30 paces at a bearing of 65 degrees magnetic to the 0-foot baseline stake. The first 150 feet of the baseline run in a direction of 163 degrees magnetic. Stake two is only 50 feet away from the 100-foot baseline stake. Lines 3 and 4 run off the 0-foot baseline stake in a direction of 57 degrees magnetic.





Map Name: Woodland Diagrammatic Sketch

Township 3S, Range 6E, Section 2, UTM COOR: 4-80-856E 44-93-479N

DISCUSSION

Trend Study No. 7-9 (20-12)

This study area, above Woodland, includes closely intermixed mountain big sagebrush/grass and Gambel oakbrush range types located north of Woodland. This site has a southwest facing aspect with a 35% slope at 7,160 feet elevation. The Provo River winter range in the Woodland area appears to be principally a "normal" deer winter range, although elk and moose pellet groups can also be found. There was only light wildlife use (low pellet-group frequencies) for both deer and elk in 1996. Cattle also graze the area. The level of forage utilization is generally light to moderate, depending on the species. This area is at a high enough elevation that deep snow may preclude use during severe winters. Browse production is quite high in this area and it is generally only lightly utilized.

Soil is moderately deep, but very stony. Surface rocks vary in size from pavement to large rock. Percent surface rock cover is moderately high at 32%. Soil parent material appears to be sandstone and shale which gives the soil a reddish color. Water permeability and drainage should be rapid. Plant and litter cover vary greatly, depending on the prevalence of Gambel oak. Where oak is abundant, there is usually good litter cover. In other areas, bare soil, rock and pavement are more prevalent in the interspaces. These areas also show signs of moderate soil erosion in the past. Overall soil condition is fair, but stable.

This area is characterized by a rather low-growing population of Gambel oak with numerous individuals of other shrub species scattered throughout. In this regard, the area is more like mixed mountain brush despite having an oakbrush aspect. Oakbrush contributes 59% of the browse cover, while the second most abundant species (mountain big sagebrush) makes up 19% of the browse cover. Most shrub species show only moderate levels of hedging. Only the occasional antelope bitterbrush, mountain mahogany, and serviceberry show heavy use.

Gambel oak appears to be a moderately young population, if it's judged merely by size. The average height of oak on the site is less than 3 feet high. This is a short growth form for oak, but may be normal for this site with the amount of rock in the soil profile. No great thickening or height increase of oak should be expected. With the possible exception of mountain big sagebrush, the other browse populations also appear stable. Most have adequate vigor in spite of heavy use and exhibit some reproduction. Big sagebrush, however, in 1984 was excessively decadent and exhibited moderately low vigor. At that time, it was felt that a future decline in big sagebrush density would not be surprising. The population has declined, but not significantly. Percent decadence has improved from 50% down to 32%. The population appears to have improved vigor.

Herbaceous composition and production are dominated by grasses, especially annuals (cheatgrass and Japanese brome). Perennials were common but not highly productive. Forbs are decidedly less abundant. Showy goldeneye and Louisiana sagebrush are the most common perennials. Principal biennials include yellow salsify and thistle.

1984 TREND ASSESSMENT

Photo point photographs, line intercept comparisons and newly collected frequency-density data all point to a stable soil and vegetative trend. Range condition is generally satisfactory and should remain so under current use and management. Some of the more palatable shrub species exhibit less than optimum vigor, a factor which should continue to be monitored.

1996 TREND ASSESSMENT

Soil trend is improved with lower values for percent bare ground and a good ratio for protective vegetative cover (vegetation and litter cover) to percent bare ground. There was increased vigor and a decrease in percent decadence for all preferred browse species. The mountain big sagebrush population has decreased somewhat, but this was the result of drought and intraspecific competition among the sagebrush plants. With increased precipitation and a slight decrease in numbers, vigor is much improved. Some of the preferred browse that were initially in low abundance, now have much better estimates of their respective populations with a greatly improved sampling design. Therefore, some of these species (serviceberry, mountain mahogany, bitterbrush, and snowberry) have population estimates that are greater or less than originally estimated, but the latter estimates are much more accurate. The overall trend for browse is improved. The trend for the herbaceous understory is also improved, with sum of nested frequency for both grasses and forbs showing good improvement for the perennial species. Annuals still play an important part of the herbaceous understory, making up more than 33% of the herbaceous understory cover.

TREND ASSESSMENT
soil - slightly improved
browse - improving
herbaceous understory - improving for perennials

HERBACEOUS TRENDS --
Herd unit 07, Study no: 9

Type	Species	Nested Frequency '84	'96	Quadrat Frequency '84	'96	Average Cover % '96
G	Agropyron spicatum	22	*67	10	24	1.63
G	Agropyron trichoporum	1	-	1	-	-
G	Bromus japonicus (a)	-	169	-	61	1.26
G	Bromus tectorum (a)	-	189	-	58	2.19
G	Poa fendleriana	9	-	3	-	-
G	Poa pratensis	65	*129	24	45	4.03
G	Poa secunda	40	*76	17	28	1.56
Total for Grasses		137	630	55	216	10.69
F	Achillea millefolium	-	1	-	1	.00
F	Alyssum alyssoides (a)	-	101	-	37	.36
F	Allium spp.	-	*16	-	9	.10
F	Arabis spp.	-	1	-	1	.00
F	Artemisia ludoviciana	17	*49	9	19	1.04
F	Cirsium spp.	3	-	2	-	-
F	Collomia linearis (a)	-	24	-	13	.06
F	Crepis acuminata	-	3	-	1	.03
F	Epilobium paniculatum (a)	-	33	-	15	.10
F	Galium aparine (a)	-	32	-	16	.32
F	Holosteum umbellatum (a)	-	3	-	1	.00
F	Lappula occidentalis (a)	-	1	-	1	.00

Type	Species	Nested Frequency '84	'96	Quadrat Frequency '84	'96	Average Cover % '96
F	Lepidium spp. (a)	-	8	-	3	.18
F	Lomatium spp.	-	3	-	2	.04
F	Phlox longifolia	-	*17	-	7	.08
F	Polygonum douglasii (a)	-	47	-	16	.08
F	Tragopogon dubius	1	12	1	5	.02
F	Viguiera multiflora	20	*8	10	4	.10
Total for Forbs		41	359	22	151	2.56

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07, Study no: 9

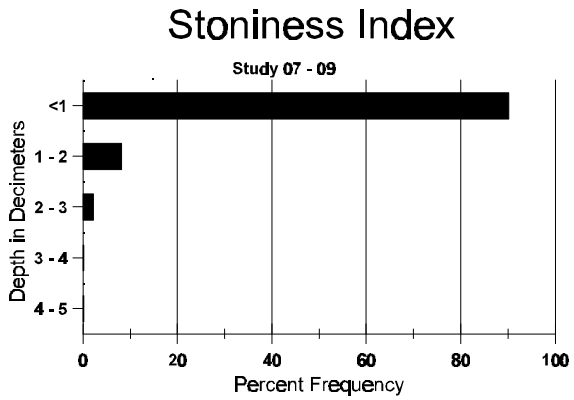
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	23	.43
B	Artemisia tridentata vaseyana	36	4.39
B	Cercocarpus montanus	7	.18
B	Chrysothamnus depressus	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	.15
B	Gutierrezia sarothrae	17	1.00
B	Mahonia repens	50	2.40
B	Opuntia spp.	1	.00
B	Pachistima myrsinites	1	-
B	Purshia tridentata	1	.38
B	Quercus gambelii	57	13.33
B	Symphoricarpos oreophilus	20	.42
Total for Browse		216	22.69

BASIC COVER --
Herd unit 07, Study no: 9

Cover Type	Nested Frequency '96	Average Cover % '84	'96
Vegetation	366	1.00	36.18
Rock	285	26.25	25.11
Pavement	148	8.25	6.99
Litter	388	58.50	45.95
Cryptogams	13	3.00	.03
Bare Ground	105	3.00	2.83

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 9

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
6.6	53.0 (6.4)	6.2	36.2	35.4	28.4	3.8	27.6	214.4	.5



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 9

Type	Quadrat Frequency '96
Rabbit	3
Elk	4
Deer	1

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	1	-	-	-	-	-	-	1	-	-	-	66	24	26	1
	96	17	2	-	6	1	-	-	-	-	26	-	-	-	520	23	25	26
D	84	-	-	2	-	-	-	-	-	-	-	-	1	1	133			2
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		199	Dec:		67%
													'96		540			4%
Artemisia tridentata vaseyana																		
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	3	2	1	-	-	-	-	-	-	6	-	-	-	400	22	27	6
	96	24	5	-	1	-	-	-	-	-	28	-	1	1	600	21	37	30
D	84	-	3	5	-	-	-	-	-	-	5	1	2	-	533			8
	96	9	6	-	-	-	-	-	-	-	10	-	-	5	300			15
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	320			16
Total Plants/Acre (excluding Dead & Seedlings)													'84		1066	Dec:		50%
													'96		940			32%
Cercocarpus montanus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	-	1	-	-	-	-	-	-	4	-	-	-	80	51	28	4
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	1	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		0%
													'96		160			25%
Chrysothamnus depressus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'96		20			-
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40	8	17	2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'96		40			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	31	-	-	-	-	-	-	-	-	31	-	-	-	620	11	16	31
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'96		700			-
Mahonia repens																		
S	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	84	39	-	-	-	-	-	-	-	-	39	-	-	-	2600			39
	96	69	-	-	3	-	-	-	-	-	72	-	-	-	1440			72
M	84	104	-	-	-	-	-	-	-	-	104	-	-	-	6933	3	2	104
	96	325	-	-	14	-	-	-	-	-	339	-	-	-	6780	4	6	339
Total Plants/Acre (excluding Dead & Seedlings)													'84		9533	Dec:		-
													'96		8220			-
Opuntia spp.																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	2	8	1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	4	13	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		66	Dec:		-
													'96		40			-
Pachistima myrsinites																		
M	84	16	-	-	-	-	-	-	-	-	16	-	-	-	1066	4	13	16
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	9	17	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		1066	Dec:		-
													'96		20			-
Purshia tridentata																		
M	84	-	2	1	-	-	-	-	-	-	3	-	-	-	200	16	43	3
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	20	60	1
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		25%
													'96		20			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	28	21	-	-	-	-	-	-	-	49	-	-	-	3266			49
	96	17	-	-	5	-	-	-	-	-	22	-	-	-	440			22
M	84	5	9	11	-	-	-	-	-	-	25	-	-	-	1666	30	15	25
	96	181	-	-	-	-	-	-	-	-	181	-	-	-	3620	32	32	181
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	10	-	-	-	-	-	-	-	-	9	-	-	1	200			10
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12
Total Plants/Acre (excluding Dead & Seedlings)													'84		4932	Dec:		0%
													'96		4260			5%
Symphoricarpos oreophilus																		
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	2	-	-	-	-	-	-	-	-	1	-	1	-	40			2
M	84	1	1	-	-	-	-	-	-	-	2	-	-	-	133	18	20	2
	96	10	-	-	15	-	-	-	-	-	25	-	-	-	500	17	25	25
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		0%
													'96		560			4%
Gutierrezia sarothrae																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	7	1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'84		132	Dec:		-
													'96		0			-

TREND STUDY 7-10-96 (old 20-30)

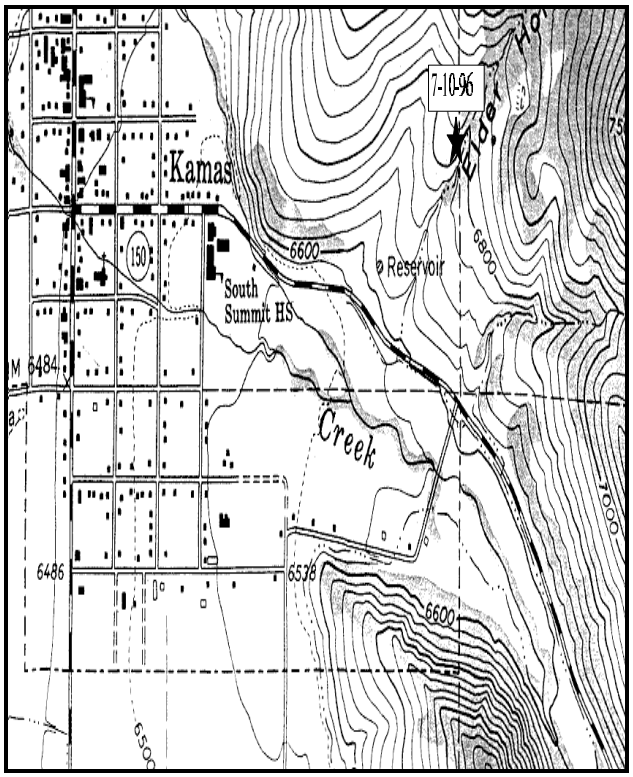
Study site name: Above Kamas Water Tanks. Range type: Mountain brush.

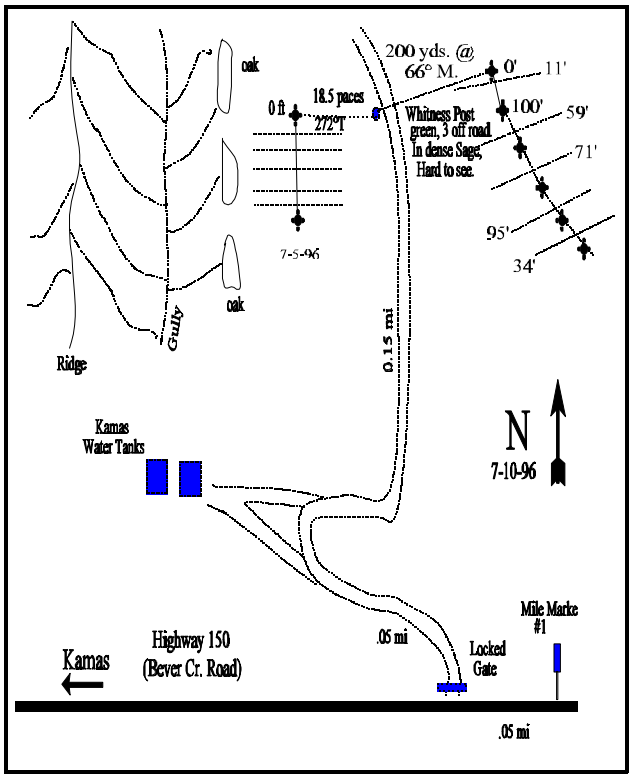
Compass bearing: frequency baseline 169 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), Line 2 (59ft), Line 3 (71ft), Line 4 (95ft), Line 5 (34ft).

LOCATION DESCRIPTION

Westbound on Highway 150 (Beaver Creek) from mile marker 1, proceed 0.05 miles to a locked gate on the right. Contact the Wildlife Biologist in the area to obtain a key. The site can also be reached by walking. Proceed through the gate, turn left, travel 0.05 miles, turn right, travel 0.05 miles, bear right, and travel 0.15 miles to green steel stake on the left side of the road. This is the location of the old Kamas Water Tanks site. The post is in dense sagebrush 3 feet from road. From the post, walk 200 yards at 66°M to a witness post on a ridge. The 0-foot stake is just a couple of paces south of the witness post. The baseline doglegs down through the same vegetation type. Line 1 runs 169 degrees magnetic. Line 2 runs 151 degrees magnetic. Line 3 runs 149 degrees magnetic. Lines 4 and 5 run 146 degrees magnetic.





Map Name: Kamas Diagrammatic Sketch

Township 2S, Range 6E, Section 15, UTM COOR: 4-78-144E 44-99-257N

DISCUSSION

Trend Study No. 7-10

The original Kamas Water Tank site sampled critical deer winter range located immediately east of Kamas. When this site was revisited in 1996, it was for sale. This is a privately owned site that for many years has been intensively grazed by sheep, cattle, and horses. Knowing that this area is important as critical winter range, the study site was moved up the ridge so that the site could be accessible in the future. Furthermore, there was little sign that the old site was used by wildlife, whereas the new site has abundant indications of use. The range type is mountain big sagebrush/grass that also contains an interspersed and diverse population of other shrub species. Elevation of the new site is approximately 7,000 feet and about 200 yards northeast of the old site. It has a slope of 35-40% and an aspect to the southwest. Deer use was reportedly heavy on the old site, however, few pellet groups were present and form class analysis of the key browse species indicates only light to moderate use. As a comparison, the old site had pellet group frequencies of only 10% for deer and none for elk. The new site has pellet group frequencies of 45% for deer and 27% for elk.

Soil on the new site is similar to the old site which is also alluvially deposited yet noticeably more shallow. The new site is more rocky with more surface rock. Rooting depth should not be a limiting factor. Soil erosion is also not a serious problem on this site, with percent bare ground moderately low at about 6% and good protective cover compared to the amount of bare soil. The most serious problem on the site is the moderately steep slope. However, that is why the slope with the southwest aspect is utilized by wildlife in the winter.

The old site sampled a dense mountain big sagebrush/grass area with an understory dominated by Kentucky bluegrass and patches of cheatgrass brome. The new site supports more diversity for preferred browse species. These include: mountain big sagebrush, serviceberry, bitterbrush, and snowberry. The only species of preferred browse that appears to have a problem is the mountain big sagebrush that has a percent decadency rate of 19%. Compared to most other sampled populations within the area, this is lower than most. The key species for this site is obviously mountain big sagebrush which makes up 72% of the browse cover. It's population consists of a variety of age classes, which indicates a fairly stable situation. The years of continuous drought have affected most of the state’s sagebrush population. The population is now recovering from drought and appears to be stable at this time with a density of 2,540 plants/acre. Twenty-six percent of the population appears to have died in the last 10 years. Forage utilization is generally moderate.

Understory growth is limited because of the slope and aspect of the site, and competition with the browse species, especially mountain big sagebrush. Although several grass species occur on the site, easily the most dominant is Kentucky bluegrass. This aggressive increaser and sod-former has good vigor and will probably fluctuate in abundance inversely with big sagebrush density, cover and drought. Cheatgrass is the second most abundant species on the site. This annual grass makes up 38% of the grass cover. Forbs are a minor component on this site and provide very little forage or protective cover.

1996 APPARENT TREND ASSESSMENT

The soil trend appears stable with percent bare ground low at only about 6% and a good ratio of bare ground to protective cover (vegetation and litter cover). The key browse species for the site is mountain big sagebrush which provides more than 72% of the browse cover. Even with some losses in its density in the last 10 or so years, the population appears stable at this time with good vigor, moderately low percent decadence, and about 28% being classified as receiving

heavy use. The herbaceous understory is dominated by Kentucky bluegrass (an increaser) and cheatgrass (winter annual) by contributing 52% of the herbaceous understory cover. There are few desirable forbs on the site. The herbaceous understory is considered stable, but poor condition because of the composition of increasers and winter annuals.

HERBACEOUS TRENDS --
Herd unit 07, Study no: 10

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
G	Agropyron cristatum	16	7	.28
G	Agropyron spicatum	6	2	.03
G	Bromus carinatus	10	6	.08
G	Bromus tectorum (a)	303	80	3.80
G	Carex spp.	17	6	.36
G	Oryzopsis hymenoides	-	-	.00
G	Poa fendleriana	4	3	.06
G	Poa pratensis	125	41	4.13
G	Poa secunda	50	20	.90
G	Sitanion hystrix	13	6	.25
Total for Grasses		544	171	9.93
F	Agoseris glauca	2	1	.00
F	Alyssum alyssoides (a)	272	79	1.76
F	Artemisia ludoviciana	14	5	.22
F	Arabis perennans	6	3	.01
F	Astragalus convallarius	1	1	.00
F	Astragalus utahensis	1	1	.00
F	Calochortus nuttallii	6	3	.01
F	Chaenactis douglasii	5	2	.03
F	Cirsium spp.	35	16	.56
F	Comandra pallida	7	3	.06
F	Collinsia parviflora (a)	8	4	.04
F	Draba spp. (a)	24	6	.03
F	Epilobium paniculatum	10	5	.02
F	Erodium cicutarium (a)	1	1	.00
F	Eriogonum racemosum	29	17	.21
F	Heterotheca villosa	1	1	.03
F	Holosteum umbellatum (a)	1	1	.00
F	Lithospermum ruderale	-	-	.15
F	Lupinus argenteus	13	6	.75
F	Oenothera spp.	3	1	.00
F	Penstemon humilis	42	18	.87

Type	Species	Nested Frequency '96	Quadrat Frequency '96	Average Cover % '96
F	Penstemon spp.	2	1	.00
F	Polygonum douglasii (a)	8	3	.01
F	Ranunculus testiculatus (a)	60	20	.20
F	Tragopogon dubius	14	6	.08
F	Viguiera multiflora	20	8	.16
F	Zigadenus paniculatus	3	1	.01
Total for Forbs		588	213	5.30

BROWSE TRENDS --
Herd unit 07, Study no: 10

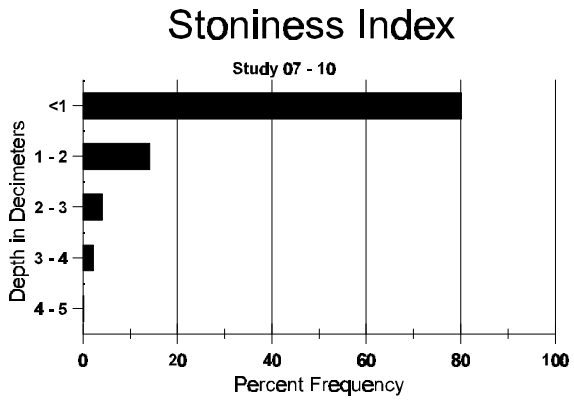
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	20	1.53
B	Artemisia tridentata vaseyana	74	21.76
B	Chrysothamnus depressus	3	-
B	Chrysothamnus nauseosus	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	5	.53
B	Eriogonum heracleoides	1	-
B	Gutierrezia sarothrae	38	1.24
B	Mahonia repens	4	-
B	Opuntia spp.	17	.54
B	Prunus virginiana	1	-
B	Purshia tridentata	4	.56
B	Symphoricarpos oreophilus	38	3.80
B	Tetradymia canescens	14	.21
Total for Browse		220	30.20

BASIC COVER --
Herd unit 07, Study no: 10

Cover Type	Nested Frequency '96	Average Cover % '96
Vegetation	461	41.93
Rock	330	22.34
Pavement	255	4.72
Litter	487	43.82
Cryptogams	54	.26
Bare Ground	221	6.30

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 10

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.1	38.4 (13.2)	7.0	48.2	27.1	24.7	3.7	16.6	198.4	.6



PELLET GROUP FREQUENCY --
Herd unit 07, Study no: 10

Type	Quadrat Frequency '96
Rabbit	1
Elk	27
Deer	45

BROWSE CHARACTERISTICS --
Herd unit 07, Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	96	-	-	1	-	-	1	-	-	-	2	-	-	-	40			2
M	96	-	5	9	3	4	3	-	-	-	24	-	-	-	480	22	29	24
Total Plants/Acre (excluding Dead & Seedlings) '96															520	Dec:		-
Artemisia tridentata vaseyana																		
Y	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	96	17	52	25	-	-	-	-	-	-	94	-	-	-	1880	20	44	94
D	96	4	11	9	-	-	1	-	-	-	21	-	-	4	500			25
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	880			44
Total Plants/Acre (excluding Dead & Seedlings) '96															2540	Dec:		20%
Chrysothamnus depressus																		
M	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	7	17	5
Total Plants/Acre (excluding Dead & Seedlings) '96															100	Dec:		-
Chrysothamnus nauseosus																		
M	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Chrysothamnus viscidiflorus viscidiflorus																		
Y	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	11	19	6
Total Plants/Acre (excluding Dead & Seedlings) '96															160	Dec:		-
Eriogonum heracleoides																		
M	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Gutierrezia sarothrae																		
S	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	96	35	-	-	-	-	-	-	-	-	35	-	-	-	700			35
M	96	170	-	-	-	-	-	-	-	-	170	-	-	-	3400	8	12	170
Total Plants/Acre (excluding Dead & Seedlings) '96															4100	Dec:		-
Mahonia repens																		
M	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	4	4	5
Total Plants/Acre (excluding Dead & Seedlings) '96															100	Dec:		-
Opuntia spp.																		
Y	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	96	24	-	-	2	-	-	-	-	-	25	-	1	-	520	4	12	26
D	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															560	Dec:		4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Prunus virginiana																		
M	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings) '96															20	Dec:		-
Purshia tridentata																		
M	96	-	-	4	-	-	-	-	-	-	4	-	-	-	80	10	51	4
Total Plants/Acre (excluding Dead & Seedlings) '96															80	Dec:		-
Symphoricarpos oreophilus																		
S	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	96	10	1	-	-	-	-	-	-	-	11	-	-	-	220			11
M	96	27	5	-	19	-	-	-	-	-	51	-	-	-	1020	21	30	51
D	96	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
Total Plants/Acre (excluding Dead & Seedlings) '96															1260	Dec:		2%
Tetradymia canescens																		
Y	96	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
M	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320	8	18	16
D	96	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
Total Plants/Acre (excluding Dead & Seedlings) '96															480	Dec:		8%

SUMMARY

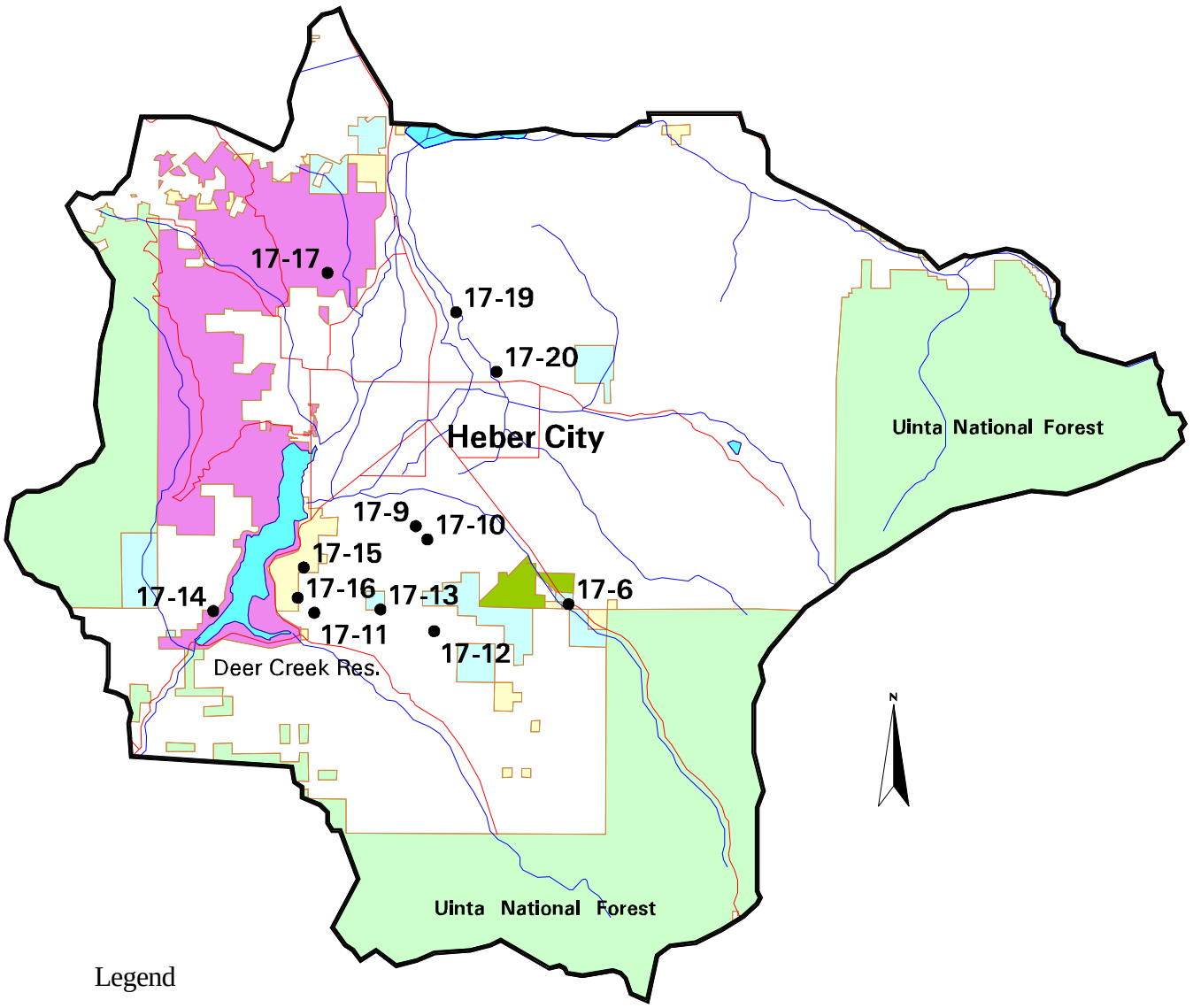
HERD UNIT - 7 (20) - KAMAS

Where downward vegetative trends are indicated on these study sites, they are related to high and often increased percentages of decadent plants and declining frequencies and densities of the key browse species. But on all the winter range surveyed, the plant communities are diverse and have the potential to recover from the downward trends and heavy utilization. Half of the key winter ranges sampled display stable vegetative trends, adequate forage production and good vigor despite the drought conditions. The most obvious management goal is to protect the remaining limited acreage of winter range and cooperate with private landowners on proper range management and improvement.

TREND SUMMARY UNIT - 7 - KAMAS

Site	1990			1996		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
7-1 Steven's Hollow	stable	down	stable	up	down	up but poor
7-2 Pinyon Canyon	stable	down slightly	up slightly	up slightly	up slightly	up
7-3 Foothill Drive	stable	stable	down slightly	up	stable	down slightly
7-4 Above Samak	stable	down	stable	up	stable	up
7-5 Kamas Water Tanks (old)	stable	down	stable	stable	stable	up
7-6 Cedar Hollow	stable	stable	stable	stable	stable	stable
7-7 Provo River Canyon	stable	down	stable	stable	up slightly	down slightly
7-8 Hailstone	stable	stable	stable but poor	stable	stable	stable but poor
7-9 Above Woodland	site not read in 1990			up slightly	up	up
7-10 Above Kamas Water Tanks (new)	new site in 1996			stable	stable	stable but poor

Heber Management Unit



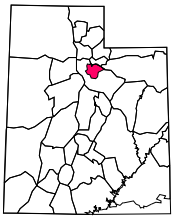
Legend

- Forest Service
- Bureau of Land Management
- State of Utah
- Private Land
- State Park
- State Wildlife Ref.
- Water Body
- Transect Location
- Road
- Water Course

Map Scale 1:285,120

1 inch = 4.5 miles

Map Location



UDAF GIS May, 2000

HERD UNIT 17 - WASATCH MOUNTAINS

BOUNDARY DESCRIPTION

Salt Lake, Summit, Wasatch, Duchesne, Carbon, Utah counties - Boundary begins at the junction of Interstate 15 and Interstate 80 on Salt Lake City; then east on I-80 to Highway US-40; south on US-40 to Highway SR-32; east on SR-32 to Highway SR-35; southeast on SR-35 to Highway SR-87; south on SR-87 to Duchesne and Highway US-191; south on US-191 to Highway US-6; northeast on US-6 to I-15; north on I-15 to I-80 in Salt Lake City and beginning point.

INTRODUCTION

Unit 17 is now mostly a compilation of older herd unit numbers 13, 14, 17, 18, 19, and 27. Currently, this much larger unit is divided into 7 smaller subunits or populations, these are: Avintaquin, Currant Creek, Diamond Fork, Heber, Price River Drainage, Salt Lake, and Timpanogos. This 1996 vol. 2 report will be reporting only on the Heber subunit.

Earlier surveys (Huff 1962) have marked the upper limit of normal winter range at 7,800 feet on most of the unit, down to 7,000 feet in some of the areas, like Round Valley and Deer Creek Reservoir. The lower winter range limit was considered to be about 5,500 feet. In severe winters, the upper limit for winter range was 6,000 to 6,500 feet, reducing the amount of range by over 50%. Surveys done in 1961 (Huff 1962) and 1976 (Olson 1977) indicated that the key browse on south and southwest exposures were moderate to heavily used. All vegetative types had depleted understories due to long histories of domestic livestock grazing. The critical limiting factor for this unit is winter range. Only 35% of the available range is considered winter range, with 52% of this critical range being privately owned. Although the majority of the winter range is controlled by private interests, the Division owns some of the most critical areas, about 10% of the winter range. Another serious problem within this unit is the increase in housing developments occurring around most of the small towns and the extensive areas of agriculture, primarily alfalfa and hay production, and pasture in the low lying valleys. This herd unit is not on the top priority winter habitat acquisition list because of high land prices and much of the winter range is zoned for housing development.

Key areas within the herd subunit have long been identified as the areas north of Midway, the north side of Daniels Canyon, north and east of Wallsburg, and the foothills west of Deer Creek Reservoir. All of these key areas were sampled by the 1983 and 1989 range trend studies. To minimize future monitoring and access problems and maximize management potential, the majority of the studies (16) were established on DWR property. The others are private land and land administered by the Utah Division of Parks and Recreation and the Bureau of Reclamation. The prevalent big sagebrush/grass range type is the most commonly sampled.

TREND STUDY 17-5-96 (old 21-1)

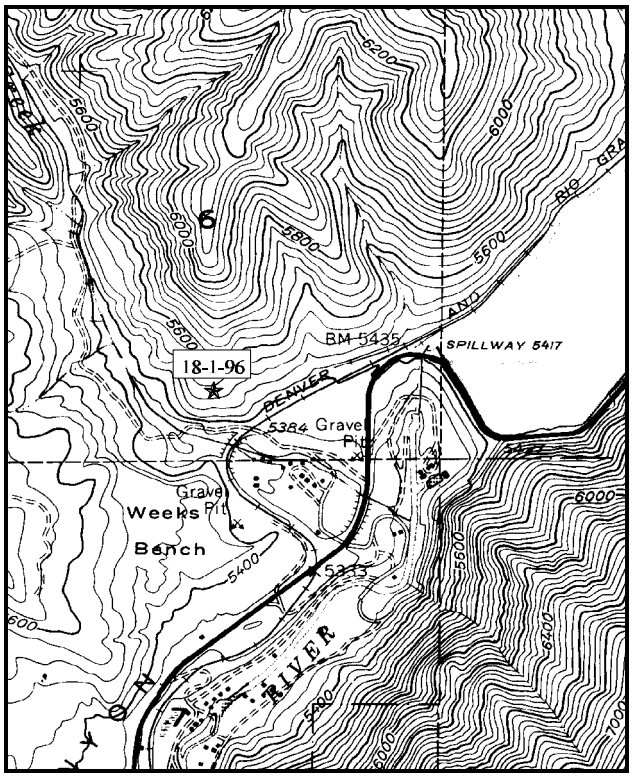
Study site name: Deer Creek Dam . Range type: Big Sagebrush-Grass .

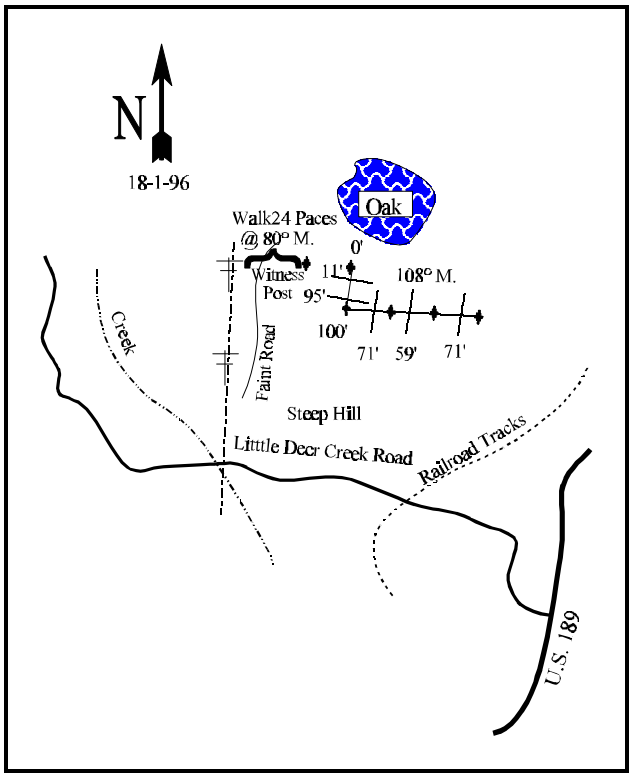
Compass bearing: frequency baseline 164 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (71ft).

LOCATION DESCRIPTION

From the dam at the south end of Deer Creek Reservoir, proceed south on U.S. 189 for 0.10 miles to an intersection to the west. Turn right toward Deer Creek and proceed northwesterly to the intersection of the Denver and Rio-Grande railroad tracks. Continue northerly for 0.3 miles to where cross over the road. From this pont, walk northeast to the second power line pole. Walk over the road. From this point, walk northeast to the second power line pole. Walk 29 paces from the pole at an azimuth of 94 degrees true to the 0-foot baseline stake. A red browse tag, number 3914, is attached to the 0-foot baseline stake. Line 4 belt was mistakenly put at 71 feet.





Map Name: Aspen Grove Diagrammatic Sketch

Township 5S , Range 4E , Section 6

DISCUSSION

Trend Study No. 17-5 (21-1)

The Deer Creek Dam study is located within deer winter range on a moderately steep sloping (15%-20%) bench at the mouth of Deer Creek. Elevation is approximately 5,540 feet on a south to southeast exposure. The study is on land administered by the Utah Division of Parks and Recreation about ½ mile west of Deer Creek dam. The range type is mountain big sagebrush-grass and receives moderate deer use in winter and spring.

Soil is alluvially deposited from sedimentary parent material and appears gravelly or sandy in texture. The soil is also quite rocky, enough so that driving the stakes into the soil was difficult. Soil appears to be moderately deep, however, steeper slopes with similar soil have greatly accelerated erosion rates.

Currently vegetative cover is estimated at 56%, while litter cover is estimated at 57%, mostly attributed to cheatgrass and other annual species. Percent bare ground cover is estimated to be under 7%, with rocks and pavement combining to provide 11% cover.

The Deer Creek Dam study was established in June of 1983 and reread in mid-September 1989 and mid-May 1996. Power line construction previous to 1989 disturbed the area along the end of the frequency lines, killing the mature sagebrush and resulting in a proliferation of sagebrush seedlings and annual weeds in 1989. The disturbance does not appear to have greatly accelerated soil erosion.

Mountain big sagebrush density is erratic with an estimated density of 2,533 plants/acre in 1983, 1,199 plants/acre in 1989, and 4,120 plants/acre in 1996. The large increase in density in 1996 could be mostly attributed to the greatly increased sample size now used. Due to the construction of a power line, there were a great number of seedling sagebrush (21,000 plants/acre) in 1989, but this number has now declined to 2,020 plants/acre in 1996. In 1996, the sagebrush showed light utilization and good vigor. The age class structure appears healthy with a good distribution of young and mature plants. It was reported in 1996 that a portion of the population located further downslope appeared to have some crown death. This is common in populations occurring on moderately steep west aspects, in association with extended drought, sagebrush can easily get winter injuries, killing portions of their crowns.

Mountain low rabbitbrush has an estimated density of 2,060 plants/acre in 1996. The population is mostly mature with very few plants showing utilization. Very few seedlings or young plants were located. Their average height was 12 inches with an average crown of 21 inches. Broom snakeweed density is estimated at 1,140 plants/acre. These plants are very small measuring only 6 inches in height with a 9 inch crown.

Other species encountered, but in low densities, include chokecherry, bitterbrush, snowberry, Saskatoon serviceberry, and white rubber rabbitbrush.

Cheatgrass provides the bulk of the herbaceous cover and was found in nearly every quadrat providing 50% of the herbaceous cover. The cheatgrass has a stunted appearance this season and has grown only 2-3 inches in height. Although they are small in stature, there is abundant seed present. Kentucky bluegrass is the next most abundant grass and has significantly decreased in sum of nested frequency value since 1989. Bluebunch wheatgrass is present and is slowly increasing in nested frequency. Other grasses encountered in 1996 were Great Basin wildrye and bulbous bluegrass.

Many of the forbs encountered are increaser or invader species, including annuals and biennials. The most abundant forb is longleaf phlox, which has significantly increased in nested frequency since 1989. Utah sweetvetch is a valuable forb and shows an increase in nested frequency since 1989 as well.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable on the study site, but declining on nearby steeper slopes. The predominant plant cover is annual vegetation which on these slopes is inadequate to prevent soil loss. Vegetative trend is stable to declining. Concerns include an apparent decline in the key browse species, lack of perennial grass cover, and the overall abundance of annual forbs and grasses.

1989 TREND ASSESSMENT

The slight changes in ground cover percentages can not be interpreted as a downward trend, since they were a result of disturbance from the construction. There is only slight soil movement detectable.

1996 TREND ASSESSMENT

Soil trend appears to be stable at this time with abundant vegetative and litter cover. The soil profile is rocky with rocks and pavement on the surface as well. In 1983 the mountain big sagebrush was reported to generally have poor vigor. The mountain big sagebrush now appears to be healthy with only light hedging and excellent vigor. Some surrounding sagebrush showed winter injury, causing some crown death, but this is very limited. Due to the increased vigor of mountain big sagebrush and because other species appear to be stable, the browse trend is upward. Herbaceous understory has poor composition at this time and is dominated by cheatgrass. Many of the abundant forbs are annuals or biennials. Perennial species are found scattered throughout the site in low numbers. Because annual species were not recorded in the past, it is difficult to give a trend assessment for the herbaceous understory. Trend for perennial species is stable for now and the health of this site is dependant on these species. Because of the fine fuels contributed by the abundant annual species in the understory, this site has the potential to carry a destructive fire that would eliminate most of the browse species.

TREND ASSESSMENT
soil - stable
browse - upward
herbaceous understory - stable, poor herbaceous understory composition

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 5

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron spicatum	a5	b37	b70	3	16	25	2.07
G	Bromus tectorum (a)	-	-	356	-	-	96	19.20
G	Elymus cinereus	-	-	5	-	-	2	.18
G	Melica bulbosa	-	-	3	-	-	1	.00
G	Poa fendleriana	ab3	a10	b-	1	5	-	-
G	Poa pratensis	a96	b164	a92	35	62	34	1.24
G	Poa secunda	1	3	-	1	1	-	-

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
Total for Grasses		105	214	526	40	84	158	22.70
F	Alyssum alyssoides (a)	-	-	96	-	-	32	.36
F	Allium spp.	$_{a}$31	$_{b}$9	$_{ab}$16	12	4	7	.06
F	Artemisia ludoviciana	3	-	6	1	-	2	.06
F	Astragalus convallarius	13	5	24	6	3	10	.24
F	Calochortus nuttallii	$_{a}$14	$_{b}$3	$_{b}$-	7	3	-	-
F	Cirsium undulatum	$_{a}$21	$_{a}$12	$_{b}$47	9	9	25	.82
F	Comandra pallida	-	-	2	-	-	1	.00
F	Cynoglossum officinale	$_{a}$-	$_{a}$2	$_{b}$37	-	1	16	2.34
F	Eriogonum brevicaule	-	7	6	-	3	2	.18
F	Galium boreale	$_{a}$-	$_{a}$-	$_{b}$55	-	-	18	.65
F	Galium spp. (a)	-	-	94	-	-	33	.41
F	Gayophytum spp. (a)	-	-	20	-	-	8	.04
F	Hackelia patens	-	3	-	-	1	-	-
F	Helianthus annuus (a)	-	1	-	-	1	-	-
F	Hedysarum boreale	$_{a}$69	$_{b}$13	$_{b}$28	35	8	15	.63
F	Lactuca serriola	$_{a}$-	$_{b}$20	$_{b}$17	-	9	9	.04
F	Linaria dalmatica	$_{a}$-	$_{a}$-	$_{b}$52	-	-	23	.85
F	Lithospermum ruderale	1	3	6	1	1	3	.44
F	Lupinus spp.	8	1	2	3	1	2	.15
F	Machaeranthera canescens	2	5	1	1	2	1	.00
F	Melilotus officinalis	-	-	9	-	-	3	.04
F	Oenothera spp.	$_{a}$4	$_{b}$10	$_{a}$3	1	7	1	.00
F	Phlox longifolia	$_{a}$26	$_{a}$15	$_{b}$109	12	9	39	2.21
F	Ranunculus testiculatus (a)	-	-	12	-	-	7	.06
F	Solidago spp.	3	-	-	1	-	-	-
F	Tragopogon dubius	$_{a}$-	$_{b}$10	$_{c}$61	-	7	24	.39
Total for Forbs		195	119	703	89	69	281	10.02

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 5

Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	2	-
B	Artemisia tridentata vaseyana	78	20.79

Type	Species	Strip Frequency ‘96	Average Cover % ‘96
B	Chrysothamnus nauseosus albicaulis	18	.90
B	Chrysothamnus viscidiflorus lanceolatus	39	3.54
B	Gutierrezia sarothrae	26	.32
B	Prunus virginiana	3	.36
B	Purshia tridentata	2	.15
B	Symphoricarpos oreophilus	19	3.25
Total for Browse		187	29.33

BASIC COVER --
Herd unit 17 , Study no: 5

Cover Type	Nested Frequency ‘96	Average Cover % '83	'89	'96
Vegetation	395	4.25	9.25	56.32
Rock	200	1.25	1.75	5.36
Pavement	219	5.50	15.25	5.72
Litter	397	82.75	68.50	57.25
Cryptogams	-	.25	0	0
Bare Ground	198	6.00	5.25	6.69

PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 5

Type	Quadrat Frequency ‘96
Elk	1
Deer	15

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20	25	26	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	1	-	-	-	-	-	-	-	-	1	-	66			1
	96	-	-	1	-	-	-	-	-	-	-	-	1	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		66			100%
													'96		40			50%
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	315	-	-	-	-	-	-	-	-	315	-	-	-	21000			315
	96	96	3	-	2	-	-	-	-	-	98	-	3	-	2020			101
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	76	1	-	1	-	-	-	-	-	78	-	-	-	1560			78
M	83	16	8	3	-	-	-	-	-	-	16	-	11	-	1800	23	33	27
	89	13	-	-	-	-	-	-	-	-	13	-	-	-	866	27	41	13
	96	76	30	4	1	-	-	-	-	-	96	2	13	-	2220	24	39	111
D	83	1	4	4	-	-	-	-	-	-	-	-	9	-	600			9
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	11	6	-	-	-	-	-	-	-	2	-	4	11	340			17
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	440			22
Total Plants/Acre (excluding Dead & Seedlings)													'83		2533	Dec:		24%
													'89		1199			11%
													'96		4120			8%
Chrysothamnus nauseosus albicaulis																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	21	27	1
	96	12	1	6	1	-	-	-	-	-	17	-	2	1	400	23	26	20
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	1	-	1	3	100			5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		66			0%
													'96		580			17%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus lanceolatus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	74	10	-	4	1	-	-	-	-	89	-	-	-	1780	12	21	89
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		2060			-
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	30	-	-	-	-	-	-	-	-	30	-	-	-	600			30
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	17	-	-	-	-	-	-	-	-	17	-	-	-	340			17
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	19	20	1
	96	36	-	1	-	1	-	-	-	-	37	-	-	1	760	6	9	38
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		66			0%
													'96		1140			4%
Prunus virginiana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	21	-	-	-	-	-	-	-	-	21	-	-	-	420			21
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	2	-	-	-	-	-	-	-	2	-	-	-	40	46	23	2
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		266			-
													'96		320			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	4	-	-	-	-	-	-	-	4	-	-	-	80	14	42	4
Total Plants/Acre (excluding Dead & Seedlings)														'83	0	Dec:		-
														'89	0			-
														'96	100			-
Symphoricarpos oreophilus																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	19	2	3	-	-	-	-	-	-	24	-	-	-	480	25	33	24
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)														'83	0	Dec:		0%
														'89	66			100%
														'96	540			0%

TREND STUDY 17-6-96 (old 21-2)

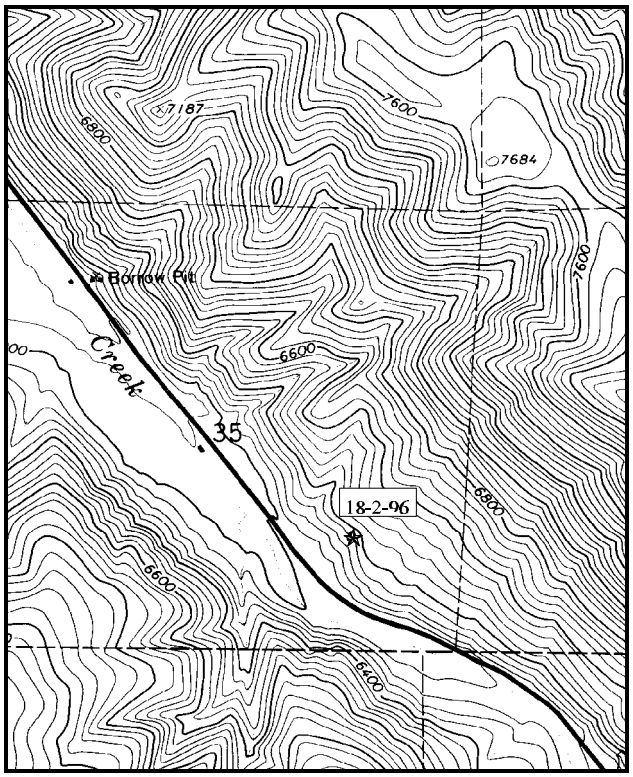
Study site name: Daniels Canyon. Range type: Big Sagebrush-Grass.

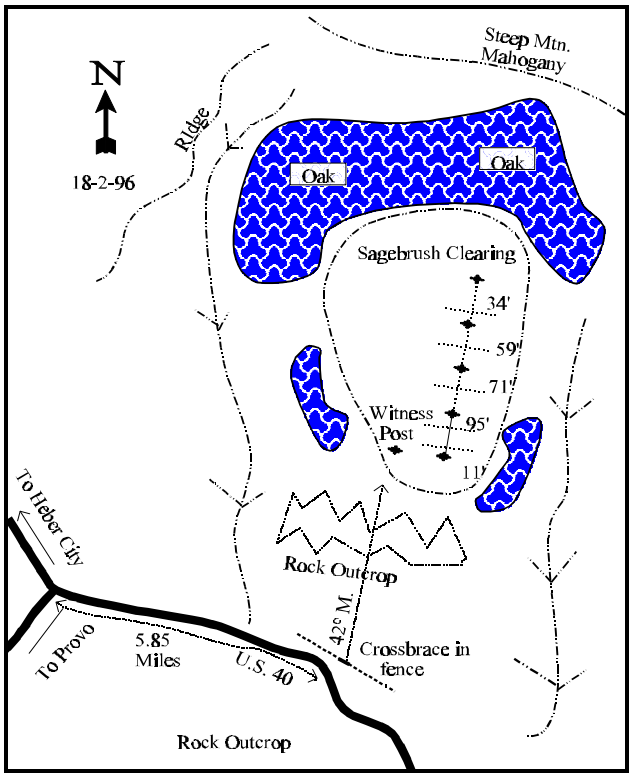
Compass bearing: frequency baseline 27 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (71ft), line 3 (59ft), line 4 (34ft).

LOCATION DESCRIPTION

From the junction of U.S. 189 and U.S. 40 (southeast of Heber City), proceed southeast on U.S. 40 towards Daniels Pass for 5.85 miles, to mile marker 25. From mile marker 25, proceed towards Daniels Pass for and additional 0.25 miles and stop. Cross the fence on the northeast side of the road and walk 34 paces along the fence in a southeasterly direction until you reach a cross brace in the fence. From this point, proceed up the slope 140 paces at and azimuth of 42 degrees magnetic, to the witness post. From the witness post, walk at a bearing of 112 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline runs at an azimuth of 27 degrees magnetic. Line two runs 13 degrees magnetic. Line three runs 21 degrees magnetic. Line 4 runs 22 degrees magnetic. The last baseline stake is 50 feet away. A red browse tag, number 3962, is attached to the 0-foot baseline stake.





Map Name: Center Creek, Utah Diagrammatic Sketch

Township 4S, Range 5E, Section 35, UTM COOR: 4-71-82E 44-74-740N

DISCUSSION

Trend Study No. 17-6 (21-2)

The Daniels Canyon study is located on Utah Division of Wildlife Resources owned winter range in the lower portion of Daniels Canyon about 200 yards above the highway. Site elevation is approximately 6,200 feet with a southwesterly aspect and moderately steep slope of 20%. The site is occupied by a sagebrush-grass community surrounded by thick Gambel oakbrush. Numerous elk and deer pellet groups in 1996 suggest heavy winter utilization. In addition, one small buck was seen just north of the site and a cow elk was seen across the narrow canyon.

Textural analysis indicates a loam soil with a neutral pH. The average soil temperature, measured at 12 inches, is 48°F. Effective rooting depth (see methods) was moderately shallow at about 11 inches. Some gravel is scattered throughout the horizon with larger rocks found on the surface. There is little bare soil and almost no erosion is apparent.

Vegetative cover is estimated to be 41%, most of which is contributed by annual grass and forb species. Litter cover also comes primarily from annuals and is estimated to be nearly 58%. Rock and pavement cover combine to provide 22% of the surface cover. Percent bare soil cover is extremely low at an estimated 1%, decreasing the rate of erosion.

As in 1983 and 1989, evidence suggests heavy winter use by deer and elk. The mountain big sagebrush is vigorous with some producing abundant seed heads in 1996. However, many have no seed heads and are moderately hedged indicating preference for some of the hybrid sagebrush forms. Fifty-six percent of the sagebrush were classified as heavily hedged in 1989, as opposed to only 3% in 1996. Mountain big sagebrush age structure reveals a mostly mature population with few seedlings encountered in 1996. The density appears to be stable and estimated to be 3,000 plants/acre in 1996. These data indicates that the extended drought has run its course now, with the population stabilizing at present levels, leaving about 21% of the population dead.

Oak clones are scattered on the slopes with most being 4-8 feet in height. Some of the shorter oak clones are heavily hedged. The patches of oakbrush do not appear to be expanding. A few more Gambel oak were encountered in 1996 with the increased sample size.

White stem rabbitbrush and stickyleaf low rabbitbrush may be slightly increasing in density on the site. These plants show no utilization and good vigor. The broom snakeweed density is estimated to be 2,500 plants/acre in 1996, which is much lower then the estimated 11,799 plants/acre in 1989. This population is mature with low biotic potential this season.

Sum of nested frequency for perennial grasses has increased since 1989, mostly due to Kentucky bluegrass and Sandberg bluegrass. Both species have significantly increased in sum of nested frequency. Much of the herbaceous understory cover comes from two annual grasses, cheatgrass and Japanese brome. These species (annuals) were not counted previously, but were reported as “lush” in 1983. Other grass species include Indian ricegrass, sand dropseed, bluebunch wheatgrass, and bulbous bluegrass.

Perennial forb sum of nested frequency has declined since 1989, although it still is higher than the initial readings in 1983. While the forbs are not abundant, there is a high diversity.

1983 APPARENT TREND ASSESSMENT

Soil trend is declining. Overall, the site is poorly developed and eroded sufficiently to prevent any significant soil buildup. There is evidence of continuing erosion and soil loss. Vegetative trend is more difficult to assess. The key browse species is healthy and moderately productive but may be threatened by other vegetative trends. Most obvious are the competitive influence of increaser shrubs and a depleted and weedy herbaceous understory.

1989 TREND ASSESSMENT

The soil trend is downward. The trend for the key browse species, big sagebrush, is declining due to lack of replacements for the increasingly decadent population. These small sagebrush openings provide attractive winter range forage, but are limited within the oak-dominated canyon.

1996 TREND ASSESSMENT

Because there is very little bare soil, soil trend is stable at this time. Much of the litter protecting the soil is contributed by annual species and could easily be washed down the slope exposing the soil. Vegetative cover helps provide protection, but most is also contributed by annual species. The browse trend is stable with a vigorous mountain big sagebrush population. The broom snakeweed population can fluctuate highly from season to season and appears to have stabilized at 2,500 plants/acre since the 1989 estimate of 11,799 plants/acre. Herbaceous trend for perennial species is slightly downward with a decrease in sum of nested frequency. Annual species dominate the herbaceous understory which were not counted in previous years.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly downward, poor herbaceous understory composition

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 6

Type	Species	Nested Frequency '83	Nested Frequency '96	Quadrat Frequency '83	Quadrat Frequency '96	Average Cover % '96
G	Agropyron intermedium	-	-	-	-	.03
G	Agropyron spicatum	2	*10	1	4	.53
G	Bromus japonicus (a)	-	182	-	53	7.01
G	Bromus tectorum (a)	-	315	-	89	11.61
G	Oryzopsis hymenoides	9	19	4	10	.78
G	Poa bulbosa	-	1	-	1	.03
G	Poa pratensis	-	*44	-	14	2.08
G	Poa secunda	-	*22	-	11	.30
G	Sporobolus cryptandrus	45	39	18	19	1.00
Total for Grasses		56	632	23	201	23.39
F	Agoseris glauca	3	3	2	1	.15
F	Alyssum alyssoides (a)	-	188	-	56	1.28

Type	Species	Nested Frequency '83	'96	Quadrat Frequency '83	'96	Average Cover % '96
F	Artemisia ludoviciana	34	*59	14	24	1.34
F	Astragalus utahensis	-	3	-	1	.03
F	Calochortus nuttallii	5	-	3	-	-
F	Cirsium spp.	1	*15	1	6	.59
F	Epilobium paniculatum	-	15	-	6	.03
F	Erodium cicutarium (a)	-	11	-	3	.18
F	Erigeron spp	3	*24	1	12	.18
F	Eriogonum racemosum	-	*19	-	10	.27
F	Heterotheca villosa	8	5	4	3	.45
F	Holosteum umbellatum (a)	-	1	-	1	.00
F	Lactuca pulchella	14	*3	7	2	.04
F	Machaeranthera canescens	-	1	-	1	.03
F	Melilotus officinalis	-	*20	-	9	.95
F	Oenothera albicaulis (a)	13	*3	7	1	.03
F	Polygonum douglasii (a)	-	21	-	12	.08
F	Sphaeralcea coccinea	16	*1	8	1	.03
F	Tragopogon dubius	37	*71	19	40	.58
F	Unknown forb-annual	-	7	-	4	.07
F	Viguiera multiflora	19	*2	8	2	.01
Total for Forbs		153	472	74	195	6.37

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 6

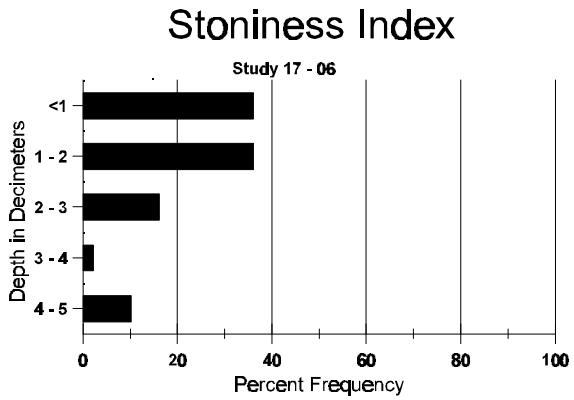
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	61	10.36
B	Chrysothamnus nauseosus albicaulis	7	.18
B	Chrysothamnus viscidiflorus viscidiflorus	5	.15
B	Gutierrezia sarothrae	51	.77
B	Opuntia spp.	29	.55
B	Quercus gambelii	6	1.74
Total for Browse		159	13.77

BASIC COVER --
Herd unit 17 , Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '83	'96
Vegetation	391	3.00	41.45
Rock	262	12.75	14.23
Pavement	163	28.50	8.03
Litter	398	51.25	57.88
Cryptogams	6	3.25	.01
Bare Ground	80	1.25	1.31

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 06

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.7	48.0 (11.9)	7.0	42.9	31.1	26.0	3.6	19.0	227.2	.3



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 6

Type	Quadrat Frequency '96
Rabbit	8
Elk	24
Deer	23

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	10	-	-	-	-	-	-	-	-	10	-	-	-	666			10
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	83	32	14	-	-	-	-	-	-	-	46	-	-	-	3066	14	17	46
	96	72	45	3	-	-	-	-	-	-	120	-	-	-	2400	17	33	120
D	83	1	7	-	-	-	-	-	-	-	8	-	-	-	533			8
	96	7	12	1	-	-	-	-	-	-	18	-	-	2	400			20
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	800			40
Total Plants/Acre (excluding Dead & Seedlings)													'83		4265	Dec:		12%
													'96		3000			13%
Chrysothamnus nauseosus albicaulis																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	41	39	1
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	32	55	4
Total Plants/Acre (excluding Dead & Seedlings)													'83		66	Dec:		-
													'96		140			-
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	3	-	-	-	-	-	7	-	-	-	140	9	19	7
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'96		140			-
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	20	-	-	2	-	-	-	-	-	22	-	-	-	440			22
M	83	32	-	-	-	-	-	-	-	-	32	-	-	-	2133	14	15	32
	96	103	-	-	-	-	-	-	-	-	103	-	-	-	2060	8	11	103
Total Plants/Acre (excluding Dead & Seedlings)													'83		2266	Dec:		-
													'96		2500			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	533	7	10	8
	96	35	-	-	-	-	-	-	-	-	35	-	-	-	700	4	8	35
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		533	Dec:		-
													'96		760			-
Quercus gambelii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	20	-	-	3	-	-	-	23	-	-	-	460	39	37	23
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'96		560			-

TREND STUDY 17-9-96 (old 21-4)

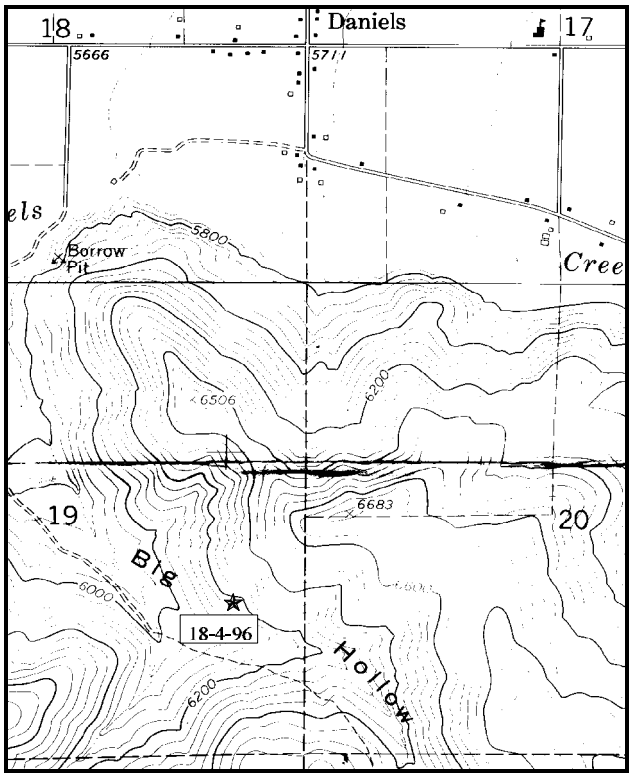
Study site name: Lower Big Hollow . Range type: Mixed oak-sage .

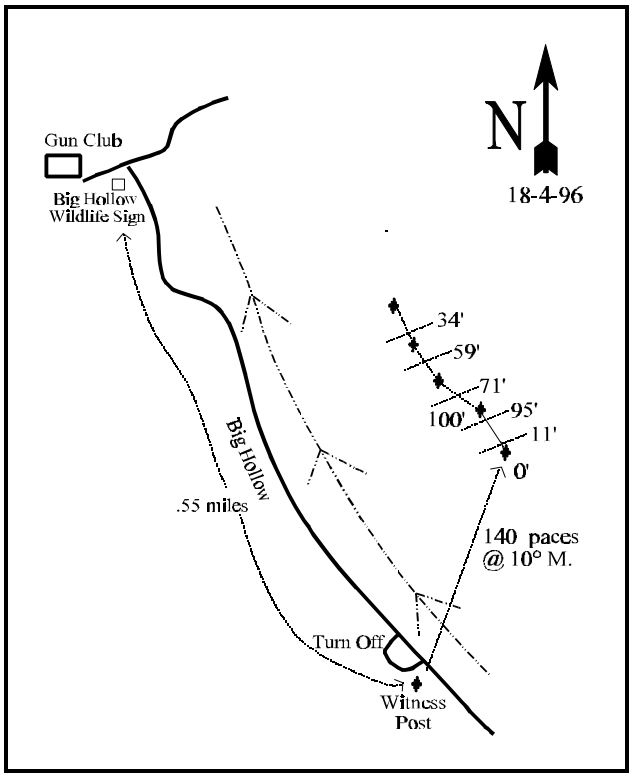
Compass bearing: frequency baseline 346 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (71ft), line 3 (59ft), line 4 (34ft).

LOCATION DESCRIPTION

Begin at the gun club parking lot at the mouth of Big Hollow, proceed east 0.10 miles to the road which runs up Big Hollow. Turn right and proceed up Big Hollow for 0.55 miles to a turnoff to the south, and a green steel "T" fencepost. From the fencepost, the 0-foot baseline stake is located 140 paces away across Big Hollow, at an azimuth of 10 degrees magnetic. A red browse tag, number 67, is attached to the 0-foot stake of the frequency baseline.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 4S , Range 5E , Section 19 , UTM COOR: 4-64-576E 44-78-066N

DISCUSSION

Trend Study No. 17-9 (21-4)

The Lower Big Hollow study is located on Division of Wildlife Resources land approximately one-half mile upstream from the mouth of Big Hollow. Aspect is west facing on a moderately steep slope (30%-35%). Elevation is approximately 6,200 feet. The range type is mixed mountain brush and Gambel oak with a rather sparse native understory. The majority of Big Hollow, at least that portion south of the stream, was destroyed by an extremely hot fire in 1976 and seeded to perennial grasses and forbs. The study site is located just outside of the seeded area.

Wildlife winter use is probably restricted to more open, snow-free winters. For management, the area may be equally or even more important as fawn rearing habitat for deer and spring-fall range for elk. During 1983, at least two yearling bucks and several does with fawns were observed in the vicinity. In 1996 deer were observed on the sight as well as a deer carcass.

Textural analysis indicates the soil is a sandy clay loam with a pH of 7.1. Average soil temperature, measured at 16 inches, was 50°F. Soil is moderately deep with an effective rooting depth of almost 15 inches. There are many small rocks on the surface. Litter from dead cheatgrass and Gambel oak leaves is abundant. Soil erosion appears slight.

Vegetative cover was estimated at 43% in 1996. Litter cover is quite high at 59% with cryptogam cover estimated at <1%. The soil surface has a prevalence of large rocks, which together with pavement make up 13% of the ground cover. Bare ground cover is low at <4%, mostly due to the abundant vegetative litter cover.

The sagebrush on this site appears to be a mix of Artemisia tridentata tridentata and Artemisia tridentata vaseyana. The browse tables refer to the sagebrush as Artemisia tridentata vaseyana. The mountain big sagebrush population is lightly hedged and shows good vigor. Data indicates this population has shifted from a decadent stand in 1989 to a stand with a healthy age structure in 1996. Density has remained relatively constant over all years with an estimated density of 1,540 plants/acre in 1996. The dead to live ratio is 1:3.

Several bitterbrush plants are scattered across the site and exhibit moderate to heavy hedging. These are mature plants just over 2 feet in height and exhibiting a slightly clubbed appearance. More Gambel oakbrush were encountered in 1996, due to the increased sample size. These clones provide excellent escape cover for wildlife. Increaser shrubs are represented by small numbers of broom snakeweed and prickly pear cactus.

The sum of nested frequency for Sandberg bluegrass has decreased since 1989, while nested frequency of bluebunch wheatgrass increased. As with most sites in this area, the site is dominated by cheatgrass. Other grasses encountered on the site include intermediate wheatgrass, smooth brome, Japanese brome, orchard grass, bulbous bluegrass, muttongrass, Kentucky bluegrass, and bottlebrush squirreltail.

Forb composition is diverse, but not very abundant. The most abundant forb is pale alyssum, an annual that provides nearly 1/3 of the forb cover. Currently, forbs provide very little of the herbaceous cover and are few in number.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable to slightly declining. Some erosion pavement is evident but overall, vegetative and litter cover provide good protection. A cautionary note

would be for the over abundance of annual grass in the understory. Cheatgrass constitutes a fire hazard and is relatively ineffective in holding soil when dry and subjected to high intensity storms. Vegetative trend of the important shrub species, is stable. The herbaceous understory is below optimum in either forage quality or production to provide good fawning habitat.

1989 TREND ASSESSMENT

Trend for the mountain big sagebrush now appears downward based on the high percentage of decadence, increase of competing oakbrush and lack of seedlings. The herbaceous understory remains below optimum for providing forage quality and quantity for good fawning habitat. There is sign of only light to moderate big game use. There is no recent evidence of use by livestock.

1996 TREND ASSESSMENT

The soil trend appears currently stable. There is adequate vegetative and litter cover to reduce soil movement by water and wind. The mountain big sagebrush population has shifted from a mostly decadent population to a vigorous mature population with the end to extensive patterns of drought. Utilization of mature plants has declined since 1989. Other browse such as, true mountain mahogany and antelope bitterbrush, show heavy utilization and a slight clubbed appearance. Overall, browse trend is slightly upward. Although the herbaceous understory does have a few valuable species, it is dominated by annual cheatgrass. As reported in 1983, this constitutes a fire hazard in the fall which could ultimately eliminate the valuable browse forage species now present. The herbaceous component is especially important if the area is to be considered spring range or fawning habitat. Herbaceous trend is stable at this time.

TREND ASSESSMENT
soil - stable
browse - slightly upward
herbaceous understory - stable, poor herbaceous understory composition

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 9

Type	Species	Nested Frequency '83	Nested Frequency '96	Quadrat Frequency '83	Quadrat Frequency '96	Average Cover % '96
G	Agropyron intermedium	-	*16	-	4	.81
G	Agropyron spicatum	8	*64	3	19	3.34
G	Bromus inermis	-	3	-	1	.15
G	Bromus japonicus (a)	-	2	-	1	.00
G	Bromus tectorum (a)	-	298	-	84	13.48
G	Dactylis glomerata	-	1	-	1	.00
G	Poa bulbosa	-	1	-	1	.03
G	Poa fendleriana	1	9	1	3	.56
G	Poa pratensis	6	24	4	8	.28
G	Poa secunda	10	*32	5	12	.62
G	Sitanion hystrix	-	1	-	1	.03
Total for Grasses		25	451	13	135	19.33
F	Alyssum alyssoides (a)	-	163	-	54	1.13

Type	Species	Nested Frequency '83	'96	Quadrat Frequency '83	'96	Average Cover % '96
F	Arabis spp.	28	18	14	7	.03
F	Aster spp.	-	7	-	2	.03
F	Balsamorhiza sagittata	-	5	-	3	.68
F	Castilleja chromosa	3	-	1	-	-
F	Chaenactis douglasii	-	4	-	3	.06
F	Cirsium spp.	-	*6	-	4	.23
F	Collomia linearis (a)	5	2	3	1	.03
F	Comandra pallida	-	6	-	2	.01
F	Descurainia spp. (a)	-	3	-	1	.00
F	Epilobium paniculatum	-	2	-	1	.00
F	Erigeron spp	-	*25	-	10	.42
F	Grindelia squarrosa	-	3	-	1	.00
F	Hackelia patens	9	*37	5	19	.38
F	Ipomopsis aggregata	-	3	-	1	.00
F	Lactuca serriola	-	1	-	1	.01
F	Machaeranthera canescens	-	*20	-	10	.22
F	Orthocarpus tolmiei (a)	-	3	-	1	.03
F	Polygonum douglasii (a)	-	2	-	1	.00
F	Senecio multilobatus	25	*3	14	3	.07
F	Solidago sparsiflora	3	-	1	-	-
F	Tragopogon dubius	7	19	5	9	.17
F	Viguiera multiflora	-	3	-	2	.01
Total for Forbs		80	335	43	136	3.59

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 9

Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	4	1.93
B	Artemisia tridentata vaseyana	49	11.55
B	Gutierrezia sarothrae	5	.06
B	Mahonia repens	1	-
B	Opuntia spp.	7	.18
B	Purshia tridentata	6	1.82
B	Quercus gambelii	24	6.91
B	Symphoricarpos oreophilus	4	.06

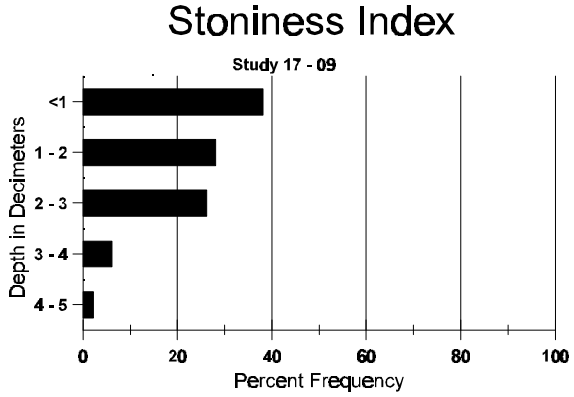
Type	Species	Strip Frequency '96	Average Cover % '96
Total for Browse		100	22.52

BASIC COVER --
Herd unit 17 , Study no: 9

Cover Type	Nested Frequency '96	Average Cover % '83	'96
Vegetation	368	.50	43.07
Rock	207	7.75	10.48
Pavement	144	1.75	2.45
Litter	397	79.00	58.93
Cryptogams	21	1.50	.15
Bare Ground	131	9.50	3.63

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 09

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.5	49.5 (16.0)	7.1	49.8	19.4	30.7	3.0	13.2	128.0	.6



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 9

Type	Quadrat Frequency '96
Rabbit	3
Elk	3
Deer	8

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	1	-	-	-	-	-	-	-	4	-	-	-	80	47	73	4
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'96		120			-
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	17	-	-	-	-	-	-	-	-	17	-	-	-	340			17
M	83	13	4	-	-	-	-	-	-	-	17	-	-	-	1133	31	46	17
	96	40	5	-	-	1	-	-	-	-	46	-	-	-	920	26	50	46
D	83	3	2	-	-	-	-	-	-	-	4	-	1	-	333			5
	96	3	11	-	-	-	-	-	-	-	13	-	-	1	280			14
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	580			29
Total Plants/Acre (excluding Dead & Seedlings)													'83		1599	Dec:		21%
													'96		1540			18%
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200	13	6	3
	96	15	-	-	-	-	-	-	-	-	15	-	-	-	300	12	16	15
Total Plants/Acre (excluding Dead & Seedlings)													'83		200	Dec:		-
													'96		360			-
Mahonia repens																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'96		20			-
Opuntia spp.																		
M	83	14	-	-	-	-	-	-	-	-	14	-	-	-	933	6	8	14
	96	8	-	-	2	-	-	-	-	-	10	-	-	-	200	5	14	10
Total Plants/Acre (excluding Dead & Seedlings)													'83		933	Dec:		-
													'96		200			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	16	24	1
	96	-	3	2	-	1	-	-	-	-	6	-	-	-	120	27	75	6
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		66	Dec:		0%
													'96		140			14%
Quercus gambelii																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	49	-	-	-	-	-	-	-	-	49	-	-	-	980	36	35	49
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'96		1200			2%
Symphoricarpos oreophilus																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	-	-	1	-	-	-	-	-	4	-	-	-	80	19	29	4
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'96		100			-

TREND STUDY 17-10-96 (old 21-5)

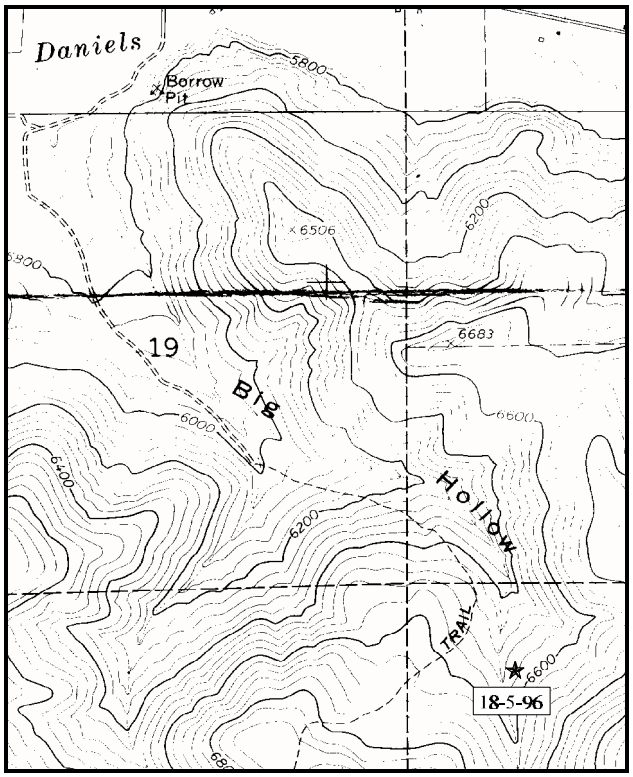
Study site name: Upper Big Hollow . Range type: Gambel oakbrush .

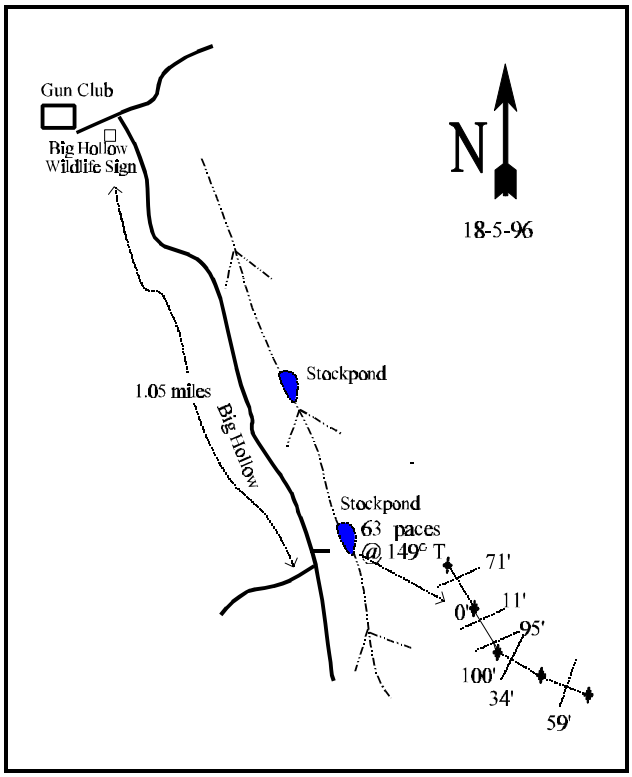
Compass bearing: frequency baseline 167 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning at the Heber Valley gun club located at the mouth of Big Hollow, proceed west for 0.10 miles to the main road which goes up Big Hollow. Proceed southerly up Big Hollow for 1.05 miles to a small turnoff (slightly above the second stockpond). From the southeast corner of the stockpond, walk 63 paces at an azimuth of 147 degrees magnetic, to the 0-foot baseline stake. The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 4S , Range 5E , Section 29 , UTM COOR: 4-65-063E 44-77-497N

DISCUSSION

Trend Study No. 17-10 (21-5)

The Upper Big Hollow study is located on Division of Wildlife Resources land in the upper part of Big Hollow, an area used for transitional range by deer during spring and fall and to some extent for fawn rearing in summer. Winter use is restricted to open, mild winters. The area is grazed by cattle and there is a stock pond about 150 yards down the slope. Elevation at the site is 6,600 feet with a moderately steep slope of 20% to 25% and exposure to the west-northwest.

The range type is Gambel oakbrush, which was burned and seeded in 1976. Currently the area is characterized by a vigorous seeded grass understory and a patchy overstory of resprouted oak, other fire tolerant shrubs, and a moderate number of mountain big sagebrush.

Textural analysis indicates a clay soil with a pH of 6.1. Soil temperature is 41°F at 15 inches. The soil is moderately deep with rocks on the soil surface and throughout the profile. Effective rooting depth is almost 15 inches (see methods). Gravel on the soil surface helps protect the soil from erosion. Erosion does not appear to be occurring presently, but many shrubs are pedestaled on the uphill slope indicating soil movement in the past. The accelerated erosion which occurred immediately after the fire has been largely arrested.

Vegetative cover is estimated to be 45%, nearly half of which is contributed by grasses. Rock and pavement cover combine to provide 8% cover. Litter cover is estimated at 48%, contributed by perennial grasses and leaves from the surrounding oakbrush. Bare ground cover is estimated at 8% with little soil movement visible.

Mountain big sagebrush has an estimated density of 1,600 plants/acre. These plants exhibit light to moderate utilization and good vigor in 1996. Decadency has declined since 1989 with only 6% of the population classified as decadent. Since 1989 the age structure has remained nearly the same with 1/3 of the population classified as young and 2/3 classified as mature.

The size of the oakbrush on the burn in Upper Big Hollow has stabilized. Seeded grasses are abundant and seem to be competing well with the oak. The clones on the site are mostly 3-5 feet in height while the clones above and below the site are 8-12 feet in height. Utilization has declined since 1989 when many of the plants were classified as moderately hedged.

Snowberry has an estimated density of 440 plants/acre with light hedging. Saskatoon serviceberry show moderate to heavy utilization with an estimated density of 260 plants/acre.

The vigorous and productive seeded grasses continue to thrive in the herbaceous understory. Sheep fescue offers the most grass cover and has significantly increased in its sum of nested frequency since 1983. Kentucky bluegrass has also significantly increased since 1989. Other abundant grasses include intermediate wheatgrass, smooth brome, and orchard grass.

Sum of nested frequency for forbs has decreased since 1983 with a high in 1989 after the wet years of 1982-85. Alfalfa continues to be important in the community and has not significantly changed over the years of sampling. Wild onion, which was numerous in the past, was only sampled once in 1996. Longleaf phlox also decreased significantly since 1989.

1983 APPARENT TREND ASSESSMENT

Soil trend is improving with the buildup of litter and organic matter. Vegetative cover is good and probably increasing. Vegetative composition appears to becoming more oak dominated with a concurrent small decrease in grass productivity. Other shrub species are currently stable but may decline in the future. Forb density is lower than optimum and is affected by competition with grasses and shrubs.

1989 TREND ASSESSMENT

The amount of bare soil exposed declined from 30% to 20% due to increases in vegetative cover and pavement. The soil trend should continue to improve. Looking at the increased frequency and density of herbaceous vegetation, the healthy species diversity and the stable browse component, the vegetative trend appears to be upward. Oakbrush expansion may eventually have a negative impact on the understory, but it currently receives enough utilization and competition to slow any increase.

1996 TREND ASSESSMENT

Soil trend on the site appears to be stable with adequate vegetative and litter cover to protect against erosion. Mountain big sagebrush has a healthy age structure with young plants coming into the community. The oakbrush around the site have stayed nearly the same size since 1989 and do not appear to be encroaching into the sagebrush-grass opening. The browse trend is stable. Sum of nested frequency for grasses has stayed nearly the same since 1989. The perennial grasses provide good soil protection and forage for wildlife. Sum of nested frequency for forbs has greatly declined since 1989 with many of the perennial species showing significant decreases, yet together they only make up 14% of the herbaceous cover. Alfalfa continues to do well while many of the native species appear to be fading out. Herbaceous trend is stable.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable, stable for grasses but down for forbs

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 10

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron cristatum	5	3	-	3	1	-	-
G	Agropyron intermedium	a83	b159	b111	32	56	41	3.04
G	Agropyron spicatum	6	2	7	3	1	3	.12
G	Bromus inermis	a132	b191	ab167	54	66	57	3.40
G	Dactylis glomerata	89	111	87	42	45	37	3.05
G	Festuca ovina	a45	ab66	b95	19	30	39	6.89
G	Poa fendleriana	17	30	19	9	13	7	.45
G	Poa pratensis	a42	a32	b104	16	14	33	3.74
G	Poa secunda	a-	b40	c18	-	18	8	.06
G	Stipa lettermani	-	-	10	-	-	4	.07

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
Total for Grasses		419	634	618	178	244	229	20.85
F	Achillea millefolium	34	21	13	13	10	5	.24
F	Agoseris glauca	$_{a}$8	$_{b}$65	$_{a}$2	4	29	2	.01
F	Alyssum alyssoides (a)	-	-	8	-	-	3	.01
F	Allium spp.	$_{a}$53	$_{b}$199	$_{c}$1	26	76	1	.00
F	Arabis spp.	$_{a}$16	$_{b}$64	$_{a}$19	11	29	10	.08
F	Astragalus spp.	4	4	-	2	2	-	-
F	Calochortus nuttallii	$_{a}$10	$_{ab}$8	$_{b}$-	5	3	-	-
F	Cirsium spp.	-	3	-	-	1	-	-
F	Collinsia parviflora (a)	-	-	4	-	-	2	.01
F	Crepis acuminata	$_{a}$-	$_{b}$16	$_{a}$-	-	8	-	-
F	Epilobium paniculatum (a)	-	-	51	-	-	23	.16
F	Eriogonum racemosum	1	-	-	1	-	-	-
F	Helianthus annuus (a)	-	2	-	-	1	-	-
F	Lathyrus brachycalyx	3	12	8	1	6	5	.30
F	Lathyrus pauciflorus	1	-	-	1	-	-	-
F	Lactuca pulchella	$_{a}$6	$_{b}$-	$_{b}$-	5	-	-	-
F	Lomatium triternatum	-	5	-	-	2	-	.00
F	Machaeranthera canescens	-	2	-	-	1	-	-
F	Medicago sativa	78	99	83	34	45	40	2.10
F	Microsteris gracilis (a)	-	-	9	-	-	3	.01
F	Orthocarpus spp. (a)	3	-	7	1	-	4	.12
F	Phlox longifolia	$_{a}$25	$_{b}$99	$_{a}$10	14	44	5	.05
F	Polygonum douglasii (a)	-	-	36	-	-	19	.11
F	Taraxacum officinale	2	-	3	1	-	1	.00
F	Tragopogon dubius	6	2	1	3	1	1	.03
F	Viguiera multiflora	$_{a}$86	$_{b}$40	$_{c}$11	38	22	5	.07
F	Zigadenus paniculatus	1	4	1	1	2	1	.00
Total for Forbs		337	645	267	161	282	130	3.38

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 10

Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	11	.70
B	Artemisia tridentata vaseyana	41	4.15

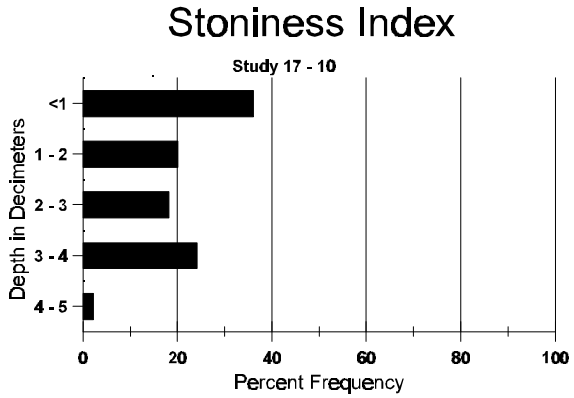
Type	Species	Strip Frequency '96	Average Cover % '96
B	Chrysothamnus nauseosus consimilis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	-
B	Gutierrezia sarothrae	14	-
B	Quercus gambelii	32	11.56
B	Symphoricarpos oreophilus	17	.80
Total for Browse		118	17.21

BASIC COVER --
Herd unit 17 , Study no: 10

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	368	4.50	14.50	44.76
Rock	226	8.25	6.25	6.83
Pavement	152	7.75	16.75	1.21
Litter	393	49.00	42.25	48.45
Cryptogams	55	.25	.50	.53
Bare Ground	192	30.25	19.75	7.69

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 10

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.7	41.4 (15.4)	6.1	34.2	21.4	44.4	3.3	7.9	217.6	.4



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 10

Type	Quadrat Frequency '96
Rabbit	1
Elk	3
Deer	3
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	2	-	-	-	-	-	-	2	-	-	-	40			2
M	83	2	2	-	-	-	-	-	-	-	4	-	-	-	133	24	20	4
	89	4	2	-	-	-	-	-	-	-	6	-	-	-	200	19	16	6
	96	2	4	5	-	-	-	-	-	-	11	-	-	-	220	22	33	11
Total Plants/Acre (excluding Dead & Seedlings)													'83		133	Dec:		-
													'89		200			-
													'96		260			-
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	12	6	-	-	-	-	-	-	-	18	-	-	-	600			18
	96	23	2	-	1	-	-	-	-	-	26	-	-	-	520			26
M	83	15	2	-	-	-	-	-	-	-	17	-	-	-	566	15	16	17
	89	10	17	-	-	-	-	-	-	-	27	-	-	-	900	20	28	27
	96	31	13	4	1	-	-	-	-	-	48	-	1	-	980	21	36	49
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	4	-	-	-	-	-	-	-	7	-	-	-	233			7
	96	-	1	-	-	-	-	-	-	-	-	-	-	1	100			5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		566	Dec:		0%
													'89		1733			13%
													'96		1600			6%
Chrysothamnus nauseosus consimilis																		
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	20	14	1
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	20	21	1
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	37	28	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		33	Dec:		-
													'89		33			-
													'96		20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	266	11	14	8
	89	10	-	-	-	-	-	-	-	-	10	-	-	-	333	13	17	10
	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40	16	20	2
Total Plants/Acre (excluding Dead & Seedlings)													'83		266	Dec:		-
													'89		333			-
													'96		40			-
Gutierrezia sarothrae																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	29	7	-	6	-	-	-	-	-	42	-	-	-	840			42
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	10	-	-	15	-	-	-	-	-	25	-	-	-	500	-	-	25
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	2	-	1	-	-	-	-	-	6	-	-	-	120			6
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		0			0%
													'96		1460			8%
Quercus gambelii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	8	-	-	-	-	-	11	-	-	-	366			11
	96	5	-	-	2	-	-	-	-	-	7	-	-	-	140			7
Y	83	10	-	-	-	-	-	-	-	-	10	-	-	-	333			10
	89	31	25	-	9	-	-	6	-	-	33	38	-	-	2366			71
	96	41	-	-	-	-	-	-	-	-	38	3	-	-	820			41
M	83	42	8	-	-	-	-	-	-	-	45	5	-	-	1666	36	29	50
	89	6	23	-	-	-	-	-	-	-	29	-	-	-	966	46	28	29
	96	91	3	-	5	-	-	8	-	-	96	11	-	-	2140	42	51	107
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	5	23	-	-	-	-	-	-	-	-	28	-	-	933			28
	96	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)													'83		1999	Dec:		0%
													'89		4265			22%
													'96		3020			2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
Y	83	2	-	-	-	-	-	-	-	-	1	-	1	-	66			2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	12	4	-	-	-	-	-	-	-	11	5	-	-	533	19	23	16
	89	32	-	-	1	-	-	-	-	-	33	-	-	-	1100	22	26	33
	96	18	-	-	4	-	-	-	-	-	22	-	-	-	440	21	37	22
Total Plants/Acre (excluding Dead & Seedlings)													'83		599	Dec:		-
													'89		1100			-
													'96		440			-

TREND STUDY 17-11-96 (old 21-6)

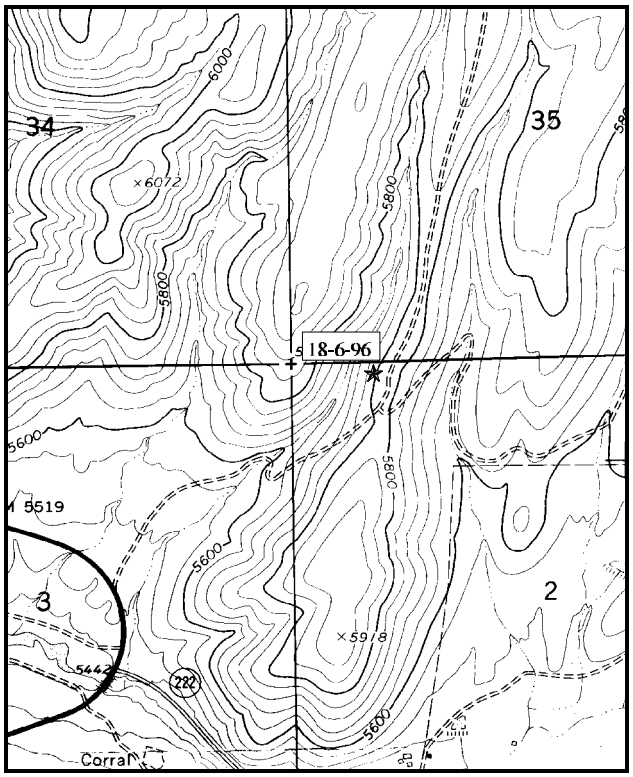
Study site name: Wallsburg Turn . Range type: Big sagebrush-grass .

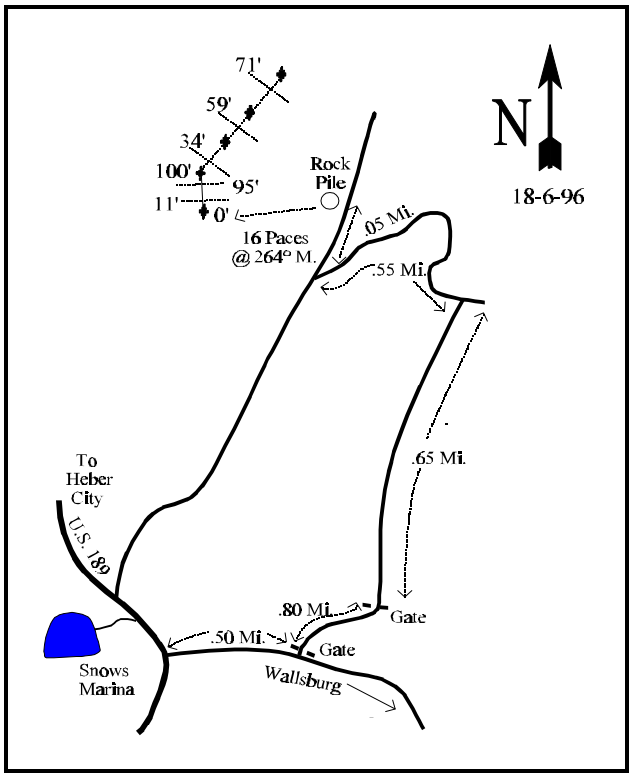
Compass bearing: frequency baseline 358 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning at the intersection of U.S. 189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile passing through two DWR gates to another intersection, and turn right. Proceed 0.05 miles to a small rock pole on the left(i.e., east) side of the road. From the rock monument, walk 16 paces at an azimuth of 264 degrees true to the 0-foot baseline stake. The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 5S , Range 4E , Section 2 , UTM COOR: 4-60-250E 44-74-375N

DISCUSSION

Trend Study No. 17-11 (21-6)

The Wallsburg Turn study is on critical deer winter range located approximately 3/4 mile northeast from the junction of highways US-189 and U-222. The study is on land owned by the Utah Division of Wildlife Resources near a broad ridge top with a moderately steep slope (25%) with a west aspect. Elevation is approximately 5,700 feet. The vegetational type is seeded grasses on what formerly was a uniform stand of mountain big sagebrush and scattered antelope bitterbrush. In August of 1976, an exceptionally hot destructive fire destroyed virtually all vegetation. A seeding effort was conducted immediately after the fire and appears to be successful resulting in a fair grass cover and a resurgent sagebrush population. Aside from terrain features, the area is devoid of thermal or escape cover.

Textural analysis indicates a silty clay loam with a pH of 7.6. The average soil temperature is 52°F measured at 11 inches. Effective rooting depth was only about 9 inches (see methods). Considerable erosion occurred after the fire because of insufficient ground cover. This quickly turned around with the establishment of the seeded species and associated litter. On the steeper slopes it appears that it was not seeded and some erosion appears to be taking place.

Vegetation cover is estimated at 44%, most of which comes from four species, crested wheatgrass, intermediate wheatgrass, alfalfa, and mountain big sagebrush. Litter cover is also quite high at an estimated 42%. Rock and pavement cover combined are estimated at 21%. There is still some bare ground present with an estimated cover of 12%, but there is very little erosion evident in 1996.

The photos and data comparisons from the burned area show a definite increase in the prominence of mountain big sagebrush on the burn. Mountain big sagebrush cover is estimated at 10% in 1996. Age structure has shifted to a more mature population with 91% of the plants sampled classified as mature. Biotic potential is low this year with very few seedlings present. Density is estimated at 2,320 plants/acre. Most of the mature plants show moderate utilization and excellent vigor. Height and crown measurements have increased in 1996 to 20 inches and 36 inches respectively.

Broom snakeweed density has increased from no plants/acre in 1989 to 2,600 plants/acre in 1996. The increase is mostly from the greatly increased sample size used in 1996. These plants showed no utilization and most were classified as mature.

Although antelope bitterbrush was sampled in past years, it was not encountered in 1996. Several plants were scattered across the landscape and they appeared severely hedged. Prickly pear cactus and stickyleaf low rabbitbrush occurred occasionally with stable populations.

Sum of nested frequency for perennial grasses has decreased from 633 in 1989 to 491 in 1996. Both intermediate wheatgrass and Sandberg bluegrasses sum of nested frequencies declined significantly since 1989. Half of the grass cover is contributed by crested wheatgrass which has slowly increased in nested frequency since 1983. Cheatgrass is currently in low abundance and is apparently being kept in check by the competitive perennial grass species. In 1989 it was reported that the grasses did not appear as prominent because of recent heavy grazing. In 1996 it was noted that crested wheatgrass appeared to be the only grass utilized, but only in scattered patches.

Alfalfa had increased sum of nested frequency values from 1983 to 1989, now it appears to be stable in 1996. These plants, like crested wheatgrass, were grazed

in scattered patches. Weedy milkvetch was encountered in 1996 but not in the previous years. This plant is fire resistant and is known to cause death in livestock. Many of the more abundant forbs encountered are annual species that do not provide much protection to the soil or much forage.

1983 APPARENT TREND ASSESSMENT

Current soil condition is poor to fair but is probably improving. As the seeded vegetative community matures, erosion should become less of a problem. Vegetative trend is improving. The coming years should see steady increases in productivity of browse and possibly even grasses. Grass productivity, however, will level off or decrease first. Forb trend is more difficult to predict. Our best estimate is a stable situation that could easily go up or down. As a management objective, it would be desirable to have more diversity among palatable species of both shrubs and forbs.

1989 TREND ASSESSMENT

While vegetative cover increased, the amount of litter decreased due to livestock grazing and drought. Rock and pavement increased from 30% to 48% cover. The amount of bare soil remained constant. The soil trend is stable, or possibly still improving. The vegetative trend also continues to improve after the fire and seeding. Deer and elk both use the site in winter.

1996 TREND ASSESSMENT

Soil trend is slightly upward. Erosion is not as substantial as was reported in the past years. Slightly more bare ground cover was reported in 1996, but it is still relatively quite low. There is still adequate vegetative and litter cover to slow overland flow. Increased density of mountain big sagebrush may be due to the increased sample size used in 1996. More importantly, the vigor of the plants is good and the individual plants have increased in height and crown measurements. The broom snakeweed density has increased to 2,600 plants/acre, but this could also be due to the increased sample size. The browse trend is stable. While perennial grass sum of nested frequency has decreased, perennial forb sum of nested frequency has increased. Alfalfa is still one of the dominant forbs present with a relatively stable nested frequency since 1989. Crested wheatgrass nested frequency has increased slightly, but intermediate wheatgrass and Sandberg bluegrass nested frequencies have both declined. Annual grasses are scattered throughout and do not appear to be increasing at this time. Herbaceous understory trend is stable.

TREND ASSESSMENT
soil - slightly upward
browse - stable
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 11

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron cristatum	a169	ab195	b220	73	73	75	8.60
G	Agropyron intermedium	a84	b260	a138	36	91	48	4.97
G	Agropyron spicatum inerme	a53	b-	b7	22	-	2	.53
G	Bromus tectorum (a)	-	-	28	-	-	9	.57

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Festuca ovina	3	-	-	2	-	-	-
G	Poa secunda	$_{a}$54	$_{b}$178	$_{c}$126	23	73	54	1.93
Total for Grasses		363	633	519	156	237	188	16.61
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{b}$12	-	-	6	.08
F	Alyssum alyssoides (a)	-	-	124	-	-	46	.33
F	Allium spp.	1	2	1	1	2	1	.00
F	Artemisia ludoviciana	-	1	-	-	1	-	-
F	Astragalus miser	$_{a}$-	$_{a}$-	$_{b}$40	-	-	19	1.05
F	Castilleja linariaefolia	-	-	8	-	-	3	.01
F	Calochortus nuttallii	1	-	-	1	-	-	-
F	Castilleja spp.	$_{a}$-	$_{a}$-	$_{b}$8	-	-	4	.04
F	Cirsium spp.	-	-	3	-	-	1	.00
F	Collomia linearis (a)	-	-	82	-	-	36	.18
F	Collinsia parviflora (a)	-	-	146	-	-	56	1.02
F	Cymopterus spp.	$_{a}$-	$_{a}$-	$_{b}$17	-	-	7	.09
F	Delphinium bicolor	-	-	1	-	-	1	.00
F	Draba spp. (a)	-	-	30	-	-	17	.22
F	Erigeron divergens	$_{a}$-	$_{a}$-	$_{b}$45	-	-	21	.13
F	Eriogonum racemosum	8	16	22	6	10	11	.27
F	Gayophytum spp. (a)	-	-	3	-	-	3	.01
F	Helianthus annuus (a)	$_{a}$3	$_{b}$23	$_{a}$-	2	12	-	-
F	Holosteum umbellatum (a)	-	-	194	-	-	67	.53
F	Lactuca serriola	$_{a}$16	$_{b}$-	$_{b}$6	9	-	2	.01
F	Medicago sativa	$_{a}$22	$_{b}$77	$_{b}$78	10	34	33	10.93
F	Polygonum douglasii (a)	-	-	2	-	-	2	.01
F	Ranunculus testiculatus (a)	-	-	29	-	-	12	.06
F	Sanguisorba minor	2	-	-	1	-	-	-
F	Sphaeralcea coccinea	3	-	2	1	-	2	.03
F	Tragopogon dubius	-	-	2	-	-	2	.01
Total for Forbs		56	119	855	31	59	352	15.08

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 11

Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	62	10.17

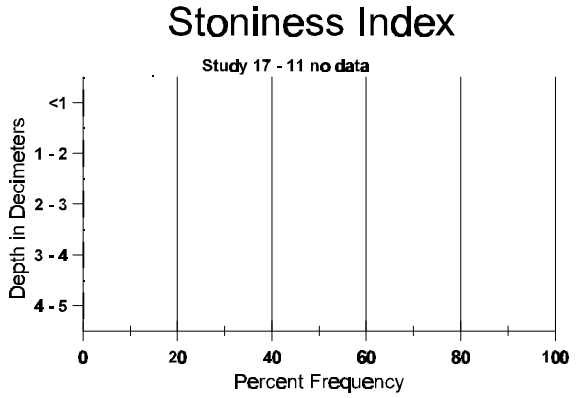
Type	Species	Strip Frequency '96	Average Cover % '96
B	Chrysothamnus viscidiflorus stenophyllus	8	.52
B	Gutierrezia sarothrae	42	1.18
B	Opuntia spp.	6	.16
B	Purshia tridentata	0	-
Total for Browse		118	12.04

BASIC COVER --
Herd unit 17 , Study no: 11

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	368	5.75	18.75	44.34
Rock	277	10.75	15.50	11.94
Pavement	265	19.00	32.00	9.28
Litter	395	39.25	27.00	41.57
Cryptogams	158	18.50	1.50	2.24
Bare Ground	247	6.75	5.25	11.85

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 11

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.9	52.4 (10.7)	7.6	18.9	53.0	28.0	3.1	16.3	156.8	.5



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 11

Type	Quadrat Frequency '96
Rabbit	2
Elk	7
Deer	12
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 11

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	83	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	89	8	6	-	-	-	-	-	-	-	14	-	-	-	466			14
	96	8	1	-	-	-	-	-	-	-	9	-	-	-	180			9
M	83	34	-	-	-	-	-	-	-	-	34	-	-	-	1133	14	13	34
	89	13	16	2	1	-	-	-	-	-	32	-	-	-	1066	18	19	32
	96	11	72	20	-	3	-	-	-	-	100	1	-	5	2120	20	36	106
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		1366	Dec:		0%
													'89		1532			0%
													'96		2320			1%
Chrysothamnus viscidiflorus stenophyllus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	5	-	-	1	-	-	-	-	-	6	-	-	-	200			6
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	10	17	1
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	5	5	1
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	10	17	6
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'83		66	Dec:		0%
													'89		266			12%
													'96		200			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	22	-	-	-	-	-	-	-	-	22	-	-	-	440			22
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320			16
M	83	4	-	-	-	-	-	-	-	-	4	-	-	-	133	10	13	4
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	114	-	-	-	-	-	-	-	-	114	-	-	-	2280	8	12	114
Total Plants/Acre (excluding Dead & Seedlings)													'83		133	Dec:		-
													'89		0			-
													'96		2600			-
Opuntia spp.																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100	6	8	3
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100	6	14	3
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	5	19	6
Total Plants/Acre (excluding Dead & Seedlings)													'83		100	Dec:		-
													'89		100			-
													'96		120			-
Purshia tridentata																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	2	1	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	1	16	-	-	-	-	-	-	-	17	-	-	-	566	16	20	17
	89	9	5	5	-	-	-	-	-	-	19	-	-	-	633	15	32	19
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	69	0
Total Plants/Acre (excluding Dead & Seedlings)													'83		566	Dec:		-
													'89		733			-
													'96		0			-

TREND STUDY 17-12-96 (old 21-7)

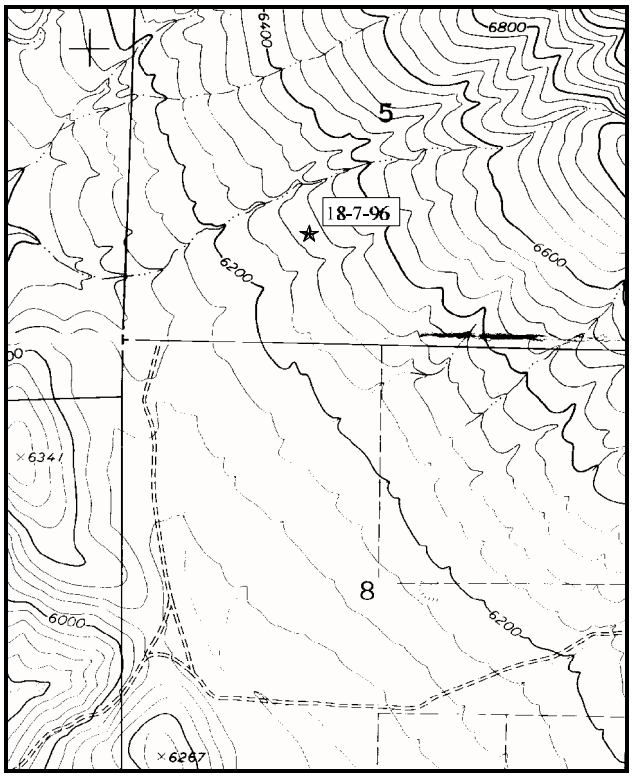
Study site name: North Wallsburg Reseeding . Range type: Mixed sagebrush-oak .

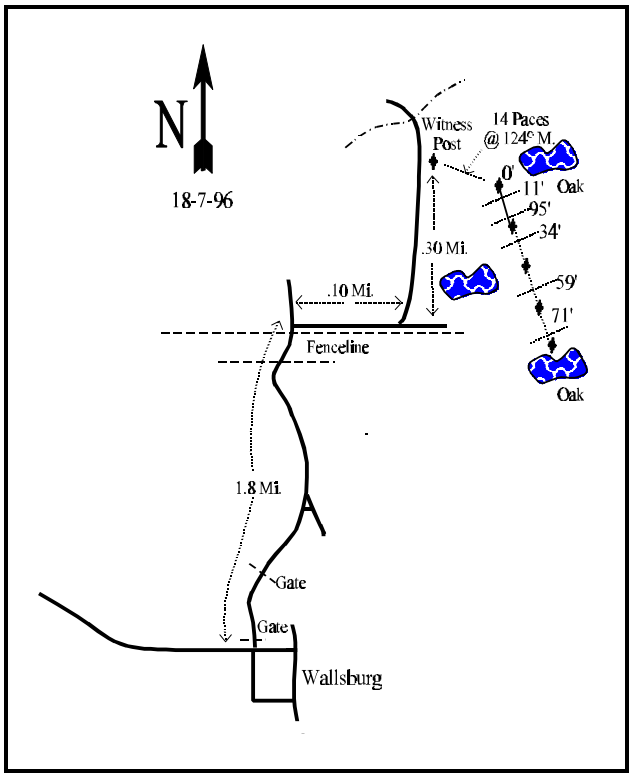
Compass bearing: frequency baseline 172 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Wallsburg, take the road which runs northerly for 1.8 miles, staying on the main road until coming to a gate. Proceed through the gate and turn east immediately after passing through the gate. Proceed east traveling along the fenceline for 0.10 miles to another intersection. Turn left at the intersection and proceed north for 0.50 miles to a green steel "T" fencepost on the right (i.e., east) side of the road. From the fencepost the 0-foot baseline stake is 18 paces away at an azimuth of 159 degrees true. A red browse tag, number 3953, is attached to the 0-foot baseline stake.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 5S , Range 5E , Section 5 , UTM COOR: 4-65-357E-44-73-591N

DISCUSSION

Trend Study No. 17-12 (21-7)

The North Wallsburg Seeding study is located on deer and elk winter range northeast of Wallsburg. The site is within the boundaries of the 1976 burn on a bench lying at the base of a large ridge between Main Canyon and Daniels Canyon. Elevation is approximately 6,500 feet. Aspect is to the west with a 10-15% slope. Although burned and subsequently seeded in 1976, the intensity and scope of the fire on this site does not appear to have been as intensive as on the major part of the burned area lying to the west. Hot fire was more patchy in this area and many mature shrubs appeared to have survived from the original mixed oak-sage community. Open areas on the site are dominated by grass, while the larger openings below the area have more sagebrush and antelope bitterbrush.

The area is an important winter concentration area for deer and elk with many deer pellet groups present as well as a smaller number of elk pellet groups. The level of hedging on the principal shrubs is light to moderate. Except for the presence of seeded grasses and forbs, the area is vegetatively similar to adjacent unburned oak-sage communities.

Textural analysis indicates the soil is a clay loam with a pH of 7.1. The average soil temperature is 46°F at a depth of 15 inches. The soil is moderately deep with many rocks and gravel on the surface and in the profile. Effective rooting depth is almost 12 inches (see methods). Rocks are limestone with white deposits of calcium on the surface of the rocks. As reported in 1983, litter and vegetative cover are adequate to prevent serious erosion. Currently, erosion does not appear to be a problem.

Vegetative cover, estimated at 35% in 1996, is contributed mostly by grasses. Unlike some of the surrounding areas, there is less browse cover on this site. Litter cover is also quite high at about 40%. Rock and pavement cover has stayed nearly the same over all years at 17%. Bare ground cover is slowly decreasing and is currently estimated at 12%.

The density of mountain big sagebrush has continually decreased from 1,433 plants/acre in 1983 to 932 plants/acre in 1989 to 340 plants/acre in 1996. The age structure has also shifted from mostly young plants classified in 1983 and 1989 to a mostly mature population reported in 1996. Height of the plants has stayed nearly the same at 28 inches over all years while the crown measurement has slowly increased to 47 inches. Percent decadency has declined to only 5% of the population. Utilization is moderate and all plants were reported to have good vigor.

Stickyleaf low rabbitbrush and broom snakeweed appeared dense in the past, but this is no longer the case. This is due to the greatly increased sample size that more accurately reflects the true density. There are not very many dead plants present to explain the decreases any other way. Both have largely mature populations and good vigor. The dense grass cover may be competing with these low growing shrubs, thereby suppressing growth and recruitment.

Most of the browse cover on the site is contributed by Gambel oak. By comparing photographs between years, the Gambel oak is obviously becoming more robust on the site. The oak is mostly 5-8 feet in height with smaller plants around the edges of the taller clones. These smaller plants exhibit heavier hedging than the taller plants.

The grass that provides the most cover is sheep fescue. Sum of nested frequency for sheep fescue has significantly increased since 1989. Both intermediate wheatgrass and crested wheatgrass sum of nested frequencies have significantly

declined since 1989. Overall, sum of nested frequency for perennial grasses has stayed nearly the same. Cheatgrass is not very common and bulbous bluegrass was first encountered in 1996. Other grasses include Sandberg bluegrass and bottlebrush squirreltail.

Forbs, as reported in 1989, remain insignificant. Alfalfa has increased slightly in sum of nested frequency. Eighteen species were encountered in 1996 with pale alyssum being the most abundant.

1983 APPARENT TREND ASSESSMENT

Soil trend is slowly improving. Some sheet and gully erosion will continue but should moderate with time. Vegetative trend is more inconclusive. Gambel oak is not encroaching into the interspaces to any great degree, however the resprouting clones are becoming more dense and growing taller. Oak requires heavy use, especially where no competitive grass understory is directly associated with it, to help keep it within reach. Insofar as available forage productivity is concerned, oak is currently at an optimum level. In oak interspaces, shrub density of broom snakeweed, stickyleaf low rabbitbrush, and mountain big sagebrush is increasing. The antelope bitterbrush population appears stable. The former two species are aggressive increasers that should be curtailed while bitterbrush and big sagebrush should be encouraged. Forb cover and density, especially that of alfalfa, should at least be maintained.

1989 TREND ASSESSMENT

Grasses continue to increase on the old burn. Big sagebrush shows a decline on the study site, but vigor remains normal and there are many young plants. The vegetative trend is stable to still improving. There is slight erosion in the open areas, but as long as sufficient litter remains after grazing, it should not be a management concern. The soil trend is stable.

1996 TREND ASSESSMENT

Soil trend is currently stable due to the adequate vegetative and litter cover. Erosion is not a problem at this time. Browse trend is also stable. The mountain big sagebrush population is vigorous and the stickyleaf low rabbitbrush and broom snakeweed populations appear to be stable. Hedging appears to be heaviest on the surrounding true mountain mahogany. The herbaceous understory is dominated by perennial grasses that compete well with annual species. Herbaceous understory is stable.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 12

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron cristatum	a90	b148	a66	42	56	26	2.41
G	Agropyron intermedium	a117	b192	a135	49	73	49	3.32
G	Bromus tectorum (a)	-	-	16	-	-	6	.10
G	Dactylis glomerata	a8	ab7	b-	4	2	-	-

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Festuca ovina	35	-	-	19	-	-	-
G	Festuca ovina	$_{a}$7	$_{b}$96	$_{c}$190	3	42	68	14.72
G	Oryzopsis hymenoides	$_{ab}$2	$_{a}$7	$_{b}$-	1	4	-	-
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{b}$32	-	-	12	.62
G	Poa fendleriana	-	8	-	-	3	-	-
G	Poa pratensis	27	8	26	10	5	9	.41
G	Poa secunda	$_{a}$-	$_{a}$3	$_{b}$24	-	2	11	.08
G	Sitanion hystrix	$_{a}$-	$_{b}$6	$_{ab}$1	-	4	1	.00
Total for Grasses		286	475	490	128	191	182	21.67
F	Agoseris glauca	-	-	2	-	-	1	.00
F	Alyssum alyssoides (a)	-	-	134	-	-	42	.36
F	Allium spp.	-	2	-	-	1	-	-
F	Astragalus spp.	-	2	1	-	1	1	.03
F	Astragalus utahensis	3	1	10	1	1	3	.33
F	Calochortus nuttallii	5	-	-	2	-	-	-
F	Chaenactis douglasii	-	2	3	-	2	1	.03
F	Cirsium spp.	2	-	6	1	-	3	.26
F	Epilobium paniculatum	-	-	3	-	-	1	.00
F	Erigeron spp	-	-	1	-	-	1	.03
F	Eriogonum racemosum	$_{a}$-	$_{a}$-	$_{b}$7	-	-	5	.05
F	Grindelia squarrosa	-	-	3	-	-	2	.06
F	Lactuca pulchella	8	-	-	3	-	-	-
F	Linum lewisii	-	-	3	-	-	1	.00
F	Lithospermum ruderale	-	-	1	-	-	1	.15
F	Medicago sativa	3	1	10	1	1	3	.33
F	Orthocarpus spp. (a)	-	-	2	-	-	1	.00
F	Phlox longifolia	$_{a}$-	$_{a}$2	$_{b}$23	-	1	12	.06
F	Polygonum douglasii (a)	-	-	5	-	-	2	.01
F	Sphaeralcea coccinea	3	3	-	1	2	-	-
F	Tragopogon dubius	$_{a}$28	$_{b}$7	$_{b}$8	13	3	3	.01
F	Viguiera multiflora	11	7	9	6	4	4	.19
F	Zigadenus paniculatus	2	-	-	1	-	-	-
Total for Forbs		65	27	231	29	16	87	1.93

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 12

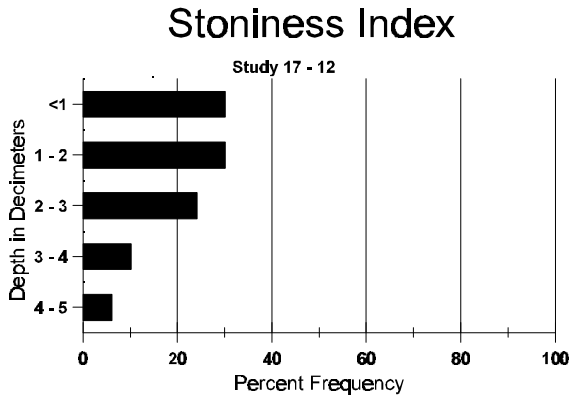
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	12	1.62
B	Cercocarpus montanus	1	.03
B	Chrysothamnus viscidiflorus viscidiflorus	35	.72
B	Gutierrezia sarothrae	21	.47
B	Opuntia spp.	6	.03
B	Purshia tridentata	5	1.59
B	Quercus gambelii	26	5.13
B	Symphoricarpos oreophilus	1	.15
B	Tetradymia canescens	7	.06
Total for Browse		114	9.81

BASIC COVER --
Herd unit 17 , Study no: 12

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	344	1.50	4.25	35.09
Rock	216	5.75	5.50	6.78
Pavement	230	6.25	10.75	10.14
Litter	395	65.00	59.75	40.23
Cryptogams	48	1.50	.25	.81
Bare Ground	206	20.00	19.50	12.07

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 12

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	S/m
11.5	46.2 (14.8)	7.1	40.2	29.1	30.7	3.5	21.1	163.2	.7



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 12

Type	Quadrat Frequency '96
Rabbit	8
Elk	5
Deer	27
Cattle	5

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 12

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	83	36	-	-	-	-	-	-	-	-	33	3	-	-	1200			36
	89	10	7	-	2	-	-	-	-	-	19	-	-	-	633			19
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	7	-	-	-	-	-	-	-	-	5	2	-	-	233	26	30	7
	89	2	3	-	-	-	-	-	-	-	5	-	-	-	166	28	36	5
	96	4	8	1	-	-	-	-	-	-	13	-	-	-	260	28	47	13
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	1	-	-	-	-	-	-	-	3	-	-	1	133			4
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'83		1433	Dec:		0%
													'89		932			14%
													'96		340			6%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus montanus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	1	-	-	-	1	-	-	-	20	32	38	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		20			-
Chrysothamnus viscidiflorus viscidiflorus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	13	-	-	-	-	-	-	-	-	13	-	-	-	433			13
	89	6	-	-	1	-	-	-	-	-	7	-	-	-	233			7
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	83	147	-	-	-	-	-	-	-	-	133	14	-	-	4900	8	7	147
	89	205	-	-	3	-	-	-	-	-	173	-	35	-	6933	10	13	208
	96	49	-	-	2	-	-	-	-	-	51	-	-	-	1020	11	20	51
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	18	-	-	-	-	-	-	-	-	12	-	6	-	600			18
	96	1	-	-	3	-	-	-	-	-	3	-	-	1	80			4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'83		5333	Dec:		0%
													'89		7766			8%
													'96		1300			6%
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	25	-	-	-	-	-	-	-	-	2	23	-	-	833			25
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	83	123	-	-	-	-	-	-	-	-	54	69	-	-	4100	8	9	123
	89	219	-	-	-	-	-	-	-	-	188	-	31	-	7300	9	9	219
	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560	8	10	28
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	-	-	-	-	-	-	1	-	3	-	133			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'83		4933	Dec:		0%
													'89		7533			2%
													'96		840			0%
Opuntia spp.																		
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	266	6	8	8
	89	6	-	-	-	-	-	-	-	-	4	-	2	-	200	6	18	6
	96	7	-	-	-	-	1	-	-	-	8	-	-	-	160	5	23	8
Total Plants/Acre (excluding Dead & Seedlings)													'83		266	Dec:		-
													'89		200			-
													'96		160			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	2	-	-	-	-	-	-	-	5	-	-	-	100	31	78	5
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		100			-
Quercus gambelii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	4	-	-	-	-	-	4	-	-	-	133			4
	96	12	-	-	-	-	-	-	-	-	9	1	2	-	240			12
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	2	-	11	-	-	-	-	13	-	-	-	433			13
	96	12	13	-	3	-	-	-	-	-	9	19	-	-	560			28
M	83	20	-	-	-	-	-	-	-	-	20	-	-	-	666	53	34	20
	89	-	6	-	-	8	-	-	-	-	14	-	-	-	466	89	37	14
	96	18	55	-	-	-	-	32	-	-	63	42	-	-	2100	50	32	105
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	4	5	-	-	-	-	-	-	-	8	1	-	180			9
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12
Total Plants/Acre (excluding Dead & Seedlings)													'83		666	Dec:		0%
													'89		899			0%
													'96		2840			6%
Symphoricarpos oreophilus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	35	35	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		20			-
Tetradymia canescens																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320	9	15	16
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		400			-

TREND STUDY 17-13-96 (old 21-8)

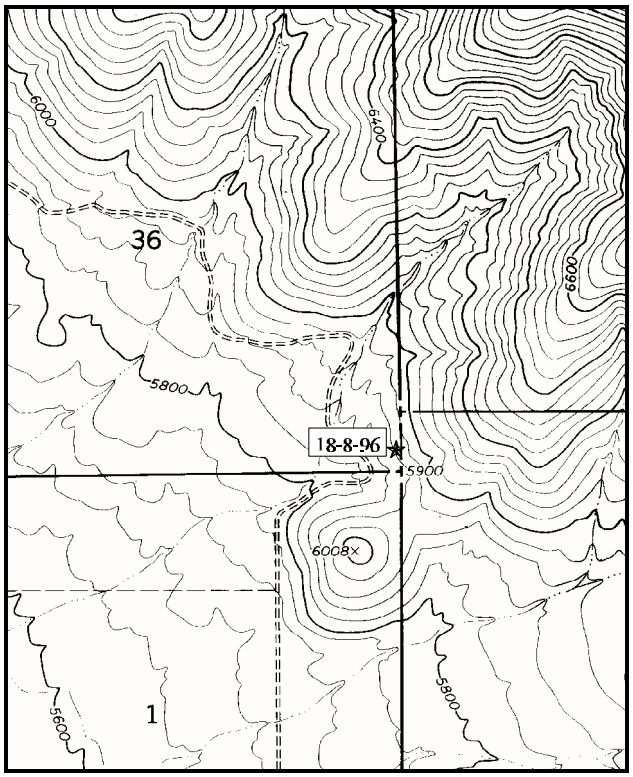
Study site name: North Wallsburg. Range type: Big sagebrush-grass.

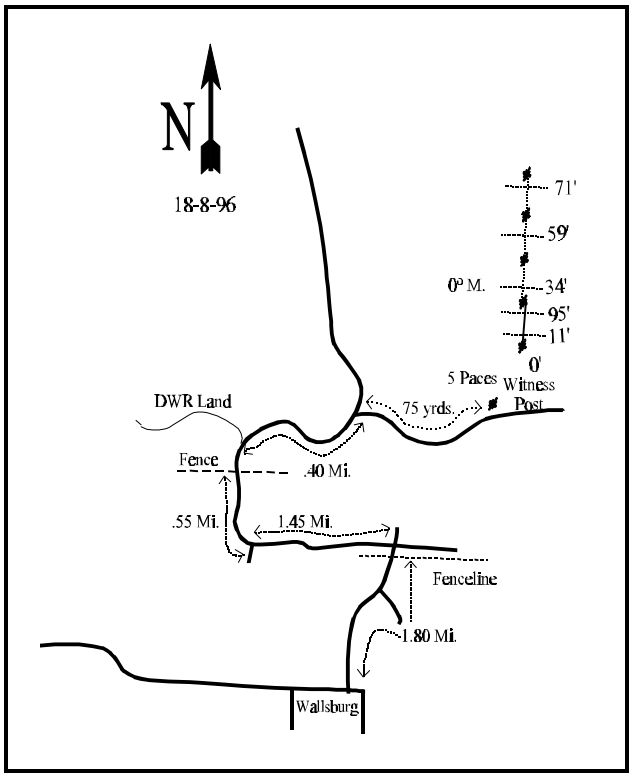
Compass bearing: frequency baseline 180 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning at the town of Wallsburg, proceed northerly for 1.80 miles staying on the main road. At 1.80 miles the road will come to a fence line and a gate, proceed through the gate and turn left. Proceed west for 1.45 miles to where the road bends northward at the DWR fence line. Continue on the same road northward for 0.55 additional miles to a cattle guard. Cross the fence and take the right fork immediately following, and proceed 0.40 miles to another fork in the road. Walk 75 yards up the old road to a red steel fencepost on the left side of the road and stop. From the fencepost the 0-foot stake of the baseline is 7 paces to the northeast.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 4S, Range 4E, Section 36, UTM COOR: 4-63-070E 44-74-517N

DISCUSSION

Trend Study No. 17-13 (21-8)

The North Wallsburg study is on Division of Wildlife Resources property located north of Wallsburg. The area reportedly receives heavy deer and light to moderate elk use in winter. The site is typical of the sagebrush-grass community prevalent in the Wallsburg area before a series of wildfires burned much of the area in the 1960's and 1970's. This particular site is on a moderately steep slope (15%-20%) with a southwest aspect. Elevation is approximately 6,000 feet. The range type is mountain big sagebrush.

The soil is classified as a sandy clay loam with an average temperature of 50°F at a depth of 14 inches. Soil is moderately deep with some rocks on the surface and in the profile. Effective rooting depth (see methods) is almost 12 inches. The soil pH is neutral (7.1). Vegetation cover is estimated at 44%, most is contributed by grasses. Litter cover is abundant with an estimated cover of 44%. Bare ground has decreased since 1989 from 18% to only 4% in 1996. Rock and pavement cover combine for 16% cover. Although reported as ongoing in 1983, erosion does not appear to be a serious problem due to the abundant litter and vegetative cover.

Mountain big sagebrush is the dominant browse with an estimated cover of 9% in 1996. This is mostly a mature population, but more seedling and young plants were classified in 1996 than in the past. Plants exhibited light to moderate use with good vigor. Seed production from last year appears erratic considering the remaining seed heads. In 1989, it was reported that the stand was more decadent and in more poor vigor than in 1983. This was determined by comparing photographs. While percent decadency increased in 1989, vigor also improved for the population. In fact, since 1983, vigor has improved while heavy utilization has declined. Density is estimated at 2,240 plants/acre in 1996. The long term effects of the extended drought have caused 28% of the population to die. Now the population appears to have stabilized with good vigor. Broom snakeweed density shows an increase since 1983 from 399 plants/acre to 4,500 plants/acre in 1996. This increase is mostly due to the greatly increased sample size now used for the classification of the different age classes cannot explain the increase. In any case, this population should be monitored for further increase, yet the 1996 data does not support a large increase to its population. Most of these plants are mature with an average height of 9 inches and crown measurement of 13 inches. Other species present but in low densities include white rubber rabbitbrush and prickly pear.

Grass cover consists mostly of cheatgrass. This provides 55% of the herbaceous understory cover at this time. Bulbous bluegrass has significantly increased in nested frequency since 1983 as has Sandberg bluegrass. Indian ricegrass and bottlebrush squirreltail are present, but in low numbers. Forbs remain relatively rare with pale alyssum providing the most forb cover. Sum of nested frequency for perennial forbs is now the same as was reported in 1983.

1983 APPARENT TREND ASSESSMENT

This site is essentially stable. There is little evidence to suggest any great change in either soil condition or vegetative character.

1989 TREND ASSESSMENT

The vegetative trend has taken a downward turn. Without treatment, there is little possibility of significant improvement in winter range values. Sagebrush productivity and vigor may improve when the drought ends. Numerous winter-killed fawns were found on the site. Erosion pavement increased while percent litter

cover decreased substantially. The percentage of bare soil remains at 18%. Erosion is slight. The soil trend is stable.

1996 TREND ASSESSMENT

Soil trend is stable. Erosion is still slight and there is adequate vegetative and litter cover present to prevent or slow erosion. Mountain big sagebrush appears to be in better health than anytime reported in the past. More seedling and young plants were encountered this year. Better vigor and lighter hedging was reported in 1996 than in 1983. Broom snakeweed may be increasing in density and should be monitored closely. Browse trend is slightly upward. Herbaceous understory is stable. Although not counted in past years, the herbaceous understory is dominated by cheatgrass. Both bulbous bluegrass and Sandberg bluegrass have sum of nested frequency values that have significantly increased since 1983. Forbs are still relatively rare and are mostly annual species. It is no wonder why much of the surrounding area has burned in the past. The fine litter provided by dried up cheatgrass and bulbous bluegrass provide ample fuel for a destructive fire to occur.

TREND ASSESSMENT
soil - stable
browse - slightly upward
herbaceous understory - stable

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 13

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron smithii	a10	b14	c-	4	4	-	-
G	Bromus tectorum (a)	-	-	303	-	-	88	16.14
G	Oryzopsis hymenoides	10	13	6	5	8	4	.36
G	Poa bulbosa	a5	b69	c157	2	33	52	7.55
G	Poa secunda	a2	b53	c166	2	22	54	3.73
G	Sitanion hystrix	a-	a-	b9	-	-	4	.19
Total for Grasses		27	149	641	13	67	202	27.98
F	Agoseris glauca	-	-	4	-	-	2	.01
F	Alyssum alyssoides (a)	-	-	101	-	-	30	.69
F	Arabis spp.	-	3	1	-	1	1	.03
F	Astragalus spp.	3	3	-	1	2	-	-
F	Astragalus utahensis	3	-	1	1	-	1	.03
F	Calochortus nuttallii	a25	b112	c-	12	54	-	-
F	Epilobium paniculatum (a)	-	-	9	-	-	4	.02
F	Erodium cicutarium (a)	-	-	49	-	-	17	.23
F	Erigeron spp	-	-	6	-	-	3	.04
F	Eriogonum racemosum	2	6	5	1	3	3	.01
F	Machaeranthera canescens	2	-	-	1	-	-	-
F	Phlox longifolia	a-	b21	a-	-	8	-	-
F	Polygonum douglasii (a)	-	-	4	-	-	2	.01

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
F	Tragopogon dubius	$_{a}$1	$_{a}$6	$_{b}$31	1	5	18	.17
F	Zigadenus paniculatus	$_{a}$2	$_{b}$9	$_{a}$-	1	6	-	-
Total for Forbs		38	160	211	18	79	81	1.25

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 13

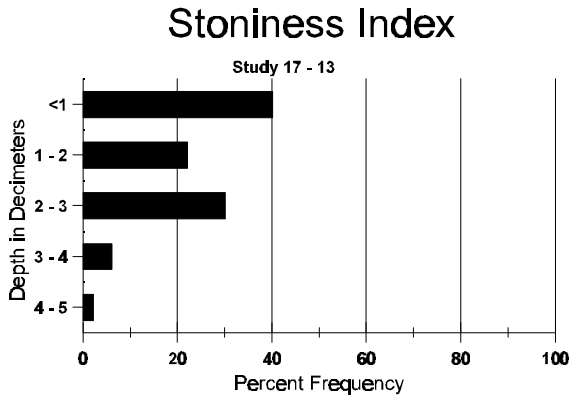
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	74	9.16
B	Chrysothamnus nauseosus albicaulis	15	1.79
B	Gutierrezia sarothrae	39	1.99
B	Opuntia spp.	19	.35
Total for Browse		147	13.30

BASIC COVER --
Herd unit 17 , Study no: 13

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	392	1.50	4.00	44.31
Rock	252	8.50	8.75	12.07
Pavement	209	3.75	14.00	3.82
Litter	386	64.75	53.25	44.58
Cryptogams	78	3.00	2.00	1.00
Bare Ground	166	18.50	18.00	4.32

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 13

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.8	50.0 (14.0)	7.1	50.9	23.7	25.4	2.4	16.1	172.8	.6



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 13

Type	Quadrat Frequency '96
Sheep	1
Rabbit	11
Elk	12
Deer	36

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 13

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	19	-	-	-	-	-	-	-	-	19	-	-	-	380			19
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	17	1	-	-	-	-	-	-	-	18	-	-	-	360			18
M	83	11	6	12	-	-	-	-	-	-	29	-	-	-	1933	26	45	29
	89	3	4	-	-	-	-	-	-	-	7	-	-	-	466	22	22	7
	96	33	25	1	-	-	-	-	-	-	59	-	-	-	1180	23	44	59
D	83	5	1	5	-	-	-	-	-	-	4	-	7	-	733			11
	89	4	14	-	-	-	-	-	-	-	15	-	-	3	1200			18
	96	10	17	8	-	-	-	-	-	-	26	-	-	9	700			35
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	880			44
Total Plants/Acre (excluding Dead & Seedlings)													'83		2866	Dec:		26%
													'89		1732			69%
													'96		2240			31%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	10	2	-	-	-	-	-	-	-	12	-	-	-	240	33	50	12
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	1	-	-	-	-	-	-	2	-	-	2	80			4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		0			0%
													'96		360			22%
Gutierrezia sarothrae																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	26	-	-	-	-	-	-	-	-	26	-	-	-	520			26
M	83	4	-	-	-	-	-	-	-	-	4	-	-	-	266	11	11	4
	89	19	-	-	-	-	-	-	-	-	19	-	-	-	1266	10	15	19
	96	199	-	-	-	-	-	-	-	-	199	-	-	-	3980	9	13	199
Total Plants/Acre (excluding Dead & Seedlings)													'83		399	Dec:		-
													'89		1266			-
													'96		4500			-
Opuntia spp.																		
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	5	-	-	-	-	-	-	-	-	5	-	-	-	333	6	14	5
	89	9	1	-	-	-	-	-	-	-	10	-	-	-	666	7	22	10
	96	13	-	-	4	-	-	-	-	-	17	-	-	-	340	5	18	17
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'83		466	Dec:		0%
													'89		799			0%
													'96		420			10%

TREND STUDY 17-14-96 (old 21-9)

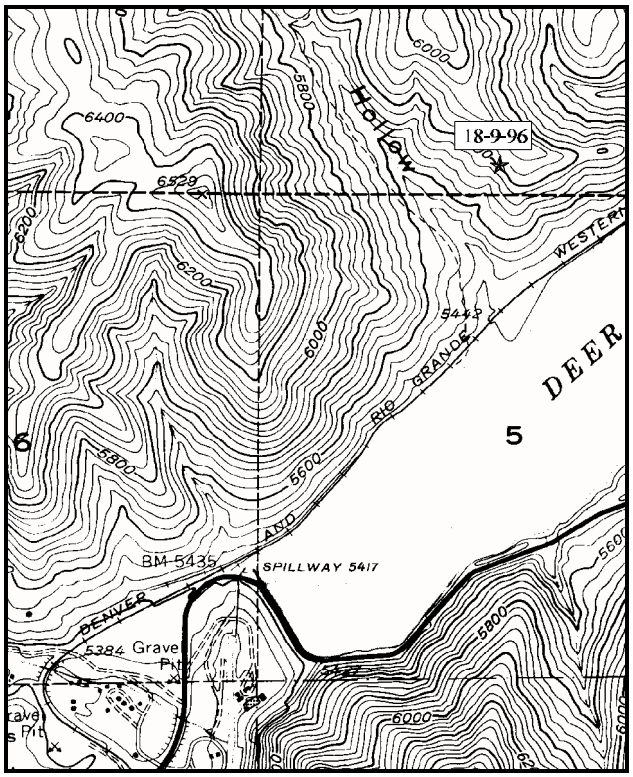
Study site name: Hoovers Hollow . Range type: Big sagebrush-grass .

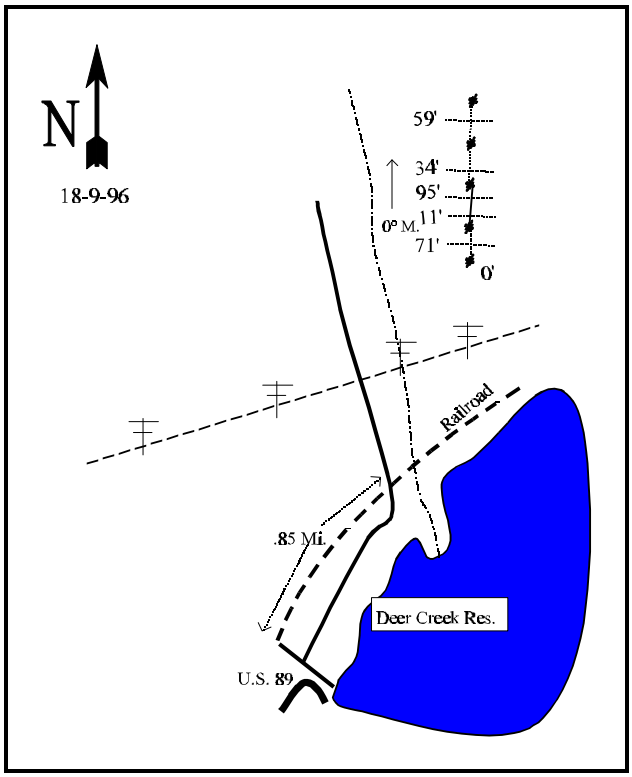
Compass bearing: frequency baseline 0 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the locked gate at the southwest corner of Deer Creek Reservoir, proceed 0.85 miles along the northern edge of the reservoir. Stop where the road crosses the railroad tracks. From this point, walk up the road leading towards Hoover Hollow to a faint road to the northeast following power lines. Walk to the second pole across a small drainage and partially up the hillside. From the power pole walk 232 paces at an azimuth of 0 degrees true, to the 0-foot baseline stake. A red browse tag, number 3949, is attached to the 0-foot baseline stake.





Map Name: Aspen Grove, Utah Diagrammatic Sketch

Township 4S , Range 4E , Section 32 , UTM COOR: 4-55-949E 44-74-447N

DISCUSSION

Trend Study No. 17-14 (21-9)

The Hoover's Hollow study is located near the mouth of Hoover Hollow on the west side of Deer Creek Reservoir. The study is near a ridge top on a moderately steep (24%) south-southwest facing slope on the north side of the hollow. Elevation is approximately 5,800 feet. Winter deer use on ridges and slopes, such as this one, is usually extremely heavy throughout the entire area. It was reported in 1989 that domestic sheep have had significant impacts on this site for many years. The reservoir is approximately 3/4 mile downslope from the site.

Soil texture is a clay loam with an average temperature of 49°F at a depth of 7 inches. The soil is very rocky but moderately deep. Effective rooting depth (see methods) is almost 9 inches. Soil depth measurements were difficult to take due to the rocky nature of the upper profile. In past years, a high rate of erosion was reported with the loss of topsoil. In 1996, no surface erosion was noticeable due to the protective ground cover.

Vegetative cover was estimated at 36% in 1996, nearly 50% of which is contributed by annual species. Litter cover is estimated at 28% and rock and pavement cover combined is estimated at 26%. Bare ground cover has stayed nearly the same at 12%.

As reported in 1989, browse forage remains very limited. Mountain big sagebrush has an estimated density of 340 plants/acre with the age structure shifting to a more mature population. Sixty percent of the sagebrush were heavily hedged in 1989, while only 29% where classified as heavily hedged in 1996. Vigor is good with only 6% exhibiting poor vigor. The white rubber rabbitbrush exhibits some light browsing with an estimated density of 480 plants/acre. Twenty-five percent of the population were classified as decadent. This is a decrease from the 54% reported in 1989. No plants were reported as decadent in 1983. Broom snakeweed density increased to 11,540 plants/acre in 1996. This great increase from 2,466 plants/acre as reported in 1989 may be due to the increased sample size now used which gives better population estimates for species that have clumped or discontinuous distributions. This population was split between young and mature plants. An incredible 21,280 plants/acre were estimated for seedlings in 1996, but it is very unlikely many of the plants will survive the summer months. The prickly pear cactus population appears to be stable at 1,000 plants/acre in 1996. In 1983, there was an estimated 6,100 plants/acre which declined to 733 plants/acre in 1989. Other browse scattered throughout the site include snowberry, antelope bitterbrush, and serviceberry.

Sum of nested frequency for perennial grasses has stayed nearly the same since 1989. Although annual species were not reported in previous years, cheatgrass is the most abundant grass followed by Sandberg bluegrass and bluebunch wheatgrass.

Forbs are very diverse and provide moderate cover in the herbaceous understory. The most abundant forbs are annual species and include storksbill, pale alyssum, *Holosteum umbellatum*, and little flowered Collinsia. Annual sunflower was noticeably not sampled in 1996 after a having a quadrat frequency of 68 in 1996. Hairy golden aster and false goatsbeard increased significantly in nested frequency value. The forb component remains dominated by other weedy species as well, including thistle, toadflax, and yellow salsify.

1983 APPARENT TREND ASSESSMENT

Overall trend is declining, especially vegetatively. Soil, although eroded, is capable of producing more desirable forage. However, to do so would require more than just rest from use. Some type of direct rehabilitation effort would be

required if any meaningful short term improvement is to occur.

1989 TREND ASSESSMENT

While the site remains in poor condition, the vegetative trend is not as rapidly downward as thought in 1983. Perennial grasses, although limited in production and desirability, have increased, as did the density of sagebrush. The vegetative trend is stable.

1996 TREND ASSESSMENT

Soil trend is slightly improving with increasing litter cover and decreasing bare soil. Cryptogamic cover has increased to nearly 3% since 1989, when it was estimated to be at less than 1%. The mountain big sagebrush population has remained stable since 1983 with percent decadency decreasing over all years. Vigor has improved and utilization has decreased. One concern is the estimated density of broom snakeweed in 1996. At 11,540 plants/acre, an increase of over 9,000 plants/acre since 1989, this population should be carefully monitored. This great increase is likely due to an increased sample size used in 1996, but there were also a high number of young and seedlings currently and in previous years. The browse trend is stable. The herbaceous understory is stable, but with a poor composition. Native perennial grasses are still present yet they are greatly out numbered by annuals and other weedy species.

TREND ASSESSMENT
soil - slightly improving
browse - stable
herbaceous understory - stable, but very poor composition of weeds and annuals

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 14

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron cristatum	-	1	-	-	1	-	-
G	Agropyron spicatum	a18	b37	b65	7	19	32	3.63
G	Bromus tectorum (a)	-	-	346	-	-	98	5.82
G	Poa secunda	a35	b180	b159	18	65	61	3.69
G	Sporobolus cryptandrus	-	-	4	-	-	1	.03
Total for Grasses		53	218	574	25	85	192	13.17
F	Agoseris glauca	a-	a-	b32	-	-	15	.19
F	Allium acuminatum	a-	a3	b18	-	1	10	.05
F	Alyssum alyssoides (a)	-	-	302	-	-	94	1.58
F	Astragalus tenellus	-	-	4	-	-	2	.04
F	Astragalus utahensis	a2	a2	b13	1	2	5	.08
F	Castilleja linariaefolia	ab2	a-	b8	1	-	5	.10
F	Calochortus nuttallii	a-	b6	b12	-	4	6	.03
F	Cirsium spp.	65	78	67	31	38	32	1.11
F	Collomia linearis (a)	-	-	21	-	-	11	.05

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
F	Collinsia parviflora (a)	-	-	182	-	-	64	1.11
F	Cymopterus spp.	$_{a}$-	$_{a}$-	$_{b}$31	-	-	15	.10
F	Cynoglossum officinale	-	4	-	-	2	-	-
F	Draba spp. (a)	-	-	50	-	-	16	.10
F	Erodium cicutarium (a)	-	-	315	-	-	101	6.45
F	Eriogonum racemosum	$_{a}$-	$_{ab}$1	$_{b}$11	-	1	5	.02
F	Galium aparine (a)	-	-	1	-	-	1	.00
F	Helianthus annuus (a)	$_{a}$6	$_{b}$173	$_{a}$-	4	68	-	-
F	Heterotheca villosa	$_{a}$5	$_{a}$18	$_{b}$88	3	7	35	1.67
F	Holosteum umbellatum (a)	-	-	190	-	-	62	2.63
F	Lactuca serriola	-	3	2	-	1	2	.01
F	Linaria dalmatica	-	-	4	-	-	2	.03
F	Machaeranthera spp. (a)	-	-	44	-	-	17	.08
F	Oenothera spp.	$_{a}$-	$_{a}$-	$_{b}$24	-	-	9	.04
F	Polygonum douglasii (a)	-	-	3	-	-	1	.00
F	Ranunculus testiculatus (a)	-	-	58	-	-	20	.20
F	Tragopogon dubius	$_{a}$64	$_{b}$10	$_{a}$73	34	6	34	.78
F	Verbascum thapsus	-	-	4	-	-	2	.15
Total for Forbs		144	298	1557	74	130	566	16.69

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 14

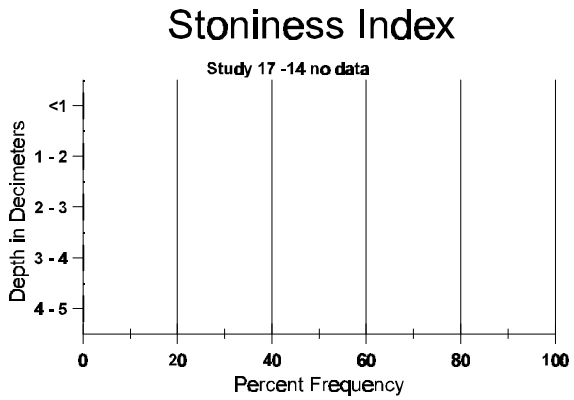
Type	Species	Strip Frequency ‘96	Average Cover % ‘96
B	Amelanchier alnifolia	2	.15
B	Artemisia tridentata vaseyana	15	1.16
B	Chrysothamnus nauseosus albicaulis	18	.72
B	Gutierrezia sarothrae	73	1.55
B	Opuntia spp.	40	2.77
B	Symphoricarpos oreophilus	1	.15
Total for Browse		149	6.51

BASIC COVER --
Herd unit 17 , Study no: 14

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	386	2.00	9.25	36.09
Rock	307	9.25	13.50	18.57
Pavement	311	12.25	41.75	7.71
Litter	395	62.75	20.50	28.28
Cryptogams	111	.25	.75	2.79
Bare Ground	278	13.50	14.25	12.42

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 14

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.9	49.2 (7.2)	7.3	34.9	35.1	30.0	2.6	25.6	92.8	.5



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 14

Type	Quadrat Frequency '96
Rabbit	1
Elk	10
Deer	28

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 14

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	13	21	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		0			0%
													'96		40			50%
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	83	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	89	1	2	2	-	-	-	-	-	-	5	-	-	-	166			5
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	83	-	-	1	-	-	-	-	-	-	-	-	1	-	33	20	22	1
	89	1	1	2	-	-	-	-	-	-	3	1	-	-	133	15	18	4
	96	-	6	5	-	-	-	-	-	-	11	-	-	-	220	17	31	11
D	83	-	-	3	-	-	-	-	-	-	2	-	1	-	100			3
	89	-	-	3	-	-	-	-	-	-	2	-	1	-	100			3
	96	1	2	-	-	-	-	-	-	-	2	-	-	1	60			3
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
Total Plants/Acre (excluding Dead & Seedlings)													'83		266	Dec:		38%
													'89		399			25%
													'96		340			18%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	1	1	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	16	-	-	-	-	-	-	-	-	16	-	-	-	533	24	30	16
	89	2	2	-	-	-	-	-	-	-	4	-	-	-	133	18	20	4
	96	6	6	4	-	-	-	-	-	-	15	-	1	-	320	23	39	16
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	2	3	1	-	-	-	-	-	-	2	2	-	2	200			6
	96	4	1	1	-	-	-	-	-	-	3	-	-	3	120			6
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
Total Plants/Acre (excluding Dead & Seedlings)													'83		533	Dec:		0%
													'89		366			55%
													'96		480			25%
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	100	-	-	-	-	-	-	-	-	100	-	-	-	3333			100
	96	1063	-	-	1	-	-	-	-	-	1064	-	-	-	21280			1064
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	338	-	-	-	-	-	-	-	-	338	-	-	-	6760			338
M	83	98	-	-	-	-	-	-	-	-	98	-	-	-	3266	9	11	98
	89	51	-	-	-	-	-	-	-	-	50	-	1	-	1700	8	10	51
	96	234	-	-	3	-	-	-	-	-	237	-	-	-	4740	5	8	237
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	20	-	-	-	-	-	-	-	-	7	-	7	6	666			20
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
Total Plants/Acre (excluding Dead & Seedlings)													'83		3266	Dec:		0%
													'89		2466			27%
													'96		11540			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	2	-	1	-	100			3
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	10	-	-	-	-	-	-	-	-	9	-	1	-	333			10
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	183	-	-	-	-	-	-	-	-	183	-	-	-	6100	6	6	183
	89	9	-	-	-	-	-	-	-	-	7	-	2	-	300	5	22	9
	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560	6	33	28
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	-	-	2	1	100			3
	96	20	-	-	-	-	-	-	-	-	11	-	1	8	400			20
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		6100	Dec:		0%
													'89		733			14%
													'96		1000			40%
Purshia tridentata																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	28	0
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		0			-
Symphoricarpos oreophilus																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	11	0
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		20			-

TREND STUDY 17-15-96 (old 21-10)

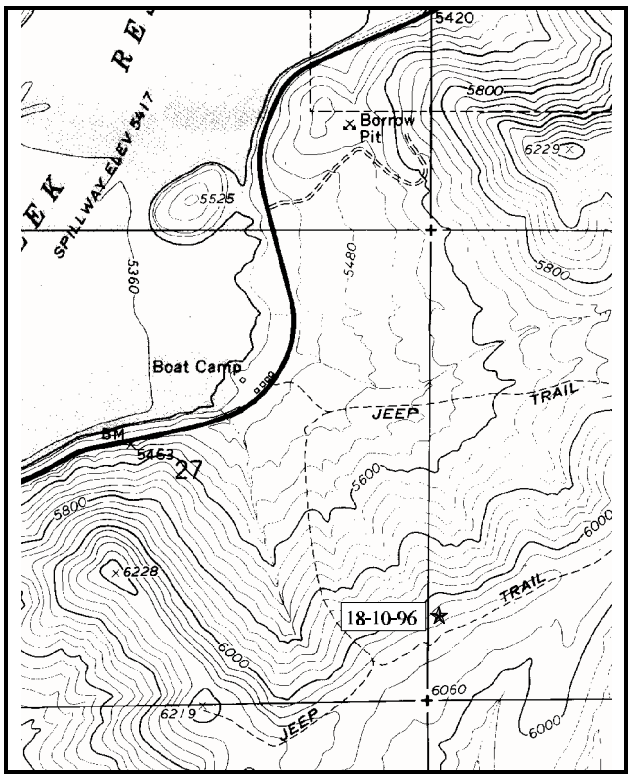
Study site name: Island Boat Camp . Range type: Bitterbrush .

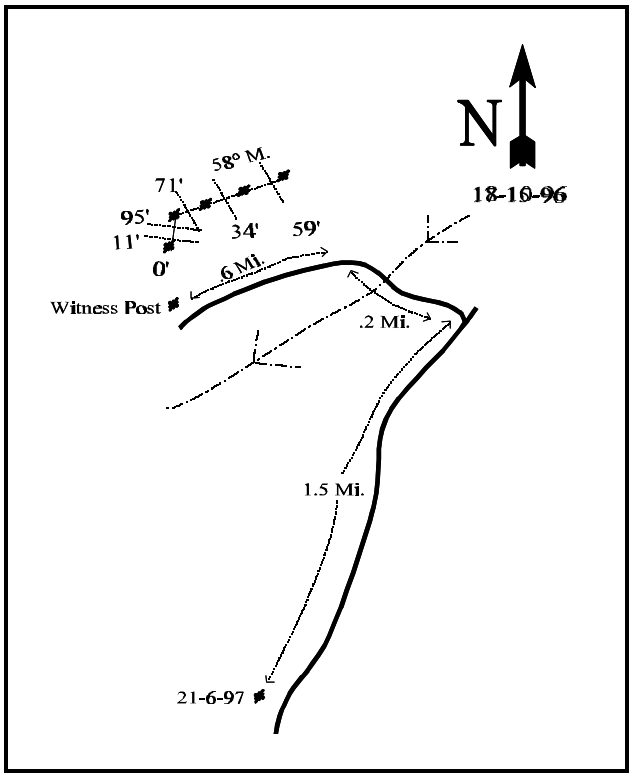
Compass bearing: frequency baseline 1 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (59ft).

LOCATION DESCRIPTION

Beginning at the intersection of U.S. 189 and the Wallsburg turnoff, proceed .50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile passing through two DWR gates to another intersection, and turn right. Proceed .05 miles to a small rock pile on the left(i.e., east) side of the road which marks study #17-11, Wallsburg Turn. Continue down the road traveling north passing a left fork for 1.5 miles to a fork. Bear left and go .2 miles thru a drainage to another ridge top and bear left. Drive along the ridge .6 miles to a witness post on the north side of the road.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 4S , Range 4E , Section 26 , UTM COOR: 4-59-799E 44-76-301N

DISCUSSION

Trend Study No. 17-15 (21-10)

The Island Boat Camp study is located on a ridge overlooking both the Island Boat Camp and Wallsburg. It is representative of the unburned mixed mountain brush type that formerly was so prevalent on the better quality sites in the western part of the Wallsburg-Deer Creek Reservoir winter range. Virtually all of the winter range to the north, east, and south of this site was burned in 1976. The study begins on the ridge top and extends onto a gently sloping (3-5%) area with a northwest aspect. Elevation is approximately 6,000 feet. Big game use, as evidenced by levels of hedging on the principal browse and frequency of deer and elk pellet groups, is moderate. Cattle also use the area but not excessively.

Soils are derived from limestone with an effective rooting depth (see methods) of almost 18 inches. The average soil temperature at 18 inches was 50°F. Rocks were encountered throughout the soil profile, yet very little were observed on the soil surface. Textural analysis indicates a clay loam that is slightly alkaline (pH of 7.8). Soil erosion is minimal due to abundant vegetative and litter cover. Percent bare soil has remained nearly the same since 1989 at around 9%.

The browse component is productive and diverse. The most abundant species is the unutilized stickyleaf low rabbitbrush. It did not increase between 1983 and 1989, but has now increased to 6,000 plants/acre. Mountain big sagebrush provides just over 10% canopy cover. Density shows a slow decline since 1983 when it was estimated at 3,199 plants/acre and now is estimated at 2,080 plants/acre. A higher percentage of decadence (42%) was noted in 1989, but this has now declined to 26%. The majority of the mountain big sagebrush are moderately hedged and display excellent vigor. No plants were classified as a seedling in any of the years this area was sampled. Broom snakeweed was encountered in 1996, with an estimated density of 900 plants/acre. It was likely always present but not sampled with the much smaller sample size previously used. The antelope bitterbrush is a mature population with no seedlings or young classified in 1996. Percent decadency is lower than reported in 1989, but nearly all the plants exhibit heavy use. Estimated density is 600 plants/acre. The serviceberry population has remained fairly stable with an estimated density of 1,220 plants/ acre in 1996. Percent decadency and utilization have declined since 1989, while vigor has improved. Other browse species include snowberry and gray horsebrush.

Sum of nested frequency for perennial grasses has increased since 1989 and nearly doubled since 1983. Bluebunch wheatgrass sum of nested frequency has significantly increased since 1989. Cheatgrass is not as abundant on this site as it was on some of the surrounding sites that were disturbed by fire in recent years. Other common species include muttongrass, Sandberg bluegrass, and Indian ricegrass.

Forb diversity is quite high with 38 species encountered. Sum of nested frequency for perennial forbs has increased from 520 in 1989 to 1,251 in 1996. The dominate perennial species include sulfur eriogonum, pale agoseris, longleaf phlox, and viola. Annual forbs include little flower Collinsia, pale alyssum, and Douglas knotweed.

1983 APPARENT TREND ASSESSMENT

Soil and vegetative trend are both stable. This is a highly productive site which, when compared to similar burned areas, gives one an appreciation of the loss resulting from the l976 fire. A possible use for this study might be as a "comparison area" from which management objectives for the burned areas might be

derived.

1989 TREND ASSESSMENT

The soil trend is stable. Although big sagebrush shows a slight decline, other key indicators are stable to improving. There is ample browse forage available. The vegetative trend is stable. The data displays a diverse and stable site in the mixed mountain brush type on the DWR Wallsburg property. There is excellent production and diversity of forage. More sign of big game use was observed here than on any other study site around the Wallsburg area.

1996 TREND ASSESSMENT

Soil trend is stable with litter and bare soil cover values remaining nearly constant. Rock and pavement combined cover are declining from 1989 to values similar to those reported in 1983. The browse trend is also stable. Many of the plants exhibit better vigor than reported in 1989. Mountain big sagebrush density has slowly declined since 1983 and this trend should continue to be monitored in the future. The stickyleaf low rabbitbrush and broom snakeweed densities should also be monitored for their possible displacement of the more palatable forage species. Both sum of nested frequency for grasses and forbs has increased since 1989. This indicates an upward trend with high diversity.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 15

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron cristatum	a-	b8	b8	-	5	3	.06
G	Agropyron spicatum	a104	a119	b178	42	48	60	6.32
G	Bromus tectorum (a)	-	-	67	-	-	22	.68
G	Festuca ovina	a15	b-	b-	7	-	-	-
G	Melica bulbosa	-	-	4	-	-	2	.06
G	Oryzopsis hymenoides	a19	b46	ab24	11	22	11	.91
G	Poa fendleriana	a103	b172	b198	41	69	69	5.01
G	Poa pratensis	a-	b12	ab5	-	5	2	.06
G	Poa secunda	a-	b30	c60	-	16	27	1.27
G	Stipa comata	3	5	-	1	2	-	-
Total for Grasses		244	392	544	102	167	196	14.40
F	Agoseris glauca	a5	a-	b141	2	-	57	.95
F	Alyssum alyssoides (a)	-	-	105	-	-	38	.18
F	Allium spp.	a9	b70	c31	5	35	16	.08
F	Antennaria spp.	a-	b21	b40	-	10	18	.52
F	Arabis spp.	5	-	-	3	-	-	-
F	Astragalus cibarius	a-	a-	b93	-	-	37	2.68
F	Astragalus convallarius	13	9	3	6	5	3	.01

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
F	Balsamorhiza sagittata	$_{a}$18	$_{a}$33	$_{b}$85	9	18	37	4.46
F	Castilleja linariaefolia	-	3	2	-	1	2	.03
F	Calochortus nuttallii	7	15	13	5	9	6	.03
F	Castilleja spp.	-	-	3	-	-	1	.03
F	Chaenactis douglasii	-	-	1	-	-	1	.03
F	Cirsium spp.	2	-	3	1	-	1	.00
F	Collomia linearis (a)	-	-	30	-	-	17	.11
F	Comandra pallida	24	27	22	10	15	10	.10
F	Collinsia parviflora (a)	-	-	198	-	-	72	.70
F	Crepis acuminata	$_{a}$-	$_{a}$4	$_{b}$95	-	4	43	.84
F	Cryptantha spp.	2	-	-	1	-	-	-
F	Cymopterus longipes	$_{a}$-	$_{a}$-	$_{b}$70	-	-	36	.33
F	Cynoglossum officinale	-	-	3	-	-	1	.00
F	Delphinium bicolor	$_{a}$-	$_{a}$-	$_{b}$41	-	-	18	.11
F	Erigeron pumilus	$_{a}$-	$_{a}$6	$_{b}$23	-	3	10	.07
F	Eriogonum racemosum	25	25	14	12	15	7	.06
F	Eriogonum umbellatum	$_{a}$74	$_{a}$80	$_{b}$143	30	33	58	2.49
F	Galium spp.	-	-	3	-	-	2	.01
F	Hackelia patens	$_{a}$5	$_{ab}$16	$_{b}$20	3	9	10	.07
F	Lactuca pulchella	2	-	-	1	-	-	-
F	Linum lewisii	$_{a}$3	$_{a}$3	$_{b}$21	2	2	11	.22
F	Lomatium triternatum	$_{a}$-	$_{b}$24	$_{b}$17	-	11	9	.04
F	Lupinus sericeus	21	34	43	10	15	19	1.00
F	Machaeranthera canescens	$_{ab}$11	$_{a}$22	$_{b}$3	5	11	1	.00
F	Machaeranthera spp	5	-	-	3	-	-	-
F	Mertensia spp.	$_{a}$-	$_{a}$-	$_{b}$8	-	-	5	.05
F	Orthocarpus spp. (a)	-	-	9	-	-	5	.05
F	Penstemon humilis	-	3	-	-	1	-	-
F	Phlox longifolia	$_{a}$-	$_{b}$90	$_{c}$134	-	47	56	.30
F	Polygonum douglasii (a)	-	-	19	-	-	7	.03
F	Ranunculus testiculatus (a)	-	-	3	-	-	1	.00
F	Senecio multilobatus	$_{a}$23	$_{b}$6	$_{ab}$9	13	3	7	.04
F	Taraxacum officinale	-	-	1	-	-	1	.00
F	Tragopogon dubius	23	23	27	11	15	13	.09
F	Vicia americana minor	-	6	-	-	2	-	-
F	Viola spp.	$_{a}$-	$_{a}$-	$_{b}$103	-	-	42	1.35
Total for Forbs		277	520	1579	132	264	678	17.18

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 15

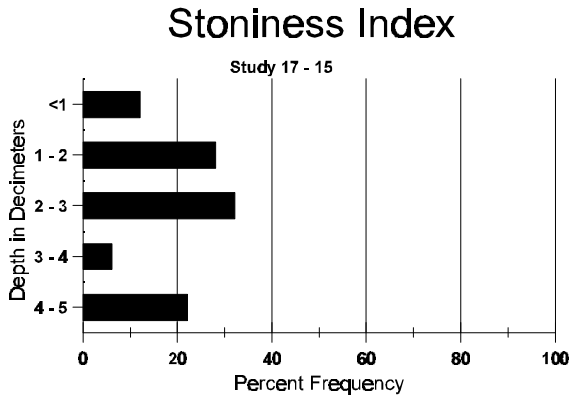
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	41	3.92
B	Artemisia tridentata vaseyana	62	10.25
B	Chrysothamnus viscidiflorus viscidiflorus	81	7.44
B	Gutierrezia sarothrae	10	.34
B	Purshia tridentata	27	5.14
B	Symphoricarpos oreophilus	18	1.90
B	Tetradymia canescens	8	.03
Total for Browse		247	29.05

BASIC COVER --
Herd unit 17 , Study no: 15

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	381	.50	12.00	54.79
Rock	84	1.00	1.25	1.50
Pavement	123	2.75	17.25	2.71
Litter	400	75.75	58.75	61.57
Cryptogams	31	.75	1.25	.64
Bare Ground	171	19.25	9.50	8.54

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 15

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.6	50.2 (18.1)	7.6	32.9	33.1	34.0	4.8	12.8	160.0	07



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 15

Type	Quadrat Frequency '96
Rabbit	5
Elk	19
Deer	35
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 15

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	2	-	-	-	-	-	3	-	-	-	200			3
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	2	-	-	1	-	-	5	-	2	-	466			7
	96	12	-	-	8	-	-	-	-	-	20	-	-	-	400			20
M	83	1	3	-	-	-	-	-	-	-	3	1	-	-	266	26	18	4
	89	-	2	1	-	-	-	-	-	-	3	-	-	-	200	47	43	3
	96	5	9	2	12	6	3	-	-	-	37	-	-	-	740	31	40	37
D	83	-	3	1	-	-	-	-	-	-	-	2	-	2	266			4
	89	-	8	3	1	1	-	-	-	-	4	-	6	3	866			13
	96	1	1	2	-	-	-	-	-	-	4	-	-	-	80			4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		532	Dec:		50%
													'89		1532			57%
													'96		1220			7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	83	9	-	-	-	-	-	-	-	-	9	-	-	-	600			9
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	83	23	6	-	-	-	-	-	-	-	29	-	-	-	1933	24	26	29
	89	13	5	-	1	-	-	-	-	-	16	-	3	-	1266	25	30	19
	96	23	39	7	1	4	-	-	-	-	74	-	-	-	1480	27	43	74
D	83	2	7	1	-	-	-	-	-	-	10	-	-	-	666			10
	89	7	9	-	-	-	-	-	-	-	7	1	7	1	1066			16
	96	8	13	5	-	2	-	-	-	-	18	-	1	9	560			28
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
Total Plants/Acre (excluding Dead & Seedlings)													'83		3199	Dec:		21%
													'89		2532			42%
													'96		2080			27%
Chrysothamnus viscidiflorus viscidiflorus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	2	-	-	-	-	-	-	-	-	1	-	1	-	133			2
	96	31	-	-	1	-	-	-	-	-	32	-	-	-	640			32
M	83	61	-	-	-	-	-	-	-	-	61	-	-	-	4066	9	9	61
	89	51	-	-	4	-	-	1	-	-	52	-	4	-	3733	13	16	56
	96	246	2	-	23	-	-	-	-	-	271	-	-	-	5420	12	21	271
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	9	-	-	-	-	-	-	-	-	7	1	1	-	600			9
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'83		4066	Dec:		0%
													'89		4466			13%
													'96		6060			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	27	-	-	1	-	-	-	-	-	28	-	-	-	560	8	10	28
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		0			0%
													'96		920			11%
Purshia tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	89	-	4	-	-	-	-	-	-	-	4	-	-	-	266			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	1	3	2	-	-	-	-	-	-	6	-	-	-	400	43	54	6
	89	-	5	-	-	-	-	-	-	-	5	-	-	-	333	38	47	5
	96	-	2	20	1	1	2	-	-	-	25	1	-	-	520	40	71	26
D	83	-	4	-	-	-	-	-	-	-	4	-	-	-	266			4
	89	-	5	1	-	-	-	-	-	-	6	-	-	-	400			6
	96	-	2	-	-	1	1	-	-	-	1	-	-	3	80			4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		932	Dec:		29%
													'89		999			40%
													'96		600			13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	4	-	-	-	-	-	9	-	-	-	180			9
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	1	-	13	-	-	-	-	-	19	-	-	-	380	23	29	19
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		560			-
Tetradymia canescens																		
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200	12	12	3
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	10	1
	96	2	-	-	-	1	-	-	-	-	3	-	-	-	60	8	12	3
D	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'83		466	Dec:		14%
													'89		199			0%
													'96		160			0%

TREND STUDY 17-16-96 (old 21-11)

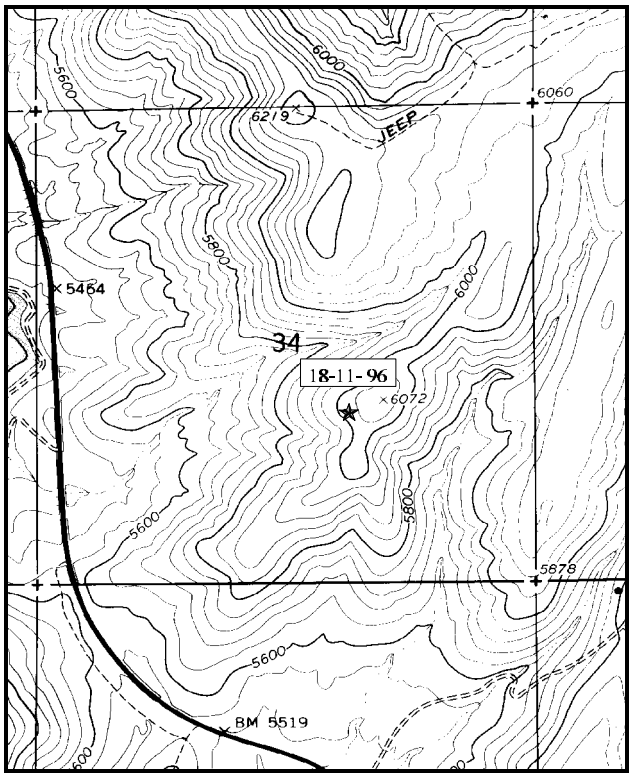
Study site name: Rainbow Bay . Range type: Big sagebrush-grass .

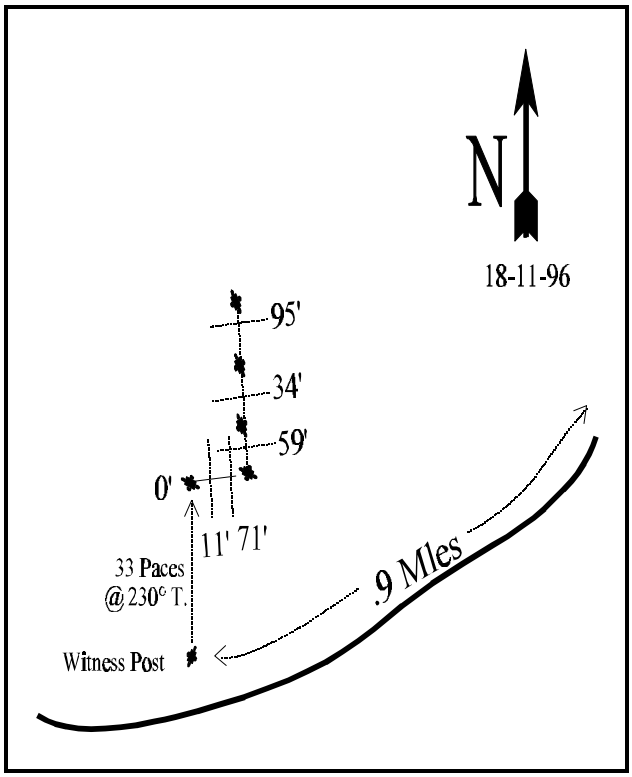
Compass bearing: frequency baseline 345 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning at the intersection of U.S. 189 and the Wallsburg turnoff, proceed .50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile passing through two DWR gates to another intersection, and turn right. Proceed .05 miles to a small rock pile on the left(i.e., east) side of the road which marks study #17-11, Wallsburg turn. Continue down the road 1.5 miles from study 6 to a fork. Bear left and go 0.2 miles thru a drainage to another ridge top and bear left. Drive along the ridge 0.6 miles to a witness post on the north side of the road which marks study #17-15. Continue down this road to an intersection with a short telephone post and a Mountain Bell wire warning sign. Turn left and stay left for 0.9 miles to a witness post on the north side of the road. From the witness post the 0-foot stake is 33 paces away at an azimuth of 230 degrees true.





Map Name: Charleston, Utah Diagrammatic Sketch

Township 4S , Range 4E , Section 34 , UTM COOR: 4-59-547E 44-75-010N

DISCUSSION

Trend Study No. 17-16 (21-11)

The Rainbow Bay trend study is located on basin big sagebrush-grass rangeland near the top of the high knoll immediately east of Rainbow Bay on Deer Creek Reservoir. The site is relatively dry with a moderately steep slope (15-20%) and a west southwest aspect. Elevation is approximately 6,000 feet. This area, although within a few hundred feet of the 1976 burn, was preserved from the fire. However, it does appear that the area burned during one of the earlier fires in the late 1960's or early 1970's. The presence of numerous fire scarred sagebrush stumps is evidence of a long fire history. Winter deer and elk use was reportedly heavy prior to 1989, but in 1989 the data and observations show only light to moderate levels of hedging and pellet group densities. Deer and elk pellet groups were numerous this season (1996) with some being extremely recent. The area is also grazed by domestic livestock, however it does not appear that they grazed along this slope last season. Cattle were seen below the site in 1996.

Soil is derived from sedimentary limestone and textural analysis indicates it is on the border of a clay loam or loam. The average soil temperature at 11 inches was 51°F. Effective rooting depth (see methods) was just over 10 inches. The soil pH is neutral at 7.2. Near the ridge top there are more bare areas of soil with quite a bit of erosion pavement. In 1983, it was reported that there were no large gullies present, but sheet erosion was obvious. Also, a large percentage of the ground surface was occupied either by erosion pavement, bare ground or a thin cover of cheatgrass litter. Perennial plants were also reported to be pedestaled. Rock and pavement cover have declined since that time and erosion does not appear to be a problem in 1996. Percent bare soil has increased slightly but vegetative and litter cover are abundant and protect the soil at this time.

As reported in 1989, the basin big sagebrush population has again declined to an estimated density of 1,520 in 1996. In 1983, the density was estimated to be 4,732 plants/acre. Percent decadency and vigor are slowly getting worse. Few seedling or young plants were classified in 1996 with the dead to live ratio being 1:3. In 1996, it was noted that some of the basin big sagebrush showed some winter injury from previous winters. Antelope bitterbrush density has fluctuated from 299 plants/acre in 1983 to 699 plants/acre in 1989. Currently, the estimated density is 480 plants/acre. Nearly 80% of these plants were classified as mature, 17% classified as young, and 4% classified as decadent. Utilization was reported as light to moderate in the past, but has now shifted to heavy use in 1996. The broom snakeweed density has greatly increased to an estimated 14,580 plants/acre in 1996. In 1989 it was estimated at 4,732 plants/acre and 1,933 plants/acre in 1983. Most of the broom snakeweed was located near the ridge top in patches that were more open. The great increase may be due to the increased sample size used in 1996, but the population should be monitored. Stickyleaf low rabbitbrush has decreased in density from 3,166 plants/acre estimated in 1989 to only 640 plants/acre in 1996. All plants encountered in 1996 were classified as mature. Other browse species include serviceberry, prickly pear, and gray horsebrush.

Perennial grass sum of nested frequency has increased since 1989, mostly due to the significant increase in nested frequency for bluebunch wheatgrass. Cheatgrass is associated with the small interspaces and is not very large this season. Some seeded grasses persist, such as crested wheatgrass and intermediate wheatgrass. Other grasses include Indian ricegrass, muttongrass, and Sandberg bluegrass.

Perennial forb sum of nested frequency has also increased. Most desirable

species are still limited, but do provide some spring forage. It was noted in 1996 that cymopterus and arrowleaf balsamroot were grazed.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable to declining. Vegetative cover, especially from grasses and forbs, is simply inadequate to prevent rapid sheet erosion. Vegetative trend is less distinct. The browse component is stable or even improving if antelope bitterbrush is able to increase in density. However, grasses and forbs are obviously deficient and show few signs of any rapid increase. An ominous sign is the abundance of cheatgrass brome. The potential for a destructive fire will be high as long as cheatgrass continues to be a major part of the composition.

1989 TREND ASSESSMENT

In terms of basin big sagebrush, the trend now appears downward. Although the sagebrush may recover somewhat with more favorable conditions, the understory appears unlikely to improve without direct intervention.

1996 TREND ASSESSMENT

Soil trend is stable with litter and vegetation being adequate to protect the bare ground. Percent bare soil, although it has increased since 1989, is still not high enough to be concerned about. The basin big sagebrush population is slowly declining over time as well as the antelope bitterbrush population. Broom snakeweed has greatly increased in density, but this may be in part due to the greatly increased sample size used in 1996. The browse trend is slightly downward. Herbaceous understory trend is slightly upward due to the increase in sum of nested frequency for grasses and forbs since 1989. Many of the species are perennials with some seeded grasses encountered. The herbaceous understory exhibits high diversity, but many of the species are in low abundance.

TREND ASSESSMENT
soil - stable
browse - slightly downward
herbaceous understory - slightly upward

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 16

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
G	Agropyron cristatum	6	13	18	4	5	7	1.39
G	Agropyron intermedium	a-	a1	b12	-	1	6	.22
G	Agropyron spicatum	a70	b150	c222	30	56	75	10.96
G	Agropyron trichoporum	-	1	-	-	1	-	-
G	Bromus tectorum (a)	-	-	270	-	-	84	3.04
G	Oryzopsis hymenoides	a-	b11	b11	-	4	5	.19
G	Poa bulbosa	-	3	-	-	1	-	-
G	Poa fendleriana	-	-	6	-	-	2	.06
G	Poa secunda	a5	b26	b42	2	14	16	.45
G	Sitanion hystrix	-	1	-	-	1	-	-
Total for Grasses		81	206	581	36	83	195	16.32

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
F	Agoseris glauca	a-	a2	b91	-	1	45	.82
F	Allium acuminatum	a-	a-	b14	-	-	8	.18
F	Alyssum alyssoides (a)	-	-	289	-	-	91	1.41
F	Arabis spp.	a-	b11	ab3	-	6	2	.01
F	Artemisia ludoviciana	3	1	-	1	1	-	-
F	Astragalus cibarius	a-	a-	b123	-	-	57	4.16
F	Astragalus convallarius	-	-	2	-	-	1	.00
F	Astragalus utahensis	19	17	6	7	8	2	.03
F	Balsamorhiza sagittata	a7	b44	c76	4	20	38	4.84
F	Castilleja linariaefolia	a-	a-	b40	-	-	24	.22
F	Calochortus nuttallii	a1	b41	a12	1	22	6	.03
F	Chaenactis douglasii	-	3	-	-	1	-	-
F	Cirsium spp.	a3	a-	b8	1	-	6	.05
F	Collomia linearis (a)	-	-	101	-	-	47	.28
F	Comandra pallida	a8	b22	a-	3	10	-	-
F	Collinsia parviflora (a)	-	-	252	-	-	84	2.10
F	Crepis acuminata	a4	b20	ab12	2	10	7	.08
F	Cymopterus longipes	a-	a-	b84	-	-	40	.74
F	Delphinium bicolor	a-	a-	b11	-	-	5	.07
F	Draba spp. (a)	-	-	58	-	-	23	.16
F	Erigeron pumilus	-	-	9	-	-	3	.01
F	Eriogonum racemosum	12	37	22	8	19	15	.15
F	Eriogonum umbellatum	-	-	4	-	-	2	.01
F	Gayophytum ramosissimum	-	-	3	-	-	1	.00
F	Hackelia patens	-	-	3	-	-	1	.03
F	Helianthus annuus (a)	a5	b83	a-	3	40	-	-
F	Holosteum umbellatum (a)	-	-	179	-	-	55	1.15
F	Lithospermum ruderale	a-	ab3	b8	-	1	5	.05
F	Lomatium triternatum	a-	b22	b17	-	12	11	.05
F	Lupinus sericeus	3	4	5	1	2	4	.27
F	Machaeranthera canescens	-	3	2	-	1	1	.00
F	Medicago sativa	3	-	-	1	-	-	-
F	Orthocarpus spp. (a)	-	-	3	-	-	1	.00
F	Penstemon spp.	a1	b66	a-	1	34	-	-
F	Phlox longifolia	a-	a-	b8	-	-	4	.02
F	Polygonum douglasii (a)	-	-	103	-	-	41	.22
F	Ranunculus testiculatus (a)	-	-	4	-	-	1	.00
F	Taraxacum officinale	-	-	3	-	-	1	.00
F	Tragopogon dubius	a2	b31	c76	2	15	34	.45

Type	Species	Nested Frequency '83	'89	'96	Quadrat Frequency '83	'89	'96	Average Cover % '96
F	Unknown forb-perennial	$_{a}$-	$_{b}$7	$_{a}$-	-	4	-	-
F	Vicia americana minor	-	2	-	-	2	-	-
F	Viguiera multiflora	-	1	6	-	1	3	.04
Total for Forbs		71	420	1637	35	210	669	17.76

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

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

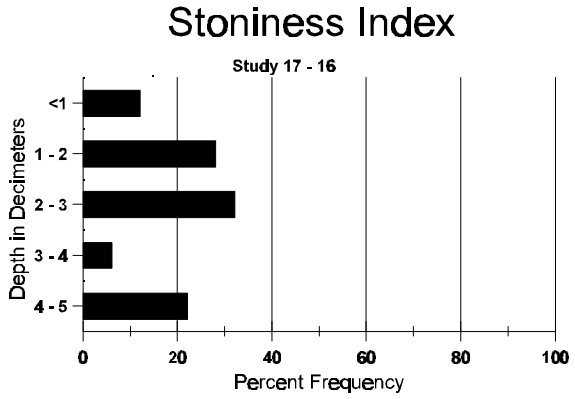
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	3	-
B	Artemisia tridentata tridentata	57	9.22
B	Chrysothamnus viscidiflorus viscidiflorus	19	1.37
B	Gutierrezia sarothrae	91	3.22
B	Opuntia spp.	14	.12
B	Purshia tridentata	20	3.81
B	Tetradymia canescens	0	.15
Total for Browse		204	17.91

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

Cover Type	Nested Frequency '96	Average Cover % '83	'89	'96
Vegetation	399	1.50	6.25	49.61
Rock	211	2.75	3.50	6.05
Pavement	262	33.25	36.75	6.51
Litter	398	57.75	46.25	49.93
Cryptogams	111	.25	3.25	1.35
Bare Ground	192	4.50	4.00	7.23

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.4	51.0 (10.9)	7.2	42.6	27.4	30.0	3.6	27.5	265.6	.7



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 16

Type	Quadrat Frequency '96
Elk	21
Deer	40
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 16

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	1	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	2	-	-	-	-	-	-	-	2	-	-	-	40			2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15	18	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		33			-
													'96		60			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Artemisia tridentata tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	4	-	-	1	-	-	-	-	-	5	-	-	-	166			5
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	24	-	-	-	-	-	-	-	-	24	-	-	-	800			24
	89	13	-	-	1	-	-	-	-	-	14	-	-	-	466			14
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	60	29	6	-	-	-	-	-	-	95	-	-	-	3166	26	28	95
	89	22	24	1	1	-	-	-	-	-	48	-	-	-	1600	26	31	48
	96	13	17	1	4	1	-	-	-	-	36	-	-	-	720	23	43	36
D	83	9	8	6	-	-	-	-	-	-	23	-	-	-	766			23
	89	16	31	4	-	-	-	-	-	-	48	-	3	-	1700			51
	96	11	27	-	1	-	-	-	-	-	30	-	-	9	780			39
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	500			25
Total Plants/Acre (excluding Dead & Seedlings)													'83		4732	Dec:		16%
													'89		3766			45%
													'96		1520			51%
Chrysothamnus viscidiflorus viscidiflorus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	16	-	-	8	-	-	-	-	-	24	-	-	-	800			24
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	53	-	-	-	-	-	-	-	-	53	-	-	-	1766	9	9	53
	89	59	-	-	11	-	-	-	-	-	69	-	1	-	2333	12	13	70
	96	30	-	-	2	-	-	-	-	-	32	-	-	-	640	12	23	32
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'83		1766	Dec:		0%
													'89		3166			1%
													'96		640			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	876	-	-	-	-	-	-	-	-	876	-	-	-	17520			876
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	17	-	-	-	-	-	-	-	-	17	-	-	-	566			17
	96	225	-	-	-	-	-	-	-	-	225	-	-	-	4500			225
M	83	57	-	-	-	-	-	-	-	-	57	-	-	-	1900	10	13	57
	89	117	-	-	1	-	-	-	-	-	118	-	-	-	3933	11	11	118
	96	496	-	-	-	-	-	-	-	-	496	-	-	-	9920	7	10	496
D	83	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	96	8	-	-	-	-	-	-	-	-	7	-	-	1	160			8
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11
Total Plants/Acre (excluding Dead & Seedlings)													'83		1933	Dec:		2%
													'89		4732			5%
													'96		14580			1%
Opuntia spp.																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	1	-	-	-	-	-	1	-	-	-	33			1
	96	2	-	-	2	-	-	-	-	-	4	-	-	-	80			4
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	7	-	-	1	-	-	-	-	-	8	-	-	-	160	5	13	8
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		0%
													'89		33			0%
													'96		280			14%

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4	Acre	Ht.	Cr.	
Purshia tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	96	2	1	-	1	-	-	-	-	-	4	-	-	-	80			4
M	83	3	3	1	-	-	-	-	-	-	7	-	-	-	233	41	124	7
	89	8	4	1	-	-	-	-	-	-	13	-	-	-	433	41	81	13
	96	2	3	7	-	1	4	-	-	2	19	-	-	-	380	24	59	19
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		299	Dec:		0%
													'89		699			0%
													'96		480			4%
Tetradymia canescens																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	23	0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'89		0			-
													'96		0			-

TREND STUDY 17-17-96 (old 21-13)

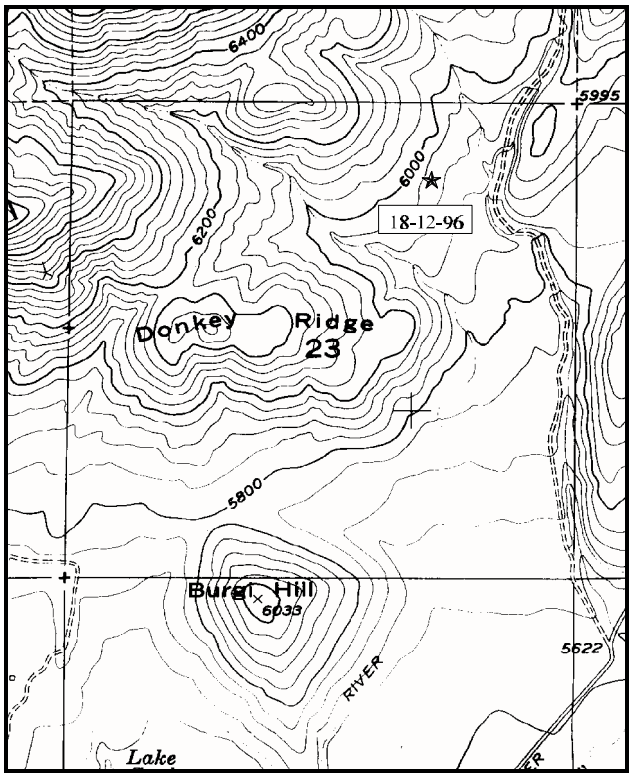
Study site name: Dutch Canyon. Range type: Big sagebrush-grass.

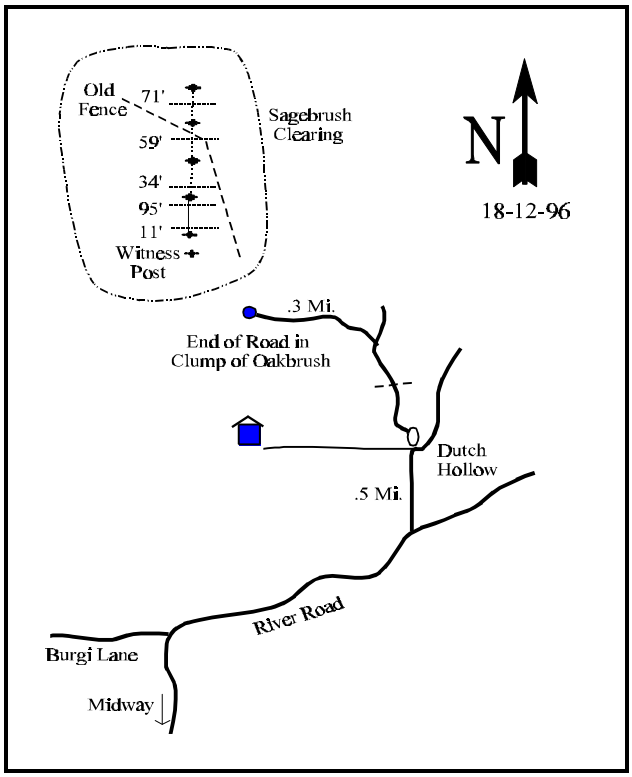
Compass bearing: frequency baseline 344 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft).

LOCATION DESCRIPTION

Begin at the intersection of River Road and Burgi Lane (north of Midway). Proceed northward on River Road for 0.80 miles to an intersection. Turn left and proceed 0.50 miles to a dead end. From the dead end proceed northwest on a jeep trail leading through the gambel oak. Proceed 0.45 miles to a fork in the road. Take the left fork for 0.30 miles to where the road ends and stop. From the end of the road, the 0-foot baseline stake is 83 paces away at an azimuth of 300 degrees true. The frequency baseline is marked by green steel "T" fenceposts, approximately 12 to 18 inches in height. A red browse tag, number 3952, is attached to the 0-foot baseline stake.





Map Name: Heber, Utah Diagrammatic Sketch

Township 3S, Range 4E, Section 23, UTM COOR. 4-60-813E 44-88-861N

DISCUSSION

Trend Study No. 17-17 (21-13)

The Dutch Canyon study is located within a small sagebrush-grass park surrounded by thick Gambel oak. Geographically, the area is near the mouth of Dutch Hollow at an elevation of 6,400 feet. The site is classified as winter range for deer and commonly exhibits light use. In 1996 deer pellet group frequency indicated moderate use. Domestic livestock also use the area. The site has a moderately steep slope (30%) with a southeast aspect.

Soil is rocky and moderately deep with only a few rocks on the surface. Some small gravel is found in the interspaces of the mountain big sagebrush and in the soil profile. Soil textural analysis reveals a sandy clay loam with a neutral pH. Effective rooting depth (see methods) was almost 20 inches. Soil temperature was almost 50°F at nearly 18 inches in depth. Litter cover is extremely high at 71%. Rock and pavement cover have declined over all years as well as percent bare soil. Most of the interspaces between the mountain big sagebrush is adequately protected by litter and vegetation, so erosion is not a problem.

The age structure of the mountain big sagebrush population indicates a stable population at this time. Density has remained nearly the same as the 1989 estimation at 1,380 plants/acre. Percent decadency has declined since 1989 with 10% of the population classified as having poor vigor. One disturbing fact is that the number of dead plants nearly equals the number of live plants at this time. As in 1983 and 1989, the mountain big sagebrush were mostly lightly hedged in 1996. This would indicate the death of the sagebrush would be more related to the extended drought and associated winter injuries. All antelope bitterbrush plants encountered were classified as mature with a decrease in the number of plants that were heavily utilized. Currently, the estimated density for antelope bitterbrush is 80 plants/acre. The oak density has not changed appreciably since 1989 with an estimated density of 2,200 plants/acre. The oak on the site are primarily under 6 feet in height, although some taller oak occurs along line 2 belt 4 and surrounding the site. Few oak clumps showed any utilization. The broom snakeweed density has decreased by nearly 50% to an estimated density of 2,740 plants/acre in 1996. This is a primarily mature population with little biotic potential for increase.

Nearly all of the herbaceous understory cover is provided by annual species. Cheatgrass is the dominate grass providing 47% of the herbaceous cover. Cheatgrass was encountered in 96% of the quadrats. Other grasses that occurred sporadically include Kentucky bluegrass, smooth brome, and mountain brome. Pale alyssum is the most abundant forb with a quadrat frequency of 75%, providing 12% of the herbaceous understory cover. An unknown annual forb was also abundant providing an additional 16% of the herbaceous cover. Showy goldeneye significantly decreased in nested frequency value, while yellow salsify significantly increased in nested frequency since 1989. Sum of nested frequency for perennial species increased for both grasses and forbs but make up very little of the herbaceous cover. The community has a poor composition.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable or slightly declining. While erosion is not currently a significant problem, the relative lack of ground cover makes the area susceptible to soil loss when high intensity storms occur. Vegetatively, browse is overwhelmingly dominant and will continue to be so. However, there is a potential for an increasingly dominant Gambel oak population accompanied by a concurrent decrease in productivity for mountain big sagebrush.

1989 TREND ASSESSMENT

Ground cover data comparisons show an increase in litter and pavement, resulting in a decrease in the amount of bare soil exposed from 22% to 5%. Slight soil movement is detectable in the shrub interspaces. Overall, the soil trend is stable.

1996 TREND ASSESSMENT

Soil trend is slightly improving with a decrease in both rock and pavement cover combined, and bare soil. No erosion is apparent at this time and there is adequate vegetative and litter cover to protect the soil. Browse trend appears stabilized at this time even though the number of dead plants nearly equals the number of living plants for big sagebrush. The extended drought has ended. Most populations have similar densities as reported in 1989. Decadency rates and heavy utilization are declining. Herbaceous understory trend is stable. Although there is an increase in sum of nested frequency for grasses and forbs since 1989, many of the species are increasers and a better composition is desired.

TREND ASSESSMENT
soil - slightly improved
browse - stable
herbaceous understory - stable, but poor composition of mostly weedy annuals

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 17

Type	Species	Nested Frequency '83	'96	Quadrat Frequency '83	'96	Average Cover % '96
G	Bromus carinatus	-	2	-	1	.00
G	Bromus inermis	-	10	-	3	.33
G	Bromus tectorum (a)	-	336	-	96	8.16
G	Poa pratensis	10	*30	5	12	1.11
Total for Grasses		10	378	5	112	9.61
F	Alyssum alyssoides (a)	-	245	-	75	2.12
F	Artemisia dracunculus	3	-	1	-	-
F	Artemisia ludoviciana	3	8	2	3	.33
F	Calochortus nuttallii	5	-	3	-	-
F	Chenopodium fremontii	-	3	-	1	.00
F	Cirsium spp.	-	*9	-	4	.02
F	Collomia linearis (a)	-	16	-	8	.04
F	Epilobium paniculatum	-	4	-	3	.04
F	Erigeron spp	-	*18	-	7	.16
F	Eriogonum racemosum	-	*10	-	5	.03
F	Heterotheca villosa	-	-	-	-	.15
F	Lactuca serriola	3	*34	1	14	.24
F	Lupinus argenteus	-	5	-	3	.21

Type	Species	Nested Frequency '83	'96	Quadrat Frequency '83	'96	Average Cover % '96
F	Polygonum douglasii (a)	-	28	-	11	.05
F	Sisymbrium altissimum (a)	-	6	-	2	.07
F	Tragopogon dubius	2	*93	1	46	.76
F	Unknown forb-annual	-	96	-	36	2.63
F	Verbascum thapsus	2	6	1	3	.39
F	Viguiera multiflora	6	*31	4	14	.36
F	Zigadenus paniculatus	-	-	-	-	.00
Total for Forbs		24	612	13	235	7.66

* Indicates significant difference at % = 0.10 (annuals excluded)

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

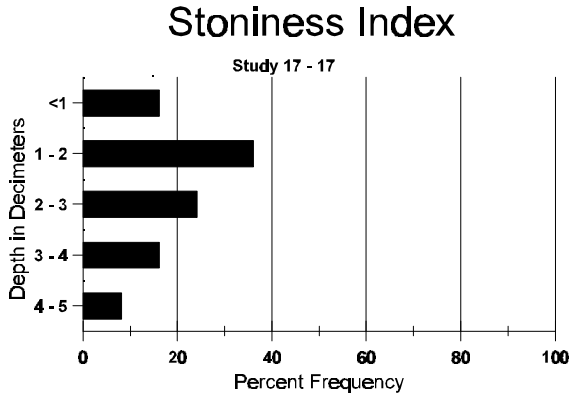
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	37	8.92
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Gutierrezia sarothrae	44	2.31
B	Purshia tridentata	3	.45
B	Quercus gambelii	31	7.17
Total for Browse		116	18.86

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

Cover Type	Nested Frequency '96	Average Cover % '83	'96
Vegetation	383	0	34.90
Rock	130	5.00	2.64
Pavement	144	6.00	2.76
Litter	400	67.25	71.23
Cryptogams	24	.25	.10
Bare Ground	130	21.50	2.18

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 17

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
19.7	49.3 (17.5)	6.9	48.2	25.4	28.4	2.5	32.9	160.0	.5



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 17

Type	Quadrat Frequency '96
Sheep	1
Rabbit	6
Deer	25

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 17

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	83	26	-	-	-	-	-	-	-	-	26	-	-	-	866			26
	96	9	-	-	2	-	-	-	-	-	11	-	-	-	220			11
M	83	27	11	-	-	-	-	-	-	-	38	-	-	-	1266	22	40	38
	96	46	-	-	1	-	-	-	-	-	47	-	-	-	940	23	43	47
D	83	16	3	1	-	-	-	-	-	-	20	-	-	-	666			20
	96	11	-	-	-	-	-	-	-	-	4	-	-	7	220			11
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1060			53
Total Plants/Acre (excluding Dead & Seedlings)													'83		2798	Dec:		24%
													'96		1380			16%
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	19	40	1
Total Plants/Acre (excluding Dead & Seedlings)													'83		0	Dec:		-
													'96		20			-
Gutierrezia sarothrae																		
S	83	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	11	-	-	-	-	-	-	-	-	11	-	-	-	366	9	11	11
	96	105	-	-	-	-	-	-	-	-	105	-	-	-	2100	8	13	105
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	31	-	-	-	-	-	-	-	-	28	-	-	3	620			31
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	500			25
Total Plants/Acre (excluding Dead & Seedlings)													'83		499	Dec:		0%
													'96		2740			23%
Purshia tridentata																		
M	83	-	-	2	-	-	-	-	-	-	2	-	-	-	66	13	25	2
	96	-	2	1	-	1	-	-	-	-	4	-	-	-	80	19	87	4
Total Plants/Acre (excluding Dead & Seedlings)													'83		66	Dec:		-
													'96		80			-

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Quercus gambelii																		
S	83	16	-	-	-	-	-	-	-	-	16	-	-	-	533			16
	96	3	8	-	1	-	-	-	-	-	12	-	-	-	240			12
Y	83	28	12	-	-	-	-	-	-	-	40	-	-	-	1333			40
	96	40	-	-	2	-	-	-	-	-	31	11	-	-	840			42
M	83	-	3	-	-	-	-	-	-	-	3	-	-	-	100	39	21	3
	96	35	1	-	11	-	-	12	5	-	64	-	-	-	1280	52	47	64
D	83	1	2	-	-	-	-	-	-	-	3	-	-	-	100			3
	96	3	1	-	-	-	-	-	-	-	4	-	-	-	80			4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17
Total Plants/Acre (excluding Dead & Seedlings)													'83		1533	Dec:		7%
													'96		2200			4%

TREND STUDY 17-19-96 (old 20-21)

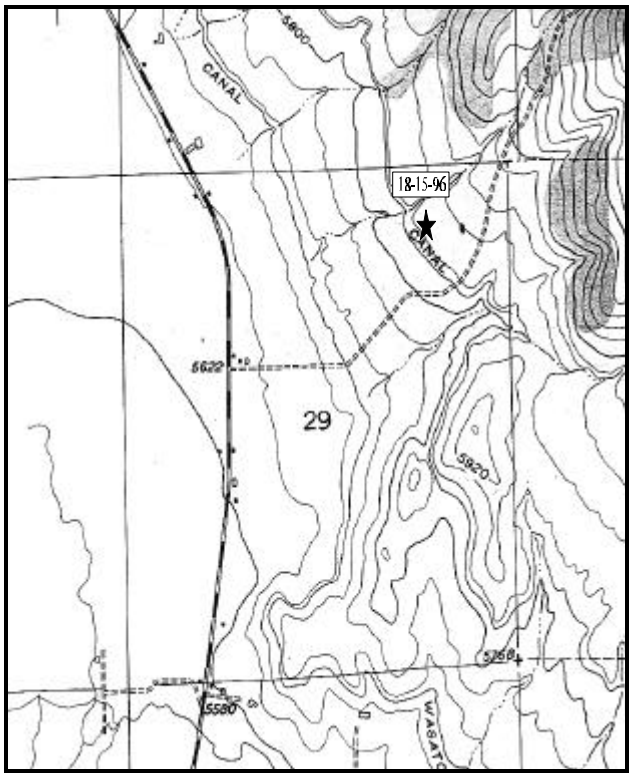
Study site name: Northeast of Heber. Range type: Big sagebrush.

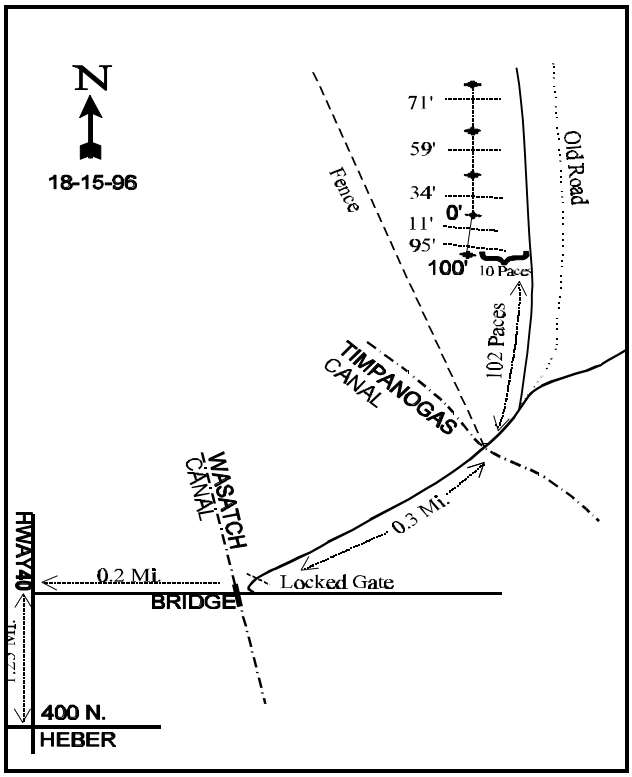
Compass bearing: frequency baseline 187 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From 400 North and Highway 40 (Main) in Heber, travel north for 1.25 miles and turn right onto a dirt road. Proceed east for 0.2 miles to a left turn just past the Wasatch Canal. Follow this road 0.3 miles to a fork immediately past Timpanogos Canal (Locked gate with two combo locks). From the canal, take a left and walk 102 paces up the road. From this point walk 10 paces west from the edge of the road to the 100-foot baseline stake. The 0-foot baseline stake is marked by a red browse tag. The baseline runs 187 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake in a direction of 345 degrees magnetic.





Map Name: Heber Diagrammatic Sketch

Township 3S, Range 5E, Section 29, UTM COOR: 4-66-292E 44-87-182N

DISCUSSION

Trend study No. 17-19 (20-21)

The “northeast of Heber” site is located north and east of Heber on a gentle south-southwest slope. It samples a mountain big sagebrush community with smaller quantities of other shrubs. Slope is 5-10% at an elevation of approximately 6,000 feet. In order to avoid a new road built parallel to the baseline, the 100 foot stake had to be move about 25 feet to the west. It was also noted in 1996 that new homes have been built about 300-400 yards to the south and west. Some seeded grasses and forbs, which were planted along the road occur in belts 1 and 5. Deer pellet groups were abundant with some scattered elk pellet groups as well.

The soil type is "Beyyant Very Cobbly Loam." This is an alluvial soil, very well-drained, much coarser textured and not surprisingly, has an available water capacity only about half that of the Watkins Ridge-Clegg complex. The Beyyant soil is also less permeable to water and potentially more erodible. Soil textural analysis indicates a sandy clay loam with a slightly acid pH. The effective rooting depth (see methods) is estimated to be almost 12 inches and the average soil temperature was 61°F at a depth of 13 inches. Percent bare soil has declined since 1984, as well as combined rock and pavement cover. Litter cover has also declined with the drought, but is still adequate to help protect the soil from erosion.

Mountain big sagebrush density was estimated at 6,866 plants/acre in 1984. At that time the percent decadency was 41%. In 1996, the estimated density was 3,820 plants/acre with a 21% decadency rate. Utilization is still light to moderate with good vigor. The age structure is similar to that sampled in 1984 with about 60% of the plants classified as mature. The dead to live ratio in 1996 is 1:3. Prickly pear cactus has an estimated density of 1,020 plants/acre with a mostly mature age structure. Antelope bitterbrush is scattered throughout the site showing moderate utilization. No other species were encountered.

Six grass species were encountered in 1996. Cheatgrass was by far the most numerous with 100% quadrat frequency. Some seeded grasses were encountered in 1996 due to the new road that was built parallel to the study site. Other grasses have similar nested frequency values to that of 1984.

Fifteen forb species were encountered as well. Sum of nested frequency for perennial forbs increased since 1984 with some seeded species encountered. One plant that could be a problem in the future is tarweed, which was sampled in 1996. Although in low abundance at this time, mismanagement or a disturbance could lead to an exploding population.

1984 APPARENT TREND ASSESSMENT

This entire area is characterized by essentially stable soil and vegetative trends. This statement applies to both the old line intercept and frequency-density sites. Although the former study identified some improvement in grass composition, density, production, and total ground cover, the dominant mountain big sagebrush population was essentially unchanged. However, there are limited clues which suggest that sagebrush may have difficulty maintaining itself in the future. The site has a stable and overwhelmingly dominant big sagebrush population which seems unlikely to change.

1996 TREND ASSESSMENT

Soil trend is stable with a decrease in percent bare soil. Litter cover has also decreased, but combined with vegetative cover, still provides adequate soil

protection. The browse trend also to have stabilized after the years of drought and winter injury. Although there was a decrease in the density of mountain big sagebrush since 1984, this change could have also been partially due to the increased sample size in 1996. Percent decadency has declined since that time and vigor has improved. The herbaceous understory is not very abundant and is dominated by annual species. A fire in this area would destroy the browse community and lead to a field of annual species. Herbaceous understory trend is slightly upward but very poor composition.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - slightly upward, poor composition

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 19

Type	Species	Nested Frequency '84	Nested Frequency '96	Quadrat Frequency '84	Quadrat Frequency '96	Average Cover % '96
G	Agropyron cristatum	-	*24	-	11	1.26
G	Agropyron intermedium	-	-	-	-	.06
G	Agropyron spicatum	8	7	4	2	.06
G	Bromus japonicus (a)	-	2	-	1	.00
G	Bromus tectorum (a)	-	368	-	100	21.32
G	Oryzopsis hymenoides	-	-	-	-	.03
G	Sitanion hystrix	33	31	16	14	.66
G	Stipa comata	-	1	-	1	.03
Total for Grasses		41	433	20	129	23.45
F	Agoseris glauca	-	6	-	2	.01
F	Allium acuminatum	6	11	4	7	.03
F	Alyssum alyssoides (a)	-	92	-	35	.81
F	Collomia linearis (a)	-	13	-	8	.04
F	Collinsia parviflora (a)	-	2	-	2	.01
F	Epilobium paniculatum	-	23	-	13	.06
F	Hedysarum boreale	-	2	-	1	.00
F	Lactuca serriola	-	-	-	-	.00
F	Linum lewisii	-	*25	-	11	.49
F	Madia glomerata (a)	-	9	-	6	.03
F	Medicago sativa	-	1	-	1	.03
F	Microsteris gracilis (a)	-	8	-	4	.02
F	Orthocarpus spp. (a)	-	38	-	19	1.05
F	Phlox longifolia	-	*5	-	4	.02
F	Polygonum douglasii (a)	-	46	-	19	.09
F	Tragopogon dubius	-	2	-	2	.01
Total for Forbs		6	283	4	134	2.73

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 19

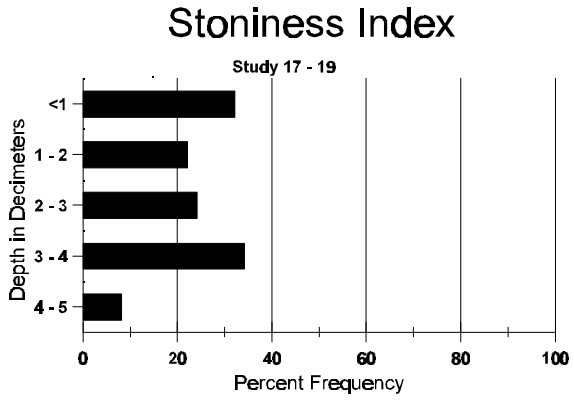
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	89	18.38
B	Opuntia spp.	30	1.27
B	Purshia tridentata	4	.21
Total for Browse		123	19.87

BASIC COVER --
Herd unit 17 , Study no: 19

Cover Type	Nested Frequency '96	Average Cover % '84	'96
Vegetation	373	2.00	39.08
Rock	138	6.25	8.19
Pavement	71	3.50	.35
Litter	395	71.00	56.29
Cryptogams	25	1.75	.43
Bare Ground	181	15.50	11.37

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 19

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.7	61.0 (12.7)	6.4	46.2	26.1	27.7	3.6	34.4	160.0	.5



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 19

Type	Quadrat Frequency '96
Rabbit	11
Elk	5
Deer	47

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 19

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	20	-	-	-	-	-	-	-	-	20	-	-	-	400			20
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	33	1	-	-	-	-	-	-	-	34	-	-	-	680			34
M	84	33	26	1	-	-	-	-	-	-	59	-	1	-	4000	26	32	60
	96	72	42	1	-	-	-	-	-	-	115	-	-	-	2300	23	41	115
D	84	30	10	3	-	-	-	-	-	-	35	-	7	1	2866			43
	96	15	23	3	-	1	-	-	-	-	38	-	-	4	840			42
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	1440			72
Total Plants/Acre (excluding Dead & Seedlings)													'84		6866	Dec:		42%
													'96		3820			22%
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	2	-	-	2	-	-	-	-	-	4	-	-	-	80			4
M	84	12	-	-	-	-	-	-	-	-	12	-	-	-	800	5	12	12
	96	43	-	-	1	-	-	-	-	-	42	-	2	-	880	5	13	44
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		1133	Dec:		0%
													'96		1020			6%
Purshia tridentata																		
M	84	-	2	-	-	-	-	-	-	-	1	-	1	-	133	17	22	2
	96	-	3	-	-	-	-	-	-	-	3	-	-	-	60	15	31	3
D	84	-	-	2	-	-	-	-	-	-	1	-	1	-	133			2
	96	-	-	-	-	1	-	-	-	-	1	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		266	Dec:		50%
													'96		80			25%

TREND STUDY 17-20-96 (old 20-22)

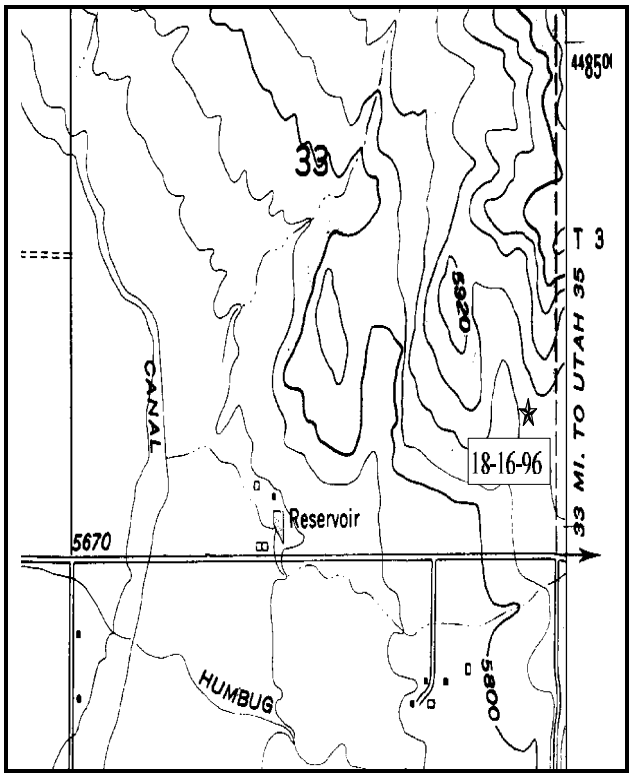
Study site name: Lake Creek Road. Range type: Big sagebrush.

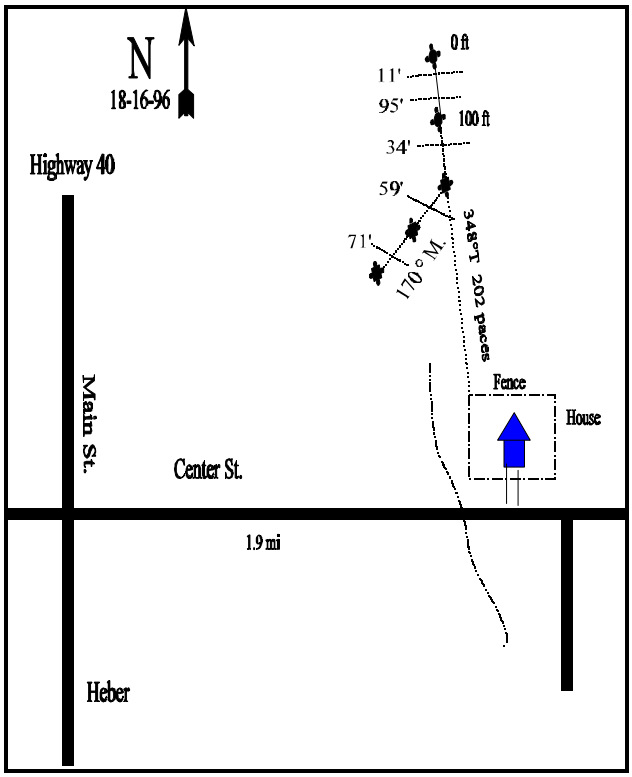
Compass bearing: frequency baseline 146 degrees.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11 & 95ft), (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Main and Center Street in Heber, proceed east 1.9 miles to a point where the road crosses an irrigation canal. Just east of the canal on the north side of the road is a house enclosed by a chain link fence. From the northwest corner of the fence walk 203 paces (approximately 1,005 feet) at 348 degrees true to the 100-foot end of the baseline. The 0-foot end is marked by browse tag # 7023.





Map Name: Heber Diagrammatic Sketch

Township 3S, Range 5E, Section 33, UTM COOR: 4-68-012E 44-84-643N

DISCUSSION

Trend Study No. 17-20 (20-22)

The Lake Creek Road study samples one of several isolated knolls and ridge tops occupied by Utah juniper that lie east of Heber city and north of the Lake Creek Road. These areas are considered extremely critical to wintering deer and light use by elk. The area exhibits high levels of deer and livestock use. The study lies on a narrow ridge top oriented in a north-south direction. Exposure is south to southeast with the slope varying from nearly level to about 15%. Elevation varies between 5,860 feet and 6,000 feet. Deer use appeared high in 1996 with numerous deer carcasses found in the area. There was light use of the area for elk.

Vegetatively, the area varies from rather open juniper with a vigorous but low-growing Gambel oak understory to a nearly closed stand of mature junipers with relatively little understory. Other browse such as mountain big sagebrush, true mountain mahogany, curlleaf mountain mahogany, and antelope bitterbrush occur occasionally throughout the area which are always heavily utilized. More than 40 years of nearly year-long cattle grazing have greatly depleted the herbaceous understory.

Soil is classified as the "Brad-Rock Outcrop Complex." Where soil exists within this mapping unit, it is a very shallow and very cobbly. Textural analysis indicates a sandy loam with a neutral pH. Effective rooting depth (see methods) is nearly 10 inches with an average soil temperature of 56°F. Depth to bedrock seldom exceeds 10 inches and is more often in the neighborhood of 4 to 6 inches. The study area has large expanses of exposed reddish-brown sandstone which has been extensively fractured and thus provides numerous cracks which trap sediment and provide a plant growth medium. Brad soils are highly permeable and not surprisingly, have low available water capacity and restricted root zones. The erosion hazard is high, but overland movement of soil is often interrupted by catchments and cracks in the exposed conditions, any improvement in trend will be very slow. Combined rock and pavement cover have decreased along with the percent of bare soil. Litter cover is similar to that estimated in 1990 at 38%. Vegetative cover is estimated at 28% in 1996.

This area is characterized by a sparse juniper stand, underlain by a very low growing Gambel oak understory, composed predominantly of young resprouts. Scattered throughout the area are a variety of other browse plants and grasses. This particular site should not be regarded as a representative sample of the total plant community on the juniper ridges. It has more plant diversity and production than most of the surrounding area.

The key browse species is Gambel oak. It appears to be the only species that responds positively to browsing use by sprouting profusely, and thus increasing production while availability is unaffected. Oak also seems particularly well suited for growth in the many rock crevices and shallow soil pockets in this area. In 1996, the estimated density of Gambel oak was 5,860 plants/acre. All other browse species are of secondary importance on this site and will likely remain so.

Herbaceous vegetation is represented by a mixture of annual and perennial grasses and relatively few forbs. Annual grasses dominate the understory and include cheatgrass, Japanese brome, and rattail fescue. Pale alyssum dominates the forbs with most other species being incidental. Neither grasses or forbs are highly productive. This is a site where Gambel oak will continue to dominate, yet will remain low-growing because of browsing and limitations of the soil. Species such as antelope bitterbrush and mountain mahogany may persist, but will not become successfully productive. Increaser shrubs such as pricklypear cactus and broom

snakeweed may increase slightly, but will eventually be limited by oak and soil conditions.

1984 APPARENT TREND ASSESSMENT

Soil trend is essentially stable. This is a shallow rocky soil with poor potential. It is unlikely to degrade much further than it already has. Similarly, the potential for soil building and erosion control is equally low.

Vegetative trend has deteriorated slightly over the past few years because of declines in abundance and production of mountain big sagebrush and highlining of Utah juniper. Neither condition can get much worse, however, so our current trend assessment is stable. Gambel oak has increased its production to at least partially compensate for the impairment of juniper production and availability. Grasses have increased at least temporarily, but are not a significant competitive factor.

1990 TREND ASSESSMENT

The signs of past heavy use of this site are obvious in the highlined juniper and depleted understory. Use since 1984 has been more moderate in terms of deer, although several fawn carcasses were found. Use by livestock, controlled by the private landowner, appears to be limited to fairly light spring use on this site. Preferred browse species such as true mountain mahogany, curlleaf mountain mahogany, big sagebrush, and bitterbrush are somewhat rare and heavily hedged. The key species is Gambel oak, which provides the bulk of the available forage. The oak are moderate to heavily hedged, but use does not adversely impact the sprouting oakbrush. Overall the site has experienced little change in the browse component. The junipers have been highlined and are unavailable, except for the young trees. Juniper density is 92 trees/acre. Grasses, including bluebunch wheatgrass and Indian ricegrass, increased in frequency. The individual grasses are larger in size this time leading to a higher cover estimate. The very shallow soil on the sandstone ridge has adequate protection from erosion.

TREND ASSESSMENT
soil - stable
browse - stable, but still poor condition
herbaceous understory - stable, but still poor condition

1996 TREND ASSESSMENT

Soil trend is slightly upward with a decrease in percent bare soil. No erosion was apparent on the site in 1996. The browse trend is stable and still in poor condition. Most browse species are rare and heavily hedged. Gambel oak is the key browse species and exhibits moderate hedging. Percent decadency has declined since 1990 and vigor is improved. The herbaceous understory is spares and dominated by annual species. Sum of nested frequency for perennial species has stayed nearly the same since 1990. Herbaceous trend is stable and in poor condition.

TREND ASSESSMENT
soil - slightly upward
browse - stable
herbaceous understory - stable, but still poor condition

HERBACEOUS TRENDS --
Herd unit 17 , Study no: 20

Type	Species	Nested Frequency '84	Nested Frequency '96	Quadrat Frequency '84	Quadrat Frequency '96	Average Cover % '96
G	Agropyron spicatum	20	18	9	8	.31
G	Bromus japonicus (a)	-	35	-	11	.37
G	Bromus tectorum (a)	-	250	-	83	2.89
G	Carex spp.	1	8	1	3	.30
G	Festuca myuros (a)	-	79	-	31	.69
G	Oryzopsis hymenoides	4	-	2	-	-
G	Poa bulbosa	-	3	-	1	.03
G	Poa fendleriana	3	8	2	4	.02
G	Poa pratensis	8	*59	5	19	.97
G	Poa secunda	20	*64	10	26	.98
G	Sporobolus cryptandrus	5	*41	3	18	1.09
G	Stipa comata	4	-	2	-	-
Total for Grasses		65	565	34	204	7.68
F	Alyssum alyssoides (a)	-	138	-	54	.37
F	Arabis spp.	-	1	-	1	.03
F	Artemisia ludoviciana	-	1	-	1	.00
F	Chenopodium fremontii	-	1	-	1	.03
F	Collinsia parviflora (a)	-	2	-	1	.00
F	Erigeron pumilus	-	*10	-	4	.12
F	Galium aparine (a)	-	4	-	2	.03
F	Hackelia patens	-	1	-	1	.03
F	Heterotheca villosa	13	16	7	6	.40
F	Microsteris gracilis (a)	-	4	-	1	.00
F	Oxybaphus linearis	1	-	1	-	-
F	Polygonum douglasii (a)	-	5	-	2	.01
F	Solidago missouriensis	-	1	-	1	.03
F	Tragopogon dubius	-	4	-	2	.01
F	Viguiera multiflora	-	2	-	1	.03
Total for Forbs		14	190	8	78	1.11

* Indicates significant difference at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 17 , Study no: 20

Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	1	-

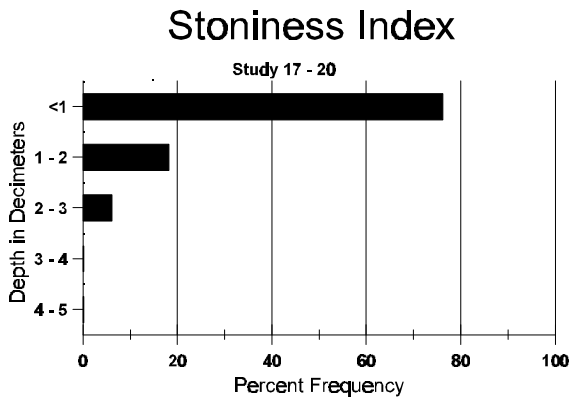
Type	Species	Strip Frequency '96	Average Cover % '96
B	Artemisia tridentata vaseyana	3	.18
B	Cercocarpus ledifolius	1	-
B	Gutierrezia sarothrae	28	.71
B	Juniperus osteosperma	4	.41
B	Mahonia repens	2	-
B	Opuntia spp.	28	.58
B	Quercus gambelii	61	14.14
Total for Browse		128	16.03

BASIC COVER --
Herd unit 17 , Study no: 20

Cover Type	Nested Frequency '96	Average Cover % '84	'96
Vegetation	324	1.00	28.23
Rock	291	25.25	31.14
Pavement	22	.25	.07
Litter	366	54.75	37.81
Cryptogams	150	12.75	6.61
Bare Ground	118	6.00	2.54

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 20

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.4	55.8 (12.0)	6.6	58.2	21.4	20.4	2.1	26.0	156.8	.3



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 20

Type	Quadrat Frequency '96
Rabbit	13
Elk	10
Deer	46
Cattle	2

BROWSE CHARACTERISTICS --
Herd unit 17 , Study no: 20

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'96		20			-
Artemisia tridentata vaseyana																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	1	-	-	-	-	-	-	-	2	-	-	-	40	11	18	2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'96		60			-
Cercocarpus ledifolius																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	1	1	-	-	-	20	26	45	1
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec:		-
													'96		20			-
Gutierrezia sarothrae																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	16	1	-	-	-	-	-	-	-	17	-	-	-	1133	10	12	17
	96	74	-	-	-	-	-	-	-	-	74	-	-	-	1480	9	14	74
Total Plants/Acre (excluding Dead & Seedlings)													'84		1133	Dec:		-
													'96		1500			-
Juniperus osteosperma																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	59	33	1
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	-	-	3
Total Plants/Acre (excluding Dead & Seedlings)													'84		132	Dec:		-
													'96		80			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Mahonia repens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	70	-	-	-	-	-	-	-	-	53	-	17	-	4666	3	5	70
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	2	3	4
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'84		4799	Dec:		3%
													'96		120			0%
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	84	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	96	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	84	39	-	-	-	-	-	-	-	-	35	-	4	-	2600	8	20	39
	96	33	-	-	-	-	-	-	-	-	33	-	-	-	660	5	12	33
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
Total Plants/Acre (excluding Dead & Seedlings)													'84		3199	Dec:		2%
													'96		800			0%
Quercus gambelii																		
S	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
Y	84	95	50	5	-	-	-	-	-	-	147	-	3	-	10000			150
	96	50	34	-	-	-	-	-	-	-	84	-	-	-	1680			84
M	84	6	22	43	-	-	-	-	-	-	56	9	6	-	4733	23	17	71
	96	27	153	18	-	-	-	-	-	-	198	-	-	-	3960	29	34	198
D	84	-	4	21	-	-	-	-	-	-	15	3	7	-	1666			25
	96	1	4	5	-	1	-	-	-	-	11	-	-	-	220			11
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17
Total Plants/Acre (excluding Dead & Seedlings)													'84		16399	Dec:		10%
													'96		5860			4%

SUMMARY

MANAGEMENT UNIT - 17 - WASATCH MOUNTAINS

A total of 13 trend studies were read within this management unit in 1996. Most of these sites are from the old Heber deer herd unit and some are from the old Kamas deer herd unit. The studies in the Heber deer unit were established in 1983 and reread in 1989. Studies located in the Kamas deer herd unit were established in 1984 and reread in 1990.

Unit Wide Trends

One common trend on many of the sites in this management unit is the abundance of weedy species in the herbaceous understory. Past overgrazing and fires have removed or reduced many of palatable browse species, leaving winter annuals to dominate. Care should be taken on these lands. Fine fuels produced by annual species like cheatgrass and Japanese brome are overly abundant and a fire would further degrade the rangelands. Attempts should be made to reduce the fire cycle and replace the annual species with perennial species.

Forb compositions are poor on most sites due to the abundance of weedy species. These include thistle, and one site contains tarweed.

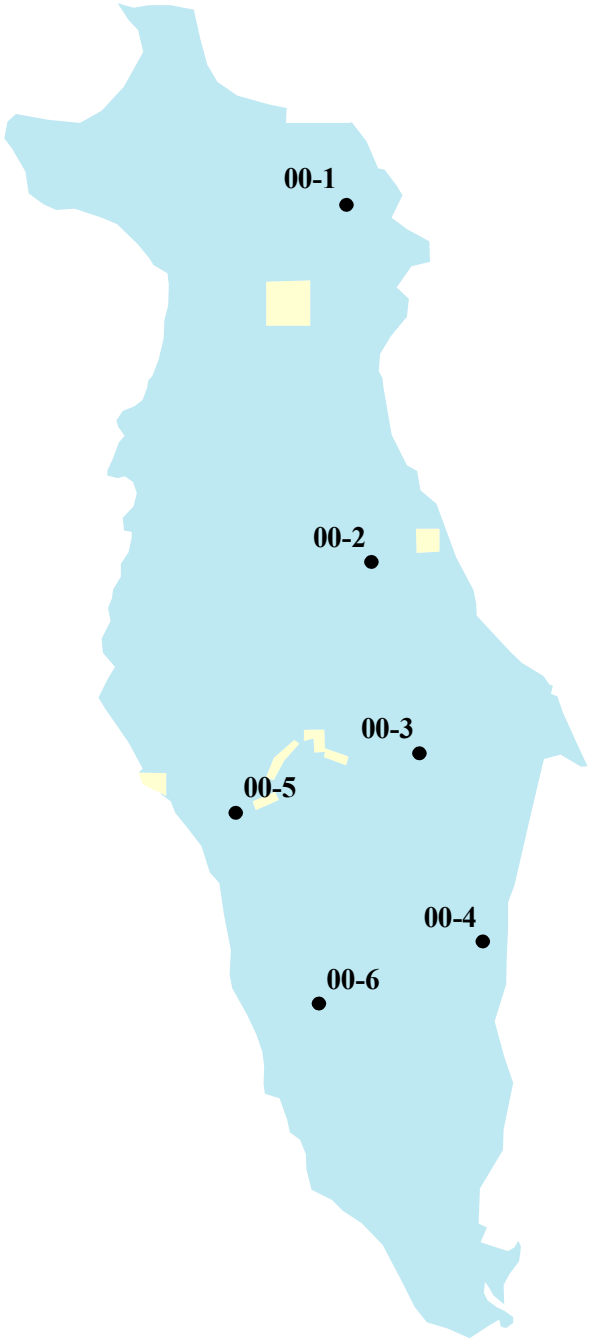
A summary table with 1996 trends follows.

TREND SUMMARY UNIT - 17 - WASATCH MOUNTAINS

Site	1996		
	Soil	Browse	Grasses & forbs
17-5 Deer Creek Dam	stable	up	stable
17-6 Daniels Canyon	stable	stable	slightly downward
17-9 Lower Big Hollow	stable	slightly upward	stable
17-10 Upper Big Hollow	stable	stable	stable
17-11 Wallsburg Turn	slightly upward	stable	stable
17-12 North Wallsburg Reseed	stable	stable	stable
17-13 North Wallsburg	stable	slightly upward	stable
17-14 Hoover’s Hollow	slightly upward	stable	stable
17-15 Island Boat Camp	stable	stable	up
17-16 Rainbow Bay	stable	slightly downward	slightly upward
17-17 Dutch Canyon	slightly upward	stable	stable

17-19 Northeast of Heber				stable	stable	slightly upward
Site	1990			1996		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
17-20 Lake Creek Road	stable	stable	stable	slightly upward	stable	stable

Management Unit 0
Antelope Island



Transect location
BLM
State of Utah

N

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

Unit Location

MANAGEMENT UNIT - 00 - ANTELOPE ISLAND

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

HISTORY

In 1845 John C. Fremont and Kit Carson made the first European exploration of Antelope Island. They shot two antelope and Fremont wrote "in grateful supply of the meat they furnished, I gave their name to the island." By the 1930's the island's namesake had disappeared from Antelope Island. In 1993 a cooperative effort between the Utah divisions of Wildlife Resources and the State Parks and Recreation resulted in the reintroduction of 24 pronghorn antelope. By the 1995 fawning season, the population had nearly doubled in size. It is hoped that predation from coyotes, bobcats, and eagles will act as population control for the pronghorn on the island.

Fielding Garr was quick to recognize Antelope Island's potential as livestock range. He began construction of a ranch house in 1848. He not only tended his own herds, but those of other stockmen as well. In 1849 Brigham Young asked Garr to manage the LDS Church's Tithing Herd, which was kept on the island until 1871. During this time the LDS Church also invested thousands of dollars in valuable stallions and brood mares which were turned loose on the island.

Antelope Island was used as a base camp for a government funded survey of the Great Salt Lake by Captain Howard Stansbury during the years of 1849-50.

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

The Great Salt Lake is the largest natural lake west of the Mississippi River. At the current level the Great Salt Lake is 75 miles long and about 35 miles wide. Located in several wide flat basins, a slight rise in water lever expands the surface area of the lake considerably. The first scientific measurements were taken in 1849 and since then the lake level has varied by 20 feet, shifting the shoreline in some places as much as 15 miles.

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

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

WILDLIFE

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

Other mammals found on the island include, mule deer, pronghorn antelope, coyotes, bobcats, badgers, porcupines, jackrabbits and several species of rodents. Antelope Island and the Great Salt Lake attract numerous migrating and nesting birds.

TREND STUDIES

Trend studies were conducted on Antelope Island beginning in 1994. Two studies were established that year with four additional studies established in 1995. In 1996 all studies were reread and the results are reported here.

TREND STUDY 00-1-96

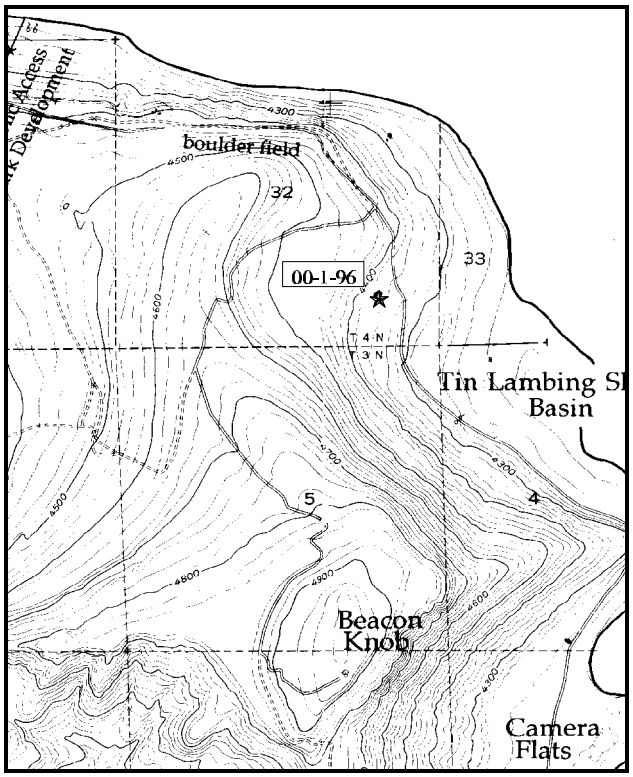
Study site name: Tin Lambing Shed . Range type: Grass .

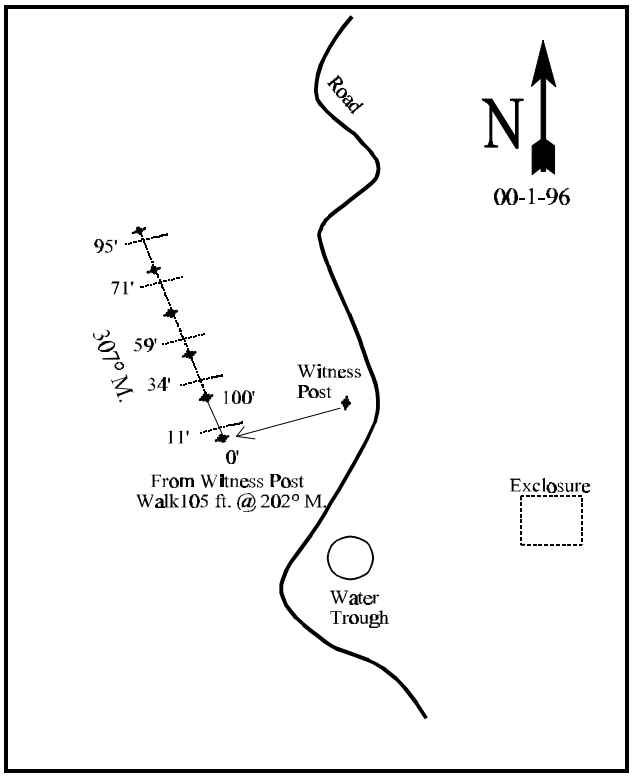
Compass bearing: frequency baseline 307 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

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





Map Name: Antelope Island North Diagrammatic Sketch

Township 4N , Range 3W , Section 32 , UTM COOR: 3-98-792E 45-42-596N

DISCUSSION

Trend Study No. 00-1

The Tin Lambing Shed study is located in the Tin Lambing Shed Basin on the northeast side of Antelope Island. The site is about 1/4 mile above the shoreline and about 200 feet above the main road. Slope is very slight at an elevation of about 4,360 feet.

Soils are derived from alluvial deposits from Lake Bonneville. Textural analysis indicates a sandy loam with a slightly acidic pH. Effective rooting depth (see methods) is nearly 18 inches with a soil temperature of 61°F. Potassium may be a limiting factor in the soil. Vegetative cover has changed very little since 1994. Litter cover has increased while percent bare soil has decreased. Litter cover is contributed primarily by cheatgrass.

Broom snakeweed and Wyoming big sagebrush were the only shrubs encountered on the site. Broom snakeweed had an estimated density of 280 plants/acre in 1996, slightly under the 380 pants/acre estimated in 1994. Most plants were classified as mature. Plants measure 9 inches in height and width with no utilization apparent. In 1996 one small Wyoming big sagebrush plant was measured on the site with a height of 7 inches and width of 9 inches.

Herbaceous understory is contributed mostly by one grass, cheatgrass. In 1996 cheatgrass was sampled in 100% of the quadrats and has increased in sum of nested frequency since 1994. Other annual grass species include rattail fescue and six weeks fescue. Muttongrass and Sandberg bluegrass both declined significantly in their respective sum of nested frequency values. Sum of nested frequency for all other grasses has also declined since 1994, although cover values have increased (individuals have become larger). Other grasses include inland saltgrass, purple threeawn, bulbous bluegrass, sand dropseed, and needle-and-thread grass.

The forbs are dominated by weedy species. Storksbill, yellow salsify, and prickly lettuce sum of nested frequency values significantly increased since 1994. These three species are highly preferred by many wildlife species. Sum of nested frequency for forbs has increased from 284 to 684.

1996 TREND ASSESSMENT

Soil trend is slightly upward with abundant vegetative and litter cover to prohibit erosion. Percent bare soil has declined since 1994, likely due to the increase in litter cover. Browse trend is stable with very few broom snakeweed plants encountered. The annual, weedy species will provide competition for browse species establishment and prohibit the population from expanding. The herbaceous understory is dominated by annual and weedy species. Cheatgrass dominates the site, although there are some perennial species still in the community. Even if fire is suppressed on the site, it will be extremely difficult to change the composition of the community. Herbaceous trend is stable at this time but with very poor composition.

TREND ASSESSMENT
soil - slightly upward
browse - stable but very few preferred species occur in the community
herbaceous understory - stable but with very poor composition of mostly annuals or weeds

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

Type	Species	Nested Frequency '94	'96	Quadrat Frequency '94	'96	Average Cover % '94	'96
G	Aristida purpurea	110	*75	41	30	4.31	2.28
G	Bromus tectorum (a)	448	*479	98	100	29.99	44.62
G	Distichlis spicata	92	*138	27	48	3.07	1.15
G	Festuca myuros (a)	-	*228	-	62	-	4.78
G	Poa bulbosa	56	*6	18	3	.78	.04
G	Poa fendleriana	37	*4	15	2	.44	.01
G	Poa secunda	221	*51	57	22	4.47	.33
G	Sporobolus cryptandrus	56	59	28	25	.97	.91
G	Stipa comata	58	45	23	16	1.93	1.39
G	Vulpia octoflora (a)	136	*17	37	6	1.06	.05
Total for Grasses		1214	1102	344	314	47.05	55.59
F	Agoseris heterophylla	5	1	2	1	.03	.00
F	Calochortus nuttallii	-	1	-	1	-	.00
F	Epilobium brachycarpum (a)	2	-	1	-	.00	-
F	Erodium cicutarium (a)	137	*284	35	81	1.25	4.18
F	Helianthus annuus (a)	26	*-	10	-	.60	-
F	Holosteum umbellatum (a)	14	*-	8	-	.04	-
F	Lactuca serriola	11	*145	4	45	.04	2.07
F	Machaeranthera spp	-	*89	-	29	-	3.75
F	Medicago sativa	-	-	-	-	-	.00
F	Plantago patagonica (a)	86	*52	25	18	.46	.16
F	Sisymbrium altissimum (a)	3	6	2	2	.01	.01
F	Tragopogon dubius	-	*93	-	38	-	1.67
F	Verbascum blattaria	-	*13	-	5	-	.94
Total for Forbs		284	684	87	220	2.46	12.82

* Indicates significant difference at % = 0.10

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

Type	Species	Strip Frequency '94	'96	Average Cover % '94	'96
B	Gutierrezia sarothrae	3	3	.01	.18
Total for Browse		3	3	0.00	0.17

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

Cover Type	Nested Frequency '94	'96	Average Cover % '94	'96
Vegetation	497	496	67.72	63.46
Rock	58	13	.16	.04
Pavement	92	114	.58	.74
Litter	495	500	54.37	73.58
Cryptogams	69	103	2.53	2.34
Bare Ground	125	154	5.24	1.79

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.6	61.0 (18.6)	6.2	76.92	9.08	14.0	1.2	8.1	124.8	.3

PELLET GROUP FREQUENCY --
Herd unit 00, Study no: 1

Type	Quadrat Frequency '94	'96
Rabbit	2	8
Elk	-	1
Deer	1	3
Buffalo	1	6

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
M	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	9	0
Total Plants/Acre (excluding Dead & Seedlings)														'94	0	Dec:		-
														'96	0			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	94	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	94	11	-	-	-	-	-	-	-	-	11	-	-	-	220	7	8	11
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260	9	9	13
D	94	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'94		380	Dec:		11%
													'96		280			0%

TREND STUDY 00-2-96

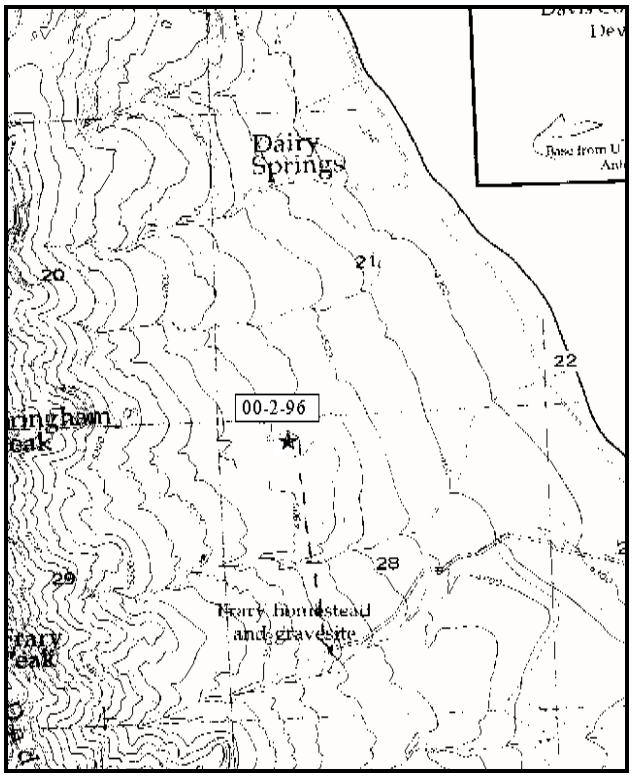
Study site name: Frary Homestead . Range type: Grass .

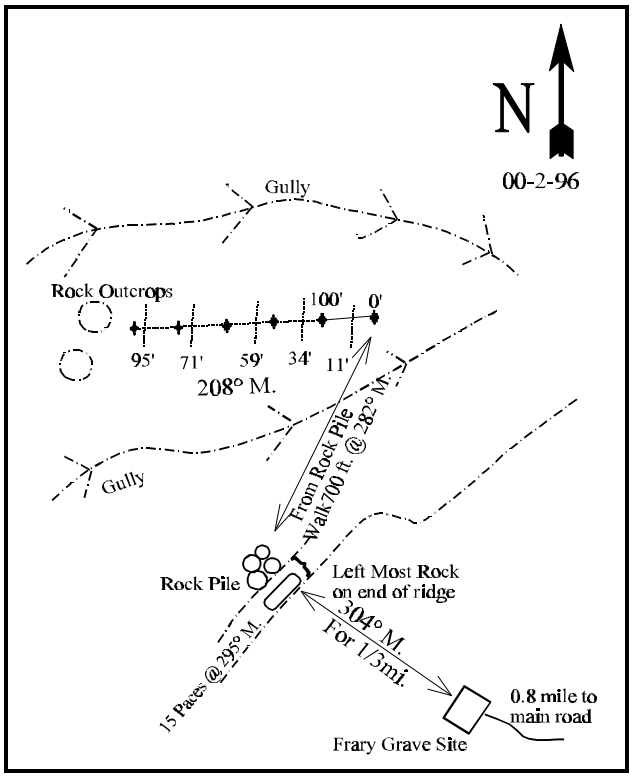
Compass bearing: frequency baseline 208 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the main road, turn west and travel 0.8 miles to the Frary homestead and grave site. From the Frary grave site, walk 1/3 mile at a bearing of 304 degrees magnetic to the left most rock on the end of the ridge. From the left most rock walk 15 paces at a bearing of 295 degrees magnetic to a rock pile. From the rock pile walk 700 feet at a bearing of 282 degrees magnetic to the 0-foot baseline stake. The baseline runs 208 degrees magnetic towards some rock outcrops.





Map Name: Antelope Island Diagrammatic Sketch

Township 3N , Range 3W , Section 28 , UTM COOR: 3-99-242E 45-36-210N

DISCUSSION

Trend Study No. 00-2

The Frary Homestead site is located on the east side of Antelope Island, north of the Frary Homestead grave site. The site is on an alluvial fan with drainages on either side (north and south). Slope is approximately 10% with an east aspect. Elevation is about 4,800 feet and water is flowing in a small creek about ½ mile to the south. Buffalo use appears common, due to the numerous bedding sites and buffalo pats. Utilization of some of the grasses and forbs is apparent.

Soil textural analysis indicates a sandy loam with a slightly acidic pH. Soils are deep and well drained with very little gravel in the profile. Moisture was apparent in the profile while digging. Vegetation cover has declined slightly since 1995 while litter and bare ground cover have stayed relatively stable.

Broom snakeweed and Wyoming big sagebrush were encountered on the site in low densities. The estimated density for broom snakeweed is 260 plants/acre which is very similar to that sampled in 1995. All plants were classified as mature in 1996. Wyoming big Sagebrush density is estimated at 20 plants/acre. No utilization is detectable on either species. Total cover for all browse amounts to less than 1%.

Grass dominates the sight producing 89% of the total vegetative cover. The composition is dominated by cheatgrass. Cheatgrass was sampled in 100% of the quadrats with an almost identical sum of nested frequency as reported in 1995. Other annual grass species include Japanese brome and rattail fescue, both of which significantly increased in nested frequency since 1995. Some perennial species are present but in low abundance.

Forb composition is also dominated by weedy annual species. Storksbill is the dominate forb followed by yellow salsify and annual agoseris. Sum of nested frequency for forbs has greatly decreased since 1995, mostly due to a decrease in bur buttercup and Carolina draba.

1996 TREND ASSESSMENT

Soil trend is stable. Although vegetative cover has declined slightly since 1995, there is still adequate cover to prohibit erosion. Percent bare ground has slightly declined, while litter cover is nearly the same. The browse trend is stable with very few broom snakeweed plants encountered. The annual, weedy species will provide competition for browse species establishment and prohibit the population from expanding. The herbaceous understory is dominated by annual and weedy species. Cheatgrass dominates the site, although there are some perennial species still in the community. Even if fire is suppressed on the site, it will be extremely difficult to change the composition of the community. Herbaceous trend is stable at this time but it has a very poor composition, too many annuals and weedy species.

TREND ASSESSMENT
soil - slightly upward
browse - stable
herbaceous understory - stable but with very poor composition

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

Type	Species	Nested Frequency '95	'96	Quadrat Frequency '95	'96	Average Cover % '95	'96
G	Aristida purpurea	185	*220	71	81	5.05	9.79
G	Bromus japonicus (a)	17	*47	7	16	.03	.46
G	Bromus tectorum (a)	482	480	98	100	43.42	34.31
G	Festuca myuros (a)	29	*126	9	45	.26	1.58
G	Poa bulbosa	6	8	3	4	.01	.02
G	Poa cusickii	-	*81	-	37	-	.41
G	Poa fendleriana	37	*3	17	1	.28	.00
G	Poa secunda	181	*54	64	27	1.16	.13
G	Sporobolus cryptandrus	24	*81	11	37	.08	.87
Total for Grasses		961	1100	280	348	50.31	47.61
F	Agoseris heterophylla	137	*74	53	31	.63	.18
F	Aster spp.	-	10	-	3	-	.01
F	Cirsium undulatum	-	-	-	-	.00	.15
F	Delphinium bicolor	1	-	1	-	.00	-
F	Descurainia pinnata	138	*-	44	-	.29	-
F	Descurainia spp. (a)	52	*-	16	-	.13	-
F	Draba reptans (a)	261	*-	71	-	1.25	-
F	Erodium cicutarium (a)	257	246	67	81	5.39	2.84
F	Erigeron divergens	2	*51	1	20	.00	.90
F	Holosteum umbellatum (a)	21	*-	7	-	.20	-
F	Lactuca serriola	106	*70	47	29	.41	.32
F	Machaeranthera spp	9	-	3	-	.01	-
F	Polygonum douglasii (a)	-	3	-	1	-	.00
F	Ranunculus testiculatus (a)	184	*2	53	1	1.48	.00
F	Sisymbrium altissimum (a)	12	2	5	1	.02	.00
F	Taraxacum officinale	6	9	3	4	.05	.07
F	Tragopogon dubius	12	*96	5	46	.02	.51
F	Verbascum blattaria	-	*61	-	27	.01	.93
Total for Forbs		1198	624	376	244	9.94	5.95

* Indicates significant difference at % = 0.10

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

Type	Species	Strip Frequency '95	'96	Average Cover % '95	'96
B	Artemisia tridentata wyomingensis	0	1	-	.03

Type	Species	Strip Frequency '95	'96	Average Cover % '95	'96
B	Gutierrezia sarothrae	6	7	.01	.19
Total for Browse		6	8	0.00	0.22

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

Cover Type	Nested Frequency '95	'96	Average Cover % '95	'96
Vegetation	497	495	70.77	62.96
Rock	71	6	.36	.03
Pavement	-	115	0	1.22
Litter	499	500	76.29	76.46
Cryptogams	11	19	.02	1.03
Bare Ground	41	63	1.21	.78

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
26.9	58.4 (19.7)	6.1	69.7	15.0	15.3	1.7	21.2	179.2	.3

PELLET GROUP FREQUENCY --
Herd unit 00, Study no: 2

Type	Quadrat Frequency '95	'96
Buffalo	5	15

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
M	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	10	12	1
Total Plants/Acre (excluding Dead & Seedlings)														'95	0	Dec:		-
														'96	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	95	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	95	3	-	-	-	-	-	-	-	-	3	-	-	-	60	9	11	3
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260	11	11	13
Total Plants/Acre (excluding Dead & Seedlings)													'95		220	Dec:		-
													'96		260			-

TREND STUDY 00-3-96

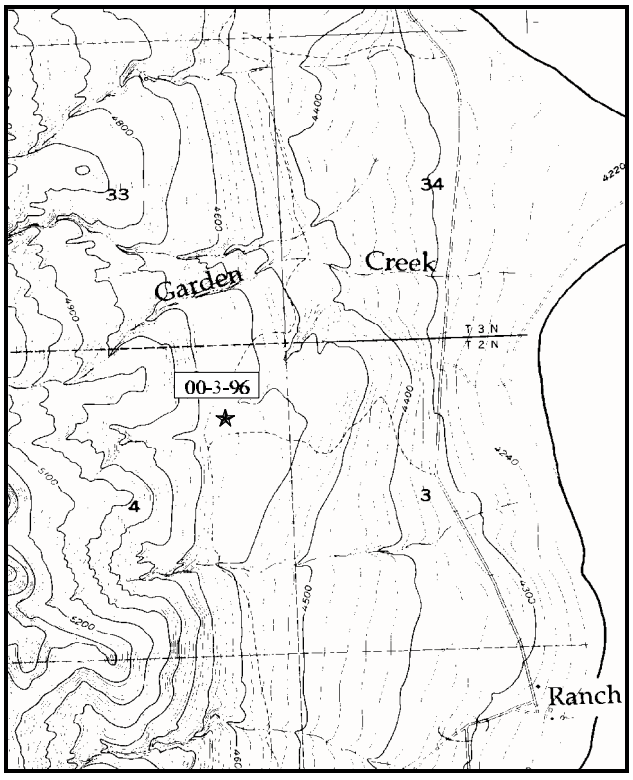
Study site name: Garden Springs Flat South . Range type: Grass .

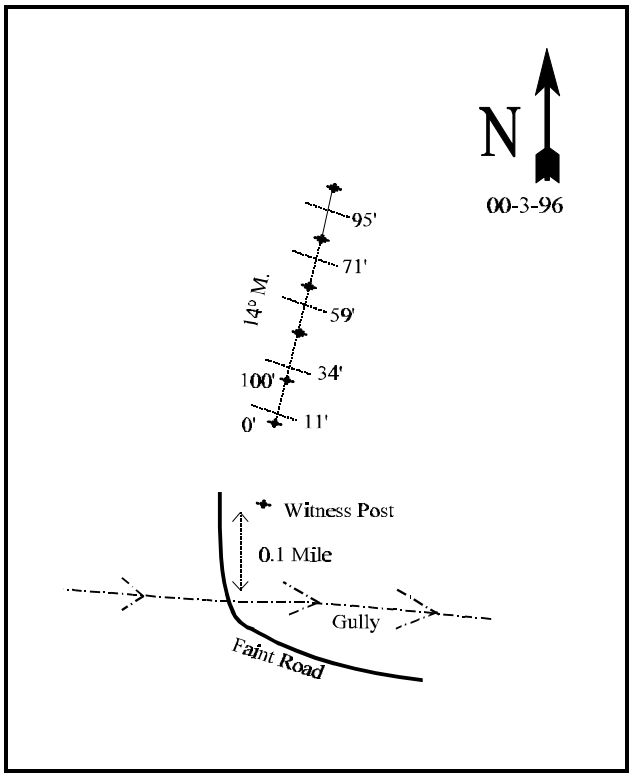
Compass bearing: frequency baseline 14 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the main gate on Antelope Island, travel south for 9.1 miles to a faint road on the right, walk up the road for 1.0 mile to were a road crosses the gully. Travel 0.1 mile from the gully to the witness post on the east side of the road. The baseline runs 14 degrees magnetic.





Map Name: Antelope Island Diagrammatic Sketch

Township 2N , Range 3W , Section 4 , UTM COOR: 4-00-107E 45-32-743N

DISCUSSION

Trend Study No. 00-3

The Garden Spring Flat South site is located about 1/4 mile south of Garden Creek on the east side of Antelope Island. The shoreline is about 1 mile from the site to the east. Slope is 3-5% with a northeast aspect. There is a buffalo trail near the site and quite a bit of buffalo sign on the area.

Soil textural analysis indicates a sandy clay loam soil with a neutral pH. The soil is moderately deep and dark with an effective rooting depth (see methods) of 23 inches. Very little rock was encountered in the soil profile. Average soil temperature is 57°F at 20 inches. Erosion is not a problem with vegetation and litter covering nearly all of the soil surface.

Only one browse specie was encountered in 1996, broom snakeweed. Estimated density for broom snakeweed was 80 plants/acre, all were classified as mature. One rabbitbrush was encountered in 1995, but was not located in 1996.

Grass is dominated by two annual species, cheatgrass and rattail fescue. Both species combined provide over half of the herbaceous understory cover. Other weedy species include purple threeawn and bulbous bluegrass. Some perennial species remain and include sand dropseed and Sandberg bluegrass.

Forbs are also dominated by weedy species. While some species, storksbill and Carolina draba, have declining nested frequency values, other weedy species, such as prickly lettuce, yellow salsify, and moth mullein, are increasing in nested frequency. Some utilization of yellow salsify was apparent in 1996. Few desirable perennial species are present at this time.

1996 TREND ASSESSMENT

Soil trend is stable with no erosion apparent. Vegetative cover has declined slightly since 1995, while all other cover values have remained relatively the same. The browse trend is stable with few plants encountered and little change in density. The annual, weedy species will provide competition for browse species establishment and prohibit the population from expanding. The herbaceous understory is dominated by annual and weedy species. Cheatgrass and rattail fescue dominate the grasses on the site, although there are some perennial species still in the community. Forb composition is shifting but still remains poor. Even if fire is suppressed on the site, it will be extremely difficult to change the composition of the community. Herbaceous trend is stable at this time but with very poor composition.

TREND ASSESSMENT
soil - stable
browse - stable
herbaceous understory - stable but with very poor composition of annuals and weeds

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

Type	Species	Nested Frequency '95	'96	Quadrat Frequency '95	'96	Average Cover % '95	'96
G	Aristida purpurea	203	*266	73	90	6.98	9.07
G	Bromus tectorum (a)	436	*463	96	99	18.07	20.18

Type	Species	Nested Frequency '95	'96	Quadrat Frequency '95	'96	Average Cover % '95	'96
G	Festuca myuros (a)	270	*379	67	88	14.43	18.01
G	Poa bulbosa	157	*120	49	36	2.10	3.58
G	Poa cusickii	34	13	13	7	.06	.18
G	Poa secunda	31	30	11	14	.08	.10
G	Sporobolus cryptandrus	49	*139	19	54	.11	.69
G	Vulpia octoflora (a)	8	-	2	-	.01	-
Total for Grasses		1188	1410	330	388	41.88	51.82
F	Agoseris heterophylla	123	126	46	45	.43	.35
F	Astragalus cibarius	-	3	-	1	-	.01
F	Aster spp.	8	*17	2	5	.03	.07
F	Calochortus nuttallii	34	*4	17	1	.08	.00
F	Cirsium undulatum	1	4	1	3	.01	.33
F	Descurainia pinnata	24	*-	9	-	.04	-
F	Draba reptans (a)	115	*3	37	1	.26	.00
F	Erodium cicutarium (a)	459	*311	99	92	26.47	3.29
F	Erigeron divergens	-	*25	-	13	-	.11
F	Grindelia squarrosa	-	*18	-	9	-	.15
F	Heterotheca villosa	-	*8	-	5	-	.05
F	Holosteum umbellatum (a)	31	*-	10	-	.07	-
F	Lappula occidentalis (a)	13	*-	5	-	.02	-
F	Lactuca serriola	54	*116	24	44	.17	1.37
F	Machaeranthera spp	15	18	7	11	.03	.08
F	Tragopogon dubius	60	*263	21	83	.11	3.10
F	Verbascum blattaria	5	*134	4	49	.02	2.40
F	Zigadenus paniculatus	50	46	23	25	.62	.62
Total for Forbs		992	1096	305	387	28.41	11.97

* Indicates significant difference at % = 0.10

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

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

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

Cover Type	Nested Frequency '95	'96	Average Cover % '95	'96
Vegetation	498	497	69.59	64.01
Rock	34	11	.09	.02
Pavement	-	89	0	.50
Litter	499	500	69.98	69.05
Cryptogams	1	45	.00	.18
Bare Ground	68	126	.98	1.14

SOIL ANALYSIS DATA --
Herd Unit 00, Study no: 03

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
23.0	57.2 (19.7)	6.6	54.7	24.0	21.3	1.8	13.4	185.6	.4

PELLET GROUP FREQUENCY --
Herd unit 00, Study no: 3

Type	Quadrat Frequency '95	'96
Deer	-	5
Buffalo	5	12

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus																		
M	95	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Total Plants/Acre (excluding Dead & Seedlings)													'95		20	Dec:		-
													'96		0			-
Gutierrezia sarothrae																		
S	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	95	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	9	2
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	11	14	4
Total Plants/Acre (excluding Dead & Seedlings)													'95		40	Dec:		-
													'96		80			-

TREND STUDY 00-4-96

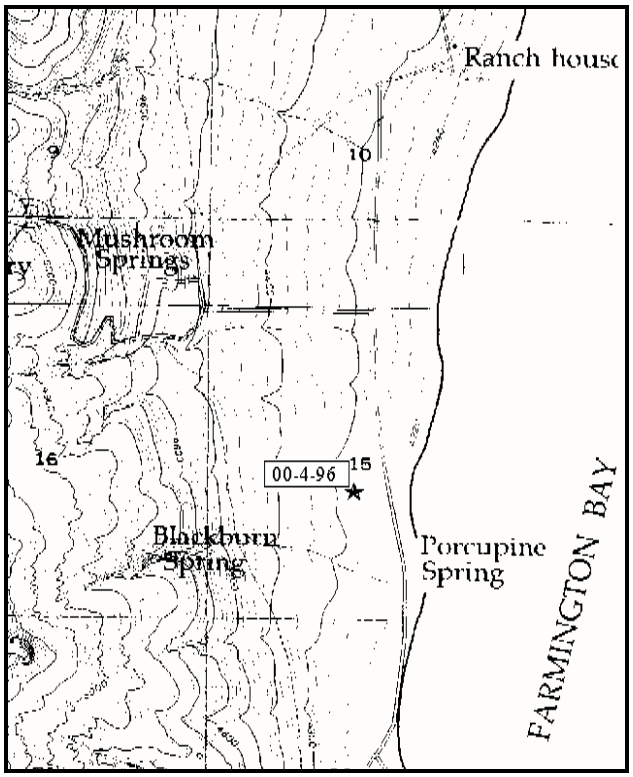
Study site name: Alfalfa Seeding . Range type: Alfalfa seeding .

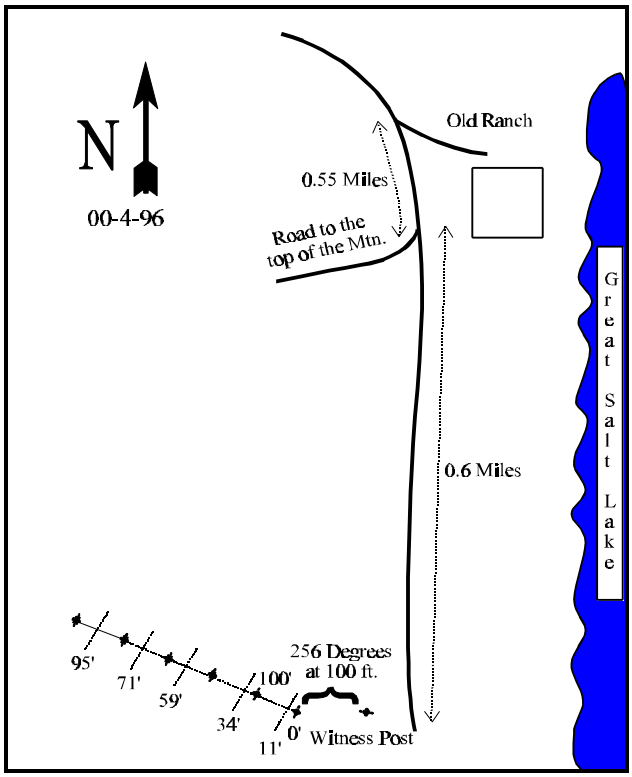
Compass bearing: frequency baseline 295 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From the ranch house, travel south for 1.15 miles to a witness post on the right hand (west) side of the road. From the witness post walk 100 feet at 256 degrees magnetic to the 0-foot baseline stake. The baseline runs 295 degrees magnetic.





Map Name: Antelope Island Diagrammatic Sketch

Township 2N , Range 3W , Section 15 , UTM COOR: 4-01-217E 45-29-465N

DISCUSSION

Trend Study No. 00-4

The Alfalfa Seeding study is located northeast of Blackburn Spring in an old burn. The site was burned and then seeded with alfalfa, intermediate wheatgrass, crested wheatgrass, and other species. Buffalo pats around the site are numerous with some utilization of the alfalfa evident in 1996.

The soil is shallow with a layer of gravel about 4 inches below the soil surface. Soil textural analysis indicates it to be a sandy loam with a slightly alkaline pH. Soil temperature was 61°F at a depth of 11 inches. The effective rooting depth (see methods) is just under 11 inches. Potassium may be a limiting factor in the soil (7.6ppm). Basic cover values have remained relatively constant since 1994 with only a slight increase in litter cover and a slight decrease in vegetative cover. No erosion was apparent in 1996.

Only one browse species was encountered on the site, white rubber rabbitbrush. White rubber rabbitbrush has an estimated density of 20 plants/acre with an average height of 23 inches and crown of 44 inches in 1996.

Grass composition is again dominated by cheatgrass which makes up 78% of the grass cover, although there is a healthy stand of crested wheatgrass and intermediate wheatgrass present. Other grasses include rattail fescue and bulbous bluegrass, but these are in low abundance.

The dominate forb is alfalfa. These plants were very robust and healthy in 1996 with some showing slight utilization. Storksbill is found in low abundance as well as holosteum and Douglas knotweed.

1996 TREND ASSESSMENT

Soil trend is stable with no erosion reported in 1996. Vegetative cover has declined slightly while litter cover has increased slightly. The browse trend is stable with white rubber rabbitbrush being the only specie encountered. Although cheatgrass is the dominate grass, other seeded grass species will compete to perhaps keep it in check. Alfalfa is large and vigorous providing cover and forage. Herbaceous trend is stable with very little change from 1994.

TREND ASSESSMENT
soil - stable
browse - stable, but very sparse
herbaceous understory - stable

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

Type	Species	Nested Frequency '94	'96	Quadrat Frequency '94	'96	Average Cover % '94	'96
G	Agropyron cristatum	98	*77	35	26	2.75	1.09
G	Agropyron intermedium	116	*156	37	51	6.19	5.06
G	Bromus tectorum (a)	427	455	96	98	29.17	23.51
G	Elymus cinereus	-	-	-	-	-	.00
G	Elymus salina	1	-	1	-	.03	-
G	Festuca myuros (a)	-	21	-	7	-	.43

Type	Species	Nested Frequency '94	Nested Frequency '96	Quadrat Frequency '94	Quadrat Frequency '96	Average Cover % '94	Average Cover % '96
G	Poa bulbosa	-	3	-	1	-	.15
G	Poa fendleriana	1	-	1	-	.00	-
G	Poa secunda	5	-	1	-	.15	.00
Total for Grasses		648	712	171	183	38.31	30.27
F	Erodium cicutarium (a)	33	*102	11	37	.22	.58
F	Holosteum umbellatum (a)	5	2	2	1	.01	.00
F	Medicago sativa	211	209	69	76	21.29	32.47
F	Polygonum douglasii (a)	-	2	-	1	-	.00
F	Salsola iberica (a)	3	-	2	-	.03	-
Total for Forbs		252	315	84	115	21.57	33.06

* Indicates significant difference at % = 0.10

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

Type	Species	Strip Frequency '94	Strip Frequency '96	Average Cover % '94	Average Cover % '96
B	Chrysothamnus nauseosus albicaulis	1	1	.15	.03
Total for Browse		1	1	0.15	0.03

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

Cover Type	Nested Frequency '94	Nested Frequency '96	Average Cover % '94	Average Cover % '96
Vegetation	484	486	69.76	62.37
Rock	75	39	1.02	.61
Pavement	62	38	.39	.14
Litter	491	498	60.32	69.96
Cryptogams	15	8	.23	.04
Bare Ground	76	44	1.83	.78

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
10.7	61.4 (11.3)	7.7	72.7	14.0	13.3	1.1	7.6	259.2	.8

PELLET GROUP FREQUENCY --
Herd unit 00, Study no: 4

Type	Quadrat Frequency '94	'96
Rabbit	1	-
Deer	1	-
Buffalo	3	10
Antelope	-	1

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

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
M	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	120	132	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	23	44	1
D	94	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Total Plants/Acre (excluding Dead & Seedlings)													'94		20	Dec:		100%
													'96		20			0%

TREND STUDY 00-5-96

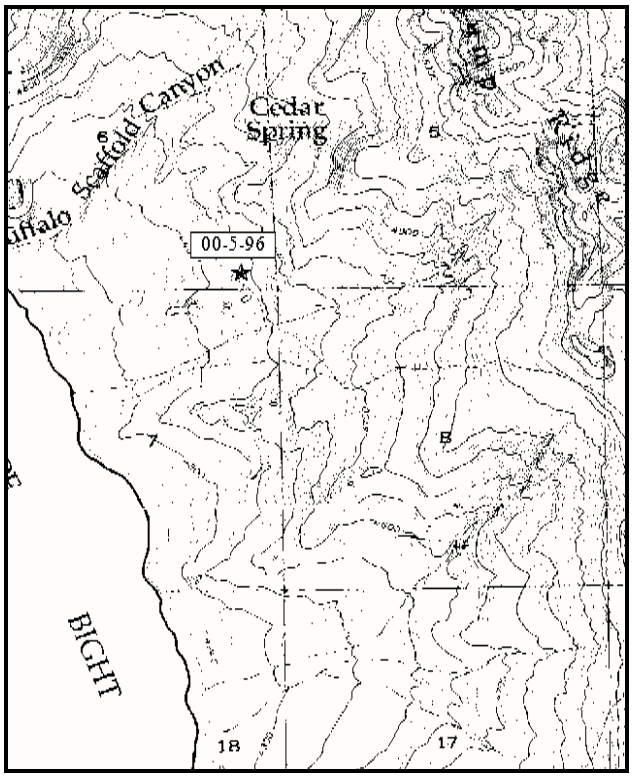
Study site name: Buffalo Scaffold Cyn. . Range type: Annual grass .

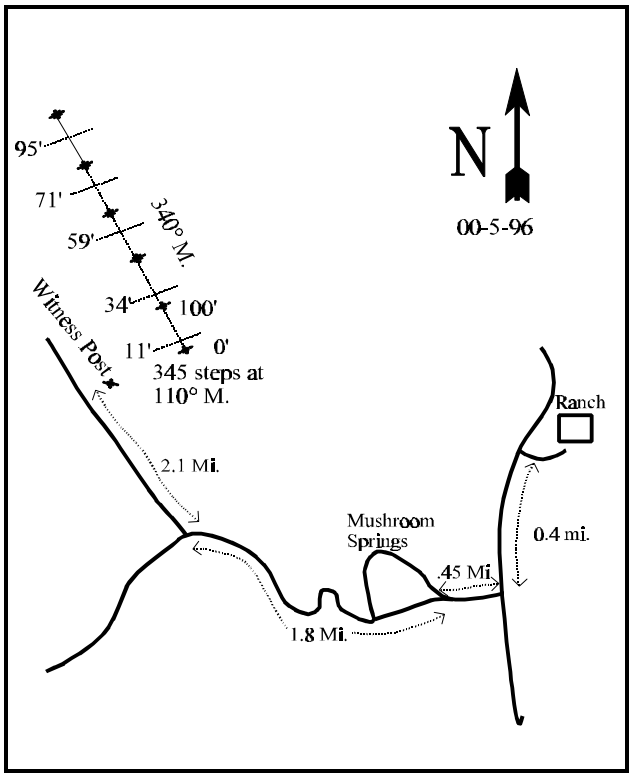
Compass bearing: frequency baseline 110 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

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





Map Name: Antelope Island Diagrammatic Sketch

Township 2N , Range 3W , Section 6 , UTM COOR: 3-96-812E 45-31-782N

DISCUSSION

Trend Study No. 00-5

The Buffalo Scaffold study is located on the west side of Antelope Island about 1/2 mile south of Buffalo Scaffold Canyon. Elevation is approximately 4,480 feet. Slope is 3-5% with a west aspect. The shoreline is about 3/4 of a mile to the west and hills are on the remaining three sides of the site.

Soil textural analysis indicates a sandy loam with a neutral pH. Effective rooting depth (see methods) is estimated to be nearly 13 inches. Average soil temperature at 12 inches is 64°F which is quite high and limiting to the plant community. This kind of temperature usually predestines the site to be dominated by annual species. There is a slight color change in the soil profile about 8 inches below the soil surface. Very little rock was encountered in the soil profile. Although vegetative cover declined from 80% in 1995 to 63% in 1996, there is still adequate vegetation and litter cover to protect the soil. No erosion was apparent.

No browse species were encountered on the site.

Nearly 90% of the grass cover is contributed by cheatgrass and rattail fescue, both annuals. These two species were sampled in 100% of the quadrats and have very high nested frequency values. Other weedy species include purple threeawn, bulbous bluegrass, and six weeks fescue. Sand dropseed is present but in low numbers.

Storksbill is the dominate forb followed by moth mullein. It was noted in 1996 that there were many old stalks from annual sunflower, but no plants were present from this season. Other species encountered include prickly lettuce, yellow salsify, and sego lily.

1996 TREND ASSESSMENT

Soil trend is stable with no erosion apparent in 1996. Vegetative cover has declined but all other cover values have remained constant. Rattail fescue and cheatgrass dominate the site providing much competition for perennial species. Herbaceous trend is stable but with a very poor composition.

TREND ASSESSMENT
soil - stable
browse - no browse
herbaceous understory - stable but with very poor composition

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

Type	Species	Nested Frequency '95	'96	Quadrat Frequency '95	'96	Average Cover % '95	'96
G	Aristida purpurea	74	*147	29	61	3.39	4.82
G	Bromus tectorum (a)	483	484	100	100	41.41	27.39
G	Festuca myuros (a)	458	465	100	100	29.28	32.27
G	Poa bulbosa	35	*6	14	2	.17	.01
G	Poa fendleriana	20	*-	6	-	1.59	-
G	Sporobolus cryptandrus	67	64	28	24	1.31	.96

Type	Species	Nested Frequency '95	Nested Frequency '96	Quadrat Frequency '95	Quadrat Frequency '96	Average Cover % '95	Average Cover % '96
G	Vulpia octoflora (a)	156	*37	36	11	7.74	.98
Total for Grasses		1293	1203	313	298	84.92	66.45
F	Agoseris heterophylla	9	*-	5	-	.02	-
F	Calochortus nuttallii	37	*9	21	3	.10	.01
F	Erodium cicutarium (a)	407	*265	100	86	8.93	2.24
F	Fritillaria spp.	3	-	1	-	.00	-
F	Lactuca serriola	1	5	1	2	.00	.01
F	Tragopogon dubius	-	*11	-	4	-	.02
F	Verbascum blattaria	20	*190	11	78	.40	2.74
Total for Forbs		477	480	139	173	9.48	5.03

* Indicates significant difference at % = 0.10

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

Cover Type	Nested Frequency '95	Nested Frequency '96	Average Cover % '95	Average Cover % '96
Vegetation	499	499	79.72	62.80
Rock	61	3	.45	.00
Pavement	1	56	.00	.69
Litter	499	500	78.74	79.65
Bare Ground	37	29	.18	.10

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.7	64.4 (12.4)	6.8	56.7	24.0	19.3	.9	10.8	208.0	.7

PELLET GROUP FREQUENCY --
Herd unit 00, Study no: 5

Type	Quadrat Frequency '95	Quadrat Frequency '96
Deer	-	2
Buffalo	2	1

TREND STUDY 00-6-96

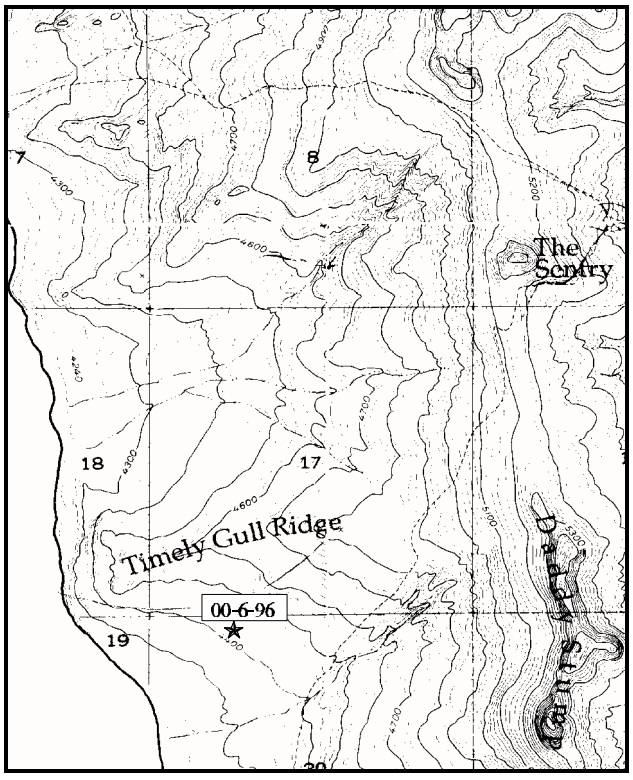
Study site name: Timely Gull Ridge. Range type: Annual grass.

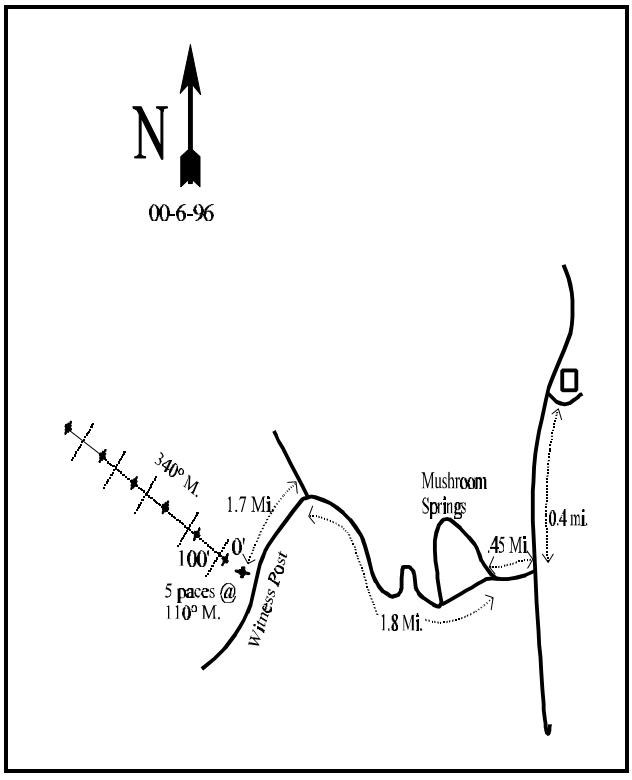
Compass bearing: frequency baseline 260 degrees magnetic.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

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





Map Name: Timely Gull Ridge Diagrammatic Sketch

Township 2N, Range 3W, Section 20 UTM COOR: 3-98-304E 45-28-291N

DISCUSSION

Trend Study No. 00-6

The Timely Gull Ridge study is located about 1/4 mile south of Timely Gull Ridge and about 1/2 mile above the shoreline. Slope is 13% with a south-southwest aspect. Elevation is approximately 4,400 feet. To the east is a large gully created by erosion with scattered pinyon and juniper on the opposite slope.

Soil textural analysis indicates a sandy loam with a neutral pH of 6.6. Effective rooting depth (see methods) was measure to be 18 inches. Average soil temperature was 66°F at a depth of 17 inches. Once again, this would tend to give the competitive advantage to the annual species allowing them to dominate the site. Potassium may also be a limiting factor in the soil at a value less than 10ppm. Vegetative cover has declined slightly since 1995, yet litter cover has increased. Very little bare ground is apparent and no signs of erosion were reported in 1996.

No browse species were encountered on the site.

Nearly 98% of the grass cover is contributed by cheatgrass, rattail fescue, and six weeks fescue. Cheatgrass dominates the site with the other annual species closely following. Other grass species include purple threeawn and sand dropseed in very low numbers.

Forb cover is very limited with storksbill and moth mullein providing the bulk of the cover. Nested frequency for storksbill has declined since 1995. Other forb species include Carolina draba and yellow salsify.

1996 TREND ASSESSMENT

Soil trend is stable with no erosion apparent in 1996. Although vegetative cover declined slightly, litter cover increased leaving little bare soil. Cheatgrass, rattail fescue, and six weeks fescue are the dominate herbaceous species providing the bulk of the vegetative cover. Even if fire is suppressed on the site, it will be extremely difficult to change the composition of the community. Herbaceous trend is stable at this time but with very poor composition.

TREND ASSESSMENT
soil - stable
browse - no browse
herbaceous understory - stable but with very poor composition

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

Type	Species	Nested Frequency '95	'96	Quadrat Frequency '95	'96	Average Cover % '95	'96
G	Aristida purpurea	25	11	10	5	.32	.12
G	Bromus tectorum (a)	499	499	100	100	61.79	63.37
G	Festuca myuros (a)	75	*163	21	51	.69	3.75
G	Poa fendleriana	3	-	2	-	.01	-
G	Sporobolus cryptandrus	55	47	26	27	.88	1.51
G	Vulpia octoflora (a)	344	*257	83	68	1.99	1.85

Type	Species	Nested Frequency '95	Nested Frequency '96	Quadrat Frequency '95	Quadrat Frequency '96	Average Cover % '95	Average Cover % '96
Total for Grasses		1001	977	242	251	65.68	70.62
F	Agoseris heterophylla	8	*-	4	-	.02	-
F	Draba reptans (a)	12	23	3	6	.01	.03
F	Erodium cicutarium (a)	430	*342	100	94	3.79	2.78
F	Tragopogon dubius	-	1	-	1	-	.00
F	Verbascum blattaria	-	*29	-	12	-	1.58
Total for Forbs		450	395	107	113	3.82	4.41

* Indicates significant difference at % = 0.10

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

Cover Type	Nested Frequency '95	Nested Frequency '96	Average Cover % '95	Average Cover % '96
Vegetation	500	500	73.59	68.52
Rock	269	36	2.95	.18
Pavement	-	131	0	1.54
Litter	500	495	66.70	79.70
Cryptogams	51	20	.52	.35
Bare Ground	40	11	.12	.05

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

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
18.2	65.8 (16.5)	6.6	76.9	10.1	13.0	.9	6.0	89.6	.4

PELLET GROUP FREQUENCY --
Herd unit 00, Study no: 6

Type	Quadrat Frequency '95	Quadrat Frequency '96
Buffalo	1	1

SUMMARY

MANAGEMENT UNIT - 00 - ANTELOPE ISLAND

Six trend studies were reread in the spring of 1996. Two studies were established in 1994 and four studies were established in 1995.

One common trend on all sites is the abundance of annual, weedy species. Most of the sites are dominated by cheatgrass and rattail fescue. Past overgrazing and recent fires have changed the plant community compositions of the island to this point. Without great input, the current fire cycle that is recurring will be difficult to stop. Green stripping with perennial species could help control the size and intensity of wildfires. Annual species provide abundant seed for the next season, as well as abundant fine fuels. Erosion on the sites is not extensive at this time due to the abundant vegetative and litter cover.

Browse communities have also been lost, mostly due to the recurring fires. Browse species on the island are not fire tolerant and are not able to resprout after fires. The annual species then displace the browse species, which can compete for soil moisture early in the year, not allowing browse seedlings to become established. Perennial grasses and forbs need to be established to compete with the winter annuals and allow browse species to become establish themselves.

A summary table with trends from 1996 follows.

TREND SUMMARY - 00 - ANTELOPE ISLAND

Site	1996		
	Soil	Browse	Grasses & forbs
00-1 Tin Lambing Shed	slightly upward	stable	stable
00-2 Frary Homestead	slightly upward	stable	stable
00-3 Garden Spring Flat South	stable	stable	stable
00-4 Alfalfa Seeding	stable	stable	stable
00-5 Buffalo Scaffold	stable	none	stable
00-6 Timely Gull Ridge	stable	none	stable

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